

**NDSU**

**CONSTRUCTION &  
MECHANICAL SAFETY**

**JUNE 1996**

**NDSU**  
**CONSTRUCTION & MECHANICAL SAFETY**  
**SAFE OPERATING PROCEDURE**

**1. TRENCHING & EXCAVATION**

NDSU employees may, on occasion, be exposed to open excavations or trenches made in the earth's surface, on or near campus. It is necessary to understand the safe operating procedures for working in and around excavations and trenches.

**I. Definitions**

- a. Competent Person** - one who is capable of identifying existing and predictable hazards in the surroundings; working conditions which are unsanitary, hazardous, or dangerous to employees; and one who has authorization to take prompt, corrective measure to eliminate them. Daily excavation inspections are to be done by the job site's competent person. Inspections must also always be done after a rain storm or other hazard- increasing occurrence.
- b. Excavation** - any man-made cut, cavity, trench, or depression in an earth surface which is formed by earth removal.
- c. Protective System** - a method of protecting employees from cave-ins of material (that could fall or roll from an excavation face) and from the collapse of adjacent structures. Protection could include sloping, shoring, benching, or shielding.
- d. Sloping** - the system or method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.
- e. Trench** - a narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 ft.

**II. General Requirements**

**a. Prior to Excavation**

- \* Prior to opening an excavation, effort shall be made to determine whether underground installations (sewer, telephone, water, fuel, electric line, etc.) will be encountered. If so, the exact locations shall be determined by the appropriate utility

company.

- \* Local utility companies must be contacted, with their requested period of time, prior to any excavation
- \* Be alert to hazards from overhead wires and underground utilities; rupture of underground gas mains and careless smoking or other sources of ignition. All surface encumbrances must be removed or supported, as necessary, to safeguard employees.
- \* All subcontractors performing excavation work and excavations performed by the company must have a “competent person” on the site to determine safe slopes for all excavations.
- \* The competent person must be able to recognize the existing and unpredictable hazards in the workplace which are or could be dangerous to employees or create an unsanitary condition.
- \* The competent person has the authorization to take prompt action to eliminate any hazards. On going daily inspections of excavations, the adjacent areas, and protective systems must be made by a competent person.
- \* Employees exposed to public vehicular traffic must be provided with and wear warning vests.

#### **B. Egress**

- \* Safe means of access and egress must be located in trench excavations of 4 ft. In depth or more so as to require no more than 25 ft of lateral travel for employees.

#### **C. Equipment Use**

- \* No employee shall be permitted underneath loads handled by lifting or digging equipment. Use tag lines to control or guide suspended loads.
- \* When mobile equipment is used near an excavation, a warning system is required when the operator’s vision is obstructed or when the operator does not have a direct view or work is necessary at the rear of the equipment. When mobile equipment is allowed adjacent to an excavation, stop logs or barricades shall be installed.

#### **D. Site Specific Hazards**

- \* Air in the excavation shall be tested in all locations where oxygen may be deficient, gaseous conditions are possible, or where other hazardous atmospheric conditions may exist or could reasonably be expected to exist. Proper respiratory protection or ventilation is required in oxygen deficient areas. When one or more of the conditions are found to be present, the NDSU Safe Operating Procedure for the **Confined Space Entry Program** shall be initiated.
- \* Employees shall not work in excavations in which there is accumulated water or in excavations in which water is accumulating unless adequate precautions have been taken to protect the employees against the hazards posed by water accumulation. The precautions needed to protect the employees will vary with each situation.
- \* Where the stability of adjacent structures is endangered by excavation operations, support systems must be provided.

- \* Adequate protection shall be provided to protected employees from loose rock or soil by placing or keeping such materials at least 2 ft. from the edge of excavations, or by the use of retaining devices .
- \* Where employees are required to cross over excavations, substantial walkways or bridges with standard guardrails shall be provided.
- \* Employees shall not be allowed in a trench over four feet deep that is not sloped to the correct angle of repose or otherwise protected.
- \* Trenches less than four feet deep shall be effectively protected when examination of the ground indicates that hazardous ground movement may be expected.
- \* Inspections of excavations, the adjacent areas and protective systems shall be made by a competent person prior to the start of work and as needed throughout the shift.
- \* Inspections shall also be made after every rainstorm or other hazard increasing occurrence. These inspections are only required when employee exposure can be reasonably anticipated.
- \* Use ladders to enter or leave trenches. Spacing between ladders in a trench shall be no more than 25 ft. apart.

**Trenches can cave-in and kill in less than 2/100th of a second.**

**RUN TOWARD THE CAVE IN, TRY TO GET ON TOP OF THE DIRT**

### **III. SOIL CLASSIFICATIONS**

**TYPE A** - cohesive soils (clay or soil with a high clay content, does not crumble) with unconfined compressive strength of 1.5 tons of pressure per square foot or greater. No soil is Type A if the soil is fissured, subject to vibration, has been previously disturbed or part of a sloped layered system where layers dip into the excavation on a slop of 4:1.

**TYPE B** - cohesive soil with an unconfined compressive strength greater than 0.5 tons but less than 1.5 tons of pressure per square foot. Is not previously disturbed soil (native prairie).

**TYPE C** - cohesive soils with an unconfined, compressive strength of 0.5 tons of pressure per square foot or less. Most soil in North Dakota is of this type.

### **IV. SLOPES**

For excavations 0 to 20 feet deep:

- 1) Slope the sides - prevent a cave in
- 2) Shore (brace) - prevent a cave in
- 3) Shield (use of trench box) - protects employees from a cave in, does not prevent the cave in.
- 4) Registered Professional Engineer is required to sign off on the system used.

For excavations 20 feet or greater:

- 1) Registered Professional Engineer is required for the design of the system used.

Maximum allowable slopes for excavations **less than 20 ft. deep:**

- 1) Stable Rock: Vertical (90 degrees)
- 2) Type A:  $3/4 : 1$  (53 degrees)
- 3) Type B:  $1:1$  (45 degrees)
- 4) Type C:  $1-1/2 : 1$  (34 degrees)

## **2. Welding & Cutting**

### **I. General Safety - Safe Operation**

- \* The operator must be properly trained and instructed by an experienced welder.
- \* Cutting or welding shall be permitted only in areas that are or have been made fire safe.
- \* Personal protective equipment is mandatory - this is to include but is not limited to the following:
  - Maximum eye protection is necessary - this includes but is not limited to goggles with side shields, and a welding shield or helmet
  - Wool or flame resistant coveralls, welding gloves and apron to protect skin from radiation burns, electric shock or fire.
  - Shoes or boots with rubber soles, steel-cap toes, and high tops.
  - Avoid clothing with cuffs or pockets that can trap hot metal.
- \* Rubber mats or wooden platforms provide extra protection during electric welding and cutting.
- \* Ensure all equipment used is maintained in a safe condition.
- \* Identify and report defective or dangerous equipment so that it can be repaired.
- \* Work in a well lit and adequately ventilated location.
- \* Maintain a high standard of housekeeping.
- \* Ensure any unsafe condition is made safe before working.
- \* DO NOT enter dangerous areas - those that are highly flammable or toxic.
- \* Do not use welding cables at currents in excess of their rated capacity.
- \* Never strike an arc in the presence of other people whose eyes are not shielded.
- \* Do not strike an arc on a compressed gas cylinder.
- \* Do not weld on containers that are near combustibles or were used to hold combustible or flammable material - Purge the containers first.
- \* Don't pick up objects marked "HOT" without testing.
- \* Keep flying sparks, hot slag, hot objects and open flames away from hoses.
- \* Don't use matches for lighting torches. Use suitable friction lighters, stationary pilot flames or some other source of ignition. Do not light torches from hot work when in a small or confined space.
- \* Don't move individual cylinders with out a cap over the cylinder valve.
- \* Be sure all individual cylinders are secure so they don't tip or fall.
- \* Don't use a hammer or wrench to force open a cylinder valve. If the valve cannot be opened by hand, notify a supervisor.

#### **NEVER ATTEMPT TO REPAIR CYLINDER VALVES**

- \* Don't use regulators or cylinder valves as hooks for hanging torches and hoses.
- \* Always protect hoses from being stepped on or run over - a connection may be ripped or the equipment may be pulled over. Avoid tangles and kinks.
- \* Be very careful when the unit or surrounding area is wet or damp - it can cause a serious electrical shock or possible death.
- \* When welding or cutting is to be discontinued for some time - close the cylinder valves

first and then release gas pressure from the regulators by opening the torch valves until flow stops. Next release the pressure adjusting screw and then close the torch valves. If the equipment is to be dismantled or repaired, follow the same procedure.

**FIRE EXTINGUISHING EQUIPMENT SHALL BE MAINTAINED IN A STATE OF READINESS FOR INSTANT USE.**

**II. ELECTRIC ARC WELDING**

IN CASE OF FIRE **DO NOT THROW WATER ON ANY ELECTRICAL DEVICE. DISCONNECT AC POWER AND USE A FOAM EXTINGUISHER OR SAND TO SMOTHER THE FLAME**

- \* Never force connections which do not fit easily.
- \* Assure that the electrode holder is fully insulated and the welding cables are free of worn or frayed insulation.
- \* See that the ground terminal lug is connected through the input cable or by separate conductor to the power system ground. An ungrounded machine can cause death by electrocution.
- \* Do not reposition the voltage bars while power source is connected to the machine. To do so could cause a serious electrical shock and possible death.
- \* Turn off the POWER switch and disconnect the power before opening the welder cabinet.
- \* Do not make or break any connections or perform any maintenance while the welding machine is in operation. The high voltage created by this machine can cause death by electrocution.
- \* Keep connections tight between the regulators, adaptors and cylinder valves. Test for leaks with soapy water, never with an open flame.
- \* Do not try to relight a torch that has “blown” out without first closing both torch valves. Relight in the usual manner.
- \* Don't use regulators or cylinder valves as hooks for hanging torches and hoses.
- \* When flame cutting, direct the torch so that sparks, hot metal or the severed section will not fall on the cylinder hose, or your legs or feet. Direct the flame away from the cylinders.
- \* When someone receives an electric shock and “locks on” to a live component, the power must be switched off before the patient is handled. Apply first aid and seek medical advice.

### III. OXYACETYLENE WELDING

#### A) Acetylene

- \* Refer to acetylene by its correct name “acetylene” and not by the word gas.
- \* Maintain all cylinders in an upright position when in use and during storage.
- \* Avoid using sparks, flames, and heat near acetylene cylinders.
- \* Never use acetylene directly from cylinders without reducing the pressure through a suitable regulator connected to the cylinder valve.
- \* Turn the acetylene cylinder so that the valve outlet points away from the oxygen cylinder.
- \* When opening an acetylene cylinder turn the key 1/4 turn.
- \* The acetylene cylinder key for opening the cylinder valve must remain on valve stem while cylinder is in use so that the acetylene cylinder can be turned off quickly in an emergency.
- \* Acetylene apparatus - such as regulators, hose or other pieces should never be used for oxygen.
- \* Never transfer acetylene from one cylinder to another nor refill an acetylene cylinder, nor mix any other gas in an acetylene cylinder.
- \* Should a leak occur in an acetylene cylinder, move it into the open air, keeping it well away from fires, open lights or other sources of ignition. Notify the manufacturer immediately.
- \* Never use acetylene at pressures above 15psi; the use of pressures higher than 15psi is dangerous because the acetylene is unstable at such levels and will be inclined to separate violently.
- \* Flashbacks can result if improper adjustment is on the torch valves. Keep all valves properly adjusted, use correct pressures, and keep the tip outlet clean and free of obstruction.
- \* Remove regulators before moving cylinders. When empty, replace cap over cylinder valve and mark the cylinder “MT”.

#### B) OXYGEN

- \* Remember that oxygen gas is a major fire and explosion hazard. Oxygen supports combustion - DO NOT use oxygen near flammable materials as grease or oil.
- \* Always refer to oxygen as “oxygen” and not by the word “air”.
- \* Do not use oxygen to refresh air.
- \* Do not use oxygen as a substitute for compressed air.
- \* Do not use oxygen or compressed air to dust off clothes.
- \* Never store oxygen and acetylene cylinders together. They must be kept separated.
- \* Never allow oil or other readily oxidizable material to come in contact with oxygen cylinders - valves- regulators - hose or fittings. Oxygen in contact with oil, grease, other hydrocarbons and oil-based substances can cause spontaneous ignition and explosion.
- \* Apparatus used for oxygen (regulators, hose or other pieces) should never be used

with any other gas.

- \* Oxygen cylinder valves should be fully open when in use.
- \* Never mix gases in an oxygen cylinder.
- \* Be sure that the cylinder valve is tightly closed before handling the cylinder.
- \* Never use oxygen directly from the cylinders without a suitable regulator attached to the cylinder valve.
- \* Do not leave torches or hoses which are connected to the supply within confined space.
- \* Do not cut or weld drums with a hazard diamond on the label.
- \* Do not use drums as a welding or cutting platform. Never oxy-cut or weld near empty drums.
- \* Do not use PVC piping to carry compressed air to various parts of your workshop or beyond.

### 3. JACKHAMMERS & TAMPERS

#### General Safe Operation

- \* Only authorized and trained personnel shall use the equipment.
- \* Keep visitors away and NEVER allow children in the work area during operation.
- \* Appropriate Personal Protective Equipment (PPE) is mandatory while the equipment is in use. It may include but is not limited to the following:

Goggles/Face Protection	Hearing protection
Gloves	Steel toe shoes

- \* All tools shall be inspected and or tested for proper working order each day before use.
- \* Any tools found not in proper working order, or that develops a defect during use, shall be immediately removed from service and not used until repaired.
- \* Adjustments or repairs shall not be made on running equipment.
- \* Always disconnect a power tool from the power source before cleaning or making adjustments to the tool.
- \* Each operating control shall be protected against unexpected or accidental activation.
- \* All belts, shafts, gears, and other moving parts must be fully enclosed or guarded, in a manner to present no hazard to the operator.
- \* When using a power tool, give the tool your full and undivided attention.
- \* Do not operate the tools if you cannot see the working surface clearly.
- \* Do not distract or disturb another worker who is operating a power tool.
- \* Ensure that cords and hoses are positioned so they do not become trip hazards.
- \* Ensure that the power source for a hydraulic or pneumatic tool is the correct pressure for the tool.
- \* All pneumatic power tools shall be secured to the hose by some positive means to prevent the tool from becoming accidentally disconnected.
- \* All electric power-operated tools shall either be of the approved double -insulated type or grounded.
- \* Do not use electrical tools in areas where water is present.
- \* For jobs with excessive vibration, extra protection shall be provided to decrease hand and arm fatigue, reduce vibration and to increase comfort. Contact your immediate supervisor for direction and additional PPE.
- \* Rotation of job duties/ tasks shall be increased and/or additional breaks shall be allowed during jobs that involve excessive vibration and repeated impact of industrial power tools and equipment.

#### 4. SANDBLASTING

Sandblasting is used extensively for the purpose of cleaning or preparing a variety of surfaces, using various types of abrasive materials. Workers who perform the sandblasting operations can be exposed to toxic materials, such as lead or zinc, while removing existing coatings from material surfaces. They are also exposed to hazards from the sandblasting agent, usually silica sand, therefore there are a number of safety precautions that must be taken by blast operators and other crew members.

Although sandblasting is done vary sparingly on NDSU campus or contracted out, NDSU employees need to be aware of the safe operating procedures for this type of cleaning process.

##### **Guidelines**

Workers who are exposed to dusts containing silica are required to comply with the *NDSU Respiratory Safety - Safe Operating Procedure* and undergo testing for use of a respirator. Job specific requirements will be outlined by the departmental supervisor prior to the start of the job.

Sandblasting operations are noisy. Where exposure to noise levels exceeds 85 dBA, the employee is required to comply with the *NDSU Noise and Hearing Conservation Program - Safe Operating Procedure*. The NDSU Safety Director shall be contacted prior to the start of the job for appropriate monitoring.

The application and use of appropriate Personal Protective Equipment is required of all employees who are involved in or near the sandblasting. Job specific requirements will be outlined by the departmental supervisor. Reference is made to the *NDSU Safe Operating Procedure on Personal Protective Equipment*.

PPE equipment shall include but not be limited to the following:

Self Contained Breathing Apparatus	Air hood respirators/Face Shields	Hearing Protection
Protective Coveralls		
Full Arm Work gloves		Safety Footwear

Sandblast operators must remove their supplied air breathing equipment only when they are well away from the work location as silica dust and other contaminants can remain suspended in the air for long periods of time.

If an electrostatically conductive blast hose is not available, the blast nozzle must be ground.

Sandblasting operations shall be carried out so that the abrasive materials and other particulate materials are contained, and pose no hazards to workers or the public.

The sandblast pot must be grounded at all times.

The sandblast pot must be provided with a safety shut down and the sandblast post must be shut off while being filled with abrasives.

The operator must blow out all air lines and hose. The entire sandblasting unit must be carefully examined for defects before any work is started.

Sandblasting nozzles must be equipped with a remote control (deadman) switch that allows the operator to control the sandblast at the nozzle.

When sandblasting is to be conducted in a confined space, the employee must comply with the requirements of the ***NDSU Confined Spaces - Safe Operating Procedure***.

All questions regarding safety and risk management during sand blasting operations can be directed to the Occupational Safety and Environmental Health Office, the Loss Prevention Office or the Safety Director.

Copies of the various required Safe Operating Procedures for NDSU can be requested from the Occupational Safety and Environmental Health Office, the Loss Prevention Office or the Safety Director.

## 5. Jacks-lever & ratchet, screw, and hydraulic

### General requirements

- The manufacturer's rated capacity shall be legibly marked on all jacks and shall not be exceeded.
- All jacks shall have a positive stop to prevent over travel.
- When it is necessary to provide a firm foundation, the base of the jack shall be blocked or cribbed. Where there is a possibility of slippage of the metal cap of the jack, a wood block shall be placed between the cap and the load.
- After the load has been raised, it shall be cribbed, blocked, or otherwise secured at once.
- Hydraulic jacks exposed to freezing temperatures shall be supplied with an adequate antifreeze liquid.
- All jacks shall be properly lubricated at regular intervals.
- Each jack shall be thoroughly inspected at times which depend upon the service conditions. Inspections shall be not less frequent than the following:
  - For constant or intermittent use at one locality, once every 6 months.
  - For jacks sent out of shop for special work, when sent out and when returned.
  - For a jack subjected to abnormal load or shock, immediately before and immediately thereafter.
- Repair or replacement parts shall be examined for possible defects.
- Jacks which are out of order shall be tagged accordingly, and shall not be used until repairs are made.

## 6. LASERS

### I. General Information/General Safety

**EYES** - Damage can occur from both acute and chronic exposure to laser radiation. Depending on the wavelength and exposure levels, corneal and/or retinal burns can result from acute overexposure. Cataracts and/or retinal injury may be possible from chronic exposure to excessive levels.

**SKIN** - Burns can result from acute exposures to high levels of optical radiation. Some specific ultraviolet wavelengths can cause carcinogenesis of the skin.

Even though skin effects have been considered of secondary importance from a safety standpoint, cases of skin damage have been increasing due to the increase use of lasers emitting ultraviolet light and high-power lasers.

**CHEMICAL HAZARDS** - Reactions induced by lasers can release hazardous particulate and gaseous products. An example of this occurs in material processing such as laser welding, cutting and drilling which can create potentially hazardous fumes and vapors.

General ventilation safety procedures should be used when lasers are used in this manner.

**ELECTRICAL HAZARDS** - Lethal electrical hazards are particularly present when high-power laser systems are used. Always practice commonly accepted safety procedures.

**OTHER SECONDARY HAZARDS** -Lasers have the potential to cause fires. Another hazards associated with these types of lasers is working with cryogenic coolants such as liquid nitrogen. Skin contact can cause burns, improper plumbing can cause explosion, and insufficient ventilation can result in displacement of oxygen by the liquified gas vaporizing.

The basic approach of all laser safety standards has been to classify lasers by their potential hazard based upon their optical emission. Basically, the classification scheme is used to describe the capability of the laser or laser system to produce injury to personnel. The higher the classification, the greater the potential hazard.

### AMERICAN NATIONAL STANDARDS INSTITUTE LASER CLASSIFICATION

<b>CLASS</b>	<b>PROPERTIES</b>
1.	Exempt laser or laser systems that cannot, under normal operation conditions, produce a hazard.
2.	Low power visible lasers or laser systems which, because of normal human

aversion responses, do not normally present a hazards. May present some potential for hazard of viewed directly for extended periods of time.

3. a Lasers or laser systems that normally would not produce a hazard if viewed for only momentary periods with the unaided eye. They may present a hazard of viewed using collecting optics.
3. b Lasers or laser systems that can produce a hazard if viewed directly. This includes intrabeam viewing or specular reflections. Except for the high power class 3b lasers, this class laser will not produce a hazardous diffuse reflection.
4. Lasers or laser systems that can produce a hazard not only from direct or specular reflection, but also from diffuse reflection. In addition, such lasers may produce fire hazards and skin hazards.

## **II. LASER SAFETY RULES**

### **CLASS 1 LASERS**

- \* A warning sign indicating the laser classification should be placed in a visible location on the laser.

### **CLASS 2 LASERS**

- \* Do not stare at the laser or permit any person to stare at the laser beam.
- \* Do not point the laser at a person's eye.

### **CLASS 3 LASERS**

- \* Use proper safety eyewear if there is a chance that the beam or hazardous specular reflections will expose the eyes.
- \* Only experienced personnel shall be authorized to operate the laser. A warning light or buzzer should indicate when the laser is operating.
- \* Enclose as much of the beam path as possible.
- \* Avoid placing the unprotected eye along or near the beam axis as attempted in some alignment procedures since the chance of hazardous specular reflection is greatest in this area.
- \* Use beam shutters and output filters to reduce the beam power to less hazardous levels

when the full output power is not required.

- \* Protect spectators from a potentially hazardous condition.
- \* Operate the laser only in a well-controlled area. That is, in a closed room with no windows and controlled access.
- \* Mount the laser on a firm support to assure the beam travels along the intended path.
- \* Eliminate unnecessary specular (mirror-like) surfaces from the vicinity of the laser beam path.

#### **CLASS 4 LASERS**

- \* Enclose the entire laser beam path if at all possible. This will reduce the laser to a less hazardous classification.
- \* Confine indoor laser operations to a light-tight room with interlocked entrances to assure that the laser cannot emit when a door is open.
- \* Insure that all personnel wear adequate eye protection, and if the laser beam irradiance represents a serious skin or fire hazard that a suitable shield is present between the laser beam and any person in the room.
- \* Use remote firing and video monitoring or remote viewing through a laser safety shield where feasible.
- \* Use beam shutters and laser output filters to reduce the laser beam power to less hazardous levels whenever the full beam power is not required.
- \* Assure that the laser device has an appropriate locking system to permit only authorized personnel to operate the laser.
- \* Install appropriate signs and labels on entrances, switches, and anywhere an unauthorized person might mistakenly activate the laser.
- \* Use dark, absorbing diffuse, fire-resistant targets and backstops where feasible.

Federal law requires the manufacturers of lasers to provide the classification for all lasers produced. If the laser is changed by the user, the classification must be determined and made known to all users.

## **7. PAINTING OPERATIONS**

## **GENERAL SAFETY - SAFE OPERATION**

Smoking is not allowed in any area which has toxic fumes, flammable gases, vapors or combustibles.

Be sure to have good ventilation and air flow while performing job related duties that result in poor air or decreased oxygen.

Employees who are required to use respirators, to protect themselves from harmful dust, fogs, fumes, mists, gases, smoke, sprays or vapors, in order to perform their job shall follow the recommendation outlined in the *NDSU Safe Operating Procedure - Respiratory Protection Standard*. A copy of this standard can be obtained from the Occupational Safety and Environmental Health Office or Loss Prevention Office.

Personal protective equipment shall be used with air/airless spray equipment. Since these sprayers generate high fluid pressure, spray from the gun, leaks or ruptured parts can inject fluid through the skin, into the body and can cause serious injury which may result in amputation or death.

Wear goggles, safety glasses or face shields (over standard glasses), as necessary, while using spray equipment - fluid injected or splashed into the eyes can cause permanent eye damage.

Keep the spray gun pointed away from yourself or others at all times.

Never put your hand or fingers over the spray tip.

Never try to stop or deflect leaks with your hand or body.

Always relieve the pressure in the sprayers before cleaning or removing the spray tip or servicing any system equipment.

Be sure the equipments safety devices are in place and operating properly before each use.

Check ALL equipment before use and during regular use. Repair or replace worn or damaged parts or tools immediately.

Do not modify or remove any part of the spray equipment - this can result in malfunction and result in serious injury.

Static electricity may be created by the high velocity flow of fluid through the pump and hose. Proper grounding of the spray equipment is necessary to prevent sparking and a possible explosion or fire.

Do not plug in or unplug any power supply cords in the spray area when there is any chance of igniting fumes still in the air.

Keep only necessary amounts of paint, thinners, solvents, and flammables in your immediate work area to prevent fire hazards.

Check all electrical cords and plugs on the equipment prior to use. Make sure all cords are in good repair.

Use and application of Ladder Safety will be followed as outlined in *NDSU's Safe Operating Procedure - LADDER SAFETY*. A copy of this standard may be obtained at the Occupational Safety and Environmental Health Office or the Loss Prevention Office.

Use and application of Fall Protection will be followed as outlined in *NDSU's Safe Operating Procedure - Fall Protection*. A copy of the standard may be obtained at the Occupational Safety and Environmental Health Office or the Loss Prevention Office.

Fall Protection must be used in the following situations:

Roofing: Commercial - six feet or higher  
Residential - 25 feet or higher

General Industry - four feet or higher

Scaffolds - 10 feet or higher

Portable Ladders - no fall protection required

## **TRAINING**

The OSEHO, in conjunction with the department supervisor, is responsible for providing training to NDSU employees, on a regular basis, to enable them to recognize and prevent hazards associated with high pressure equipment, hazardous chemicals, and general painting duties.

Documentation of all training will be maintained at the OSEHO.