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## Chapter 1 Planning for Safety

### *Pre-project planning*

Prior to the start of construction activities, a pre project-planning evaluation will be conducted to address all particular site safety for the project including owner, company and regulatory agency requirements. A *Site Evaluation Checklist* (see attached sample) will be reviewed and filled out prior to project startup to determine the types of construction activities that will occur during the project and what specific health and safety guidelines must be maintained (see attached sample) including pedestrians safety, the motoring public safety, signage, barricades, flashers, detours, traffic lights, temporary walkways, overhead protection, watchman, security, fencing and other methods required to protect and limit and/or deny access to the project site. Additionally, consideration will be given to water and dust control and other conditions as may be present during construction.

An *Emergency Site Plan* (see attached sample) will also be created to address emergency response procedures to protect people and property during construction. The plan identifies and assigns personnel to various emergency tasks and responsibilities.

### *Setting up the project for safety*

To insure the project is set up for safety, all safety supplies will be assembled on site prior to the start of the actual construction by the O,R&L Safety Officer. Minimally, the following will be available:

#### **First Aid Kit**

First-aid kits and required contents will be maintained in a serviceable condition by the Site Superintendent. New kits will be purchased at the start of each new project. Supplies will be checked monthly by the Site Superintendent to insure all supplies have been replaced after use. Unit-type kits have all items in the first-aid kit individually wrapped, sealed, and packaged in the comparable size packages. The commercial or cabinet-type kits do not require all items to be individually wrapped and sealed, but only those which must be kept sterile. Items such as scissors, tweezers, tubes of ointments with caps, or rolls of adhesive tape, and need not be individually wrapped, sealed or disposed of after a single use or application. Individual packaging and sealing shall be required only for those items which must be kept sterile in a first-aid kit.

First-aid kits shall contain at least the following items:

***10 Package Kit:***

- 1 Pkg. Adhesive bandages, 1" (16 per pkg.)
- 1 Pkg. Bandage compress, 4" (1 per pkg.)
  
- 1 Pkg. Scissors\* and tweezers (1 each per pkg.)
- 1 Pkg. Triangular bandage, 40" (1 per pkg.)
- 1 Pkg. Antiseptic soap or pads (3 per pkg.)

***16 Package Kit:***

- 1 Pkg. Absorbent gauze, 24" x 72" (1 per pkg.)
- 1 Pkg. Adhesive bandages, 1" (16 per pkg.)
- 2 Pkgs. Bandage compress, 4" (1 per pkg.)
- 1 Pkg. Eye dressing (1 per pkg.)
- 1 Pkg. Scissors\* and tweezers (1 each per pkg.)
- 2 Pkgs. Triangular bandages, 40" (1 per pkg.)
- 1 Pkg. Antiseptic soap or pads (3 per pkg.)

***24 Package Kit:***

- 2 Pkgs. Absorbent gauze, 24" x 72" (1 per pkg.)
- 2 Pkgs. Adhesive bandages, 1" (16 per pkg.)
- 2 Pkgs. Bandage compress, 4" (1 per pkg.)
- 1 Pkg. Eye dressing (1 per pkg.)
- 1 Pkg. Scissors\* and tweezers (1 each per pkg.)
- 6 Pkgs. Triangular bandages, 40" (1 per pkg.)
- 1 Pkg. Antiseptic soap or pads (3 per pkg.)

***36 Package Kit:***

- 4 Pkgs. Absorbent gauze, 24" x 72" (1 per pkg.)
- 2 Pkgs. Adhesive bandages, 1" (16 per pkg.)
- 5 Pkgs. Bandage compress, 4" (1 per pkg.)
- 2 Pkg. Eye dressing (1 per pkg.)
- 1 Pkg. Scissors\* and tweezers (1 each per pkg.)
- 8 Pkgs. Triangular bandages, 40" (1 per pkg.)
- 1 Pkg. Antiseptic soap or pads (3 per pkg.)

\*Scissors shall be capable of cutting 2 layers of 15 oz. cotton cloth or its equivalent. The first-aid kits are maintained at the ten, sixteen, twenty-four or thirty-six package level.



Where the eyes or body of any person may be exposed to injurious chemicals and/or materials, suitable facilities for quick drenching or flushing of the eyes and body will provided, within the work area, for immediate emergency use.

Additional Personal Protective Equipment that will be stored in the project trailer and maintained by the Site Superintendent are:

- Hearing Protection
- Safety Glasses
- Respirators
- Hard Hats

### Potable Water

An adequate supply of potable water with single service cups will be provided and located in the construction trailer

### Sanitary Facilities

Toilets will be provided for employees and subcontractors according to the following table:

20 or less	1
20 or more	1 toilet seat and a urinal per 40 workers
200 or more	1 toilet seat and 1 urinal per 50 workers

### Utilities

Utilities, including all underground and overhead will be located, de energized or relocated. The Site Superintendent will call CALL BEFORE YOU DIG prior to the start-up of any construction activities. The CALL BEFORE YOU DIG shall be recorded in the Superintendent’s Daily Report on Expedition including the date and time of the call and the site specific number assigned.

The Site Superintendent will arrange for the installation of temporary electrical power, insuring that it is installed in accordance with the current regulations by a licensed installer. All circuits provided should be GFCI protected.



## Signage

The Site Superintendent will secure in a conspicuous place, all safety signage and post, to include but not be limited to:

- All required State & Federal Posters
- Safety and health posters
- Emergency telephone numbers
- Directions to nearest emergency facility
- All other safety signage as required by the project.

The Project Manager will notify the O,R&L Insurance Carrier of the construction start and get a certificate of insurance for the specific site, date and check to insure that all subcontractors have the required insurance.

## Setting up the sub-contractor for safety

Sub- contractors working on the project will comply with all O,R&L safety regulations. During the submittal process, all sub-contractors will be required to supply a Health & Safety Plan (HASP) specific to the project and for review by the O,R&L Safety Officer.

Prior to beginning construction operations on-site, the sub-contractor will be required to undergo a safety orientation conducted by the Site Superintendent including but not limited to the review of all O,R&L site safety requirements, policies and procedures. A copy of the O,R&L Subcontractor Orientation booklet (see attached sample) will be provided to all sub-contractors. Sub-contractors will, at this time, be provided all site specific safety requirements and contact information for O,R&L safety staff.

\*Reference: OSHA 1910.151; OSHA 1926.50

## Site Safety Evaluation Site Sheet

<b>Hazard</b>	<b>Controls/Comments</b>
→ Vehicular traffic	
→ Pedestrian traffic	
→ Site Signage	
→ Temporary walkways	
→ Fencing	
→ Call Before You Dig	
→ Subcontractor Training	
→ Chemical Safety	
→ Confined Space Safety	
→ Electrical Safety	
→ Emergencies	
→ Fire Safety	
→ Security	

→ Utilities	
→	
→ Gases	
→ Hazcom Communication	
→ PPE	
→ Materials Handling & Storage	
→ Lockout/Tagout	
→ Noise	
→ Fall Protection & Post Fall Rescue Plan	
→ Ladders & Scaffolds	
→	
→ Sanitation	
→ Tools	
→ Barricades	



→ Detours	
→ Temp Walkways	
→ Overhead Protection	
→ Security	
→ Site Access	
→ Dust Control	

# O,R&L Supervisor Report Of Accident Investigation

Injured's Company \_\_\_\_\_ Job Location \_\_\_\_\_

Name & address of injured: \_\_\_\_\_  
\_\_\_\_\_

Length of service \_\_\_\_\_ Performing Regular Job \_\_\_\_\_

Date of accident: \_\_\_\_\_ Time \_\_\_\_\_ am/pm Date reported \_\_\_\_\_

First Aid given at jobsite Yes \_\_\_ No \_\_\_ Nature of first aid given \_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_ By Whom \_\_\_\_\_

Was an ambulance called Yes \_\_\_ No \_\_\_

What hospital was injured taken to \_\_\_\_\_

Describe nature and location and extent of injury  
\_\_\_\_\_

Describe what happened  
\_\_\_\_\_

**SAMPLE**

List and witnesses \_\_\_\_\_

Describe (in detail) what conditions or circumstances made this accident possible (include what tools, equipment and material handled) \_\_\_\_\_  
\_\_\_\_\_

Did accident occur because of a merchandise defect Yes/No; Unsafe Act Yes/No: Unsafe Condition Yes/No. Please explain \_\_\_\_\_  
\_\_\_\_\_

What corrective action has been taken as a result of this accident  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Do you agree with injureds explanation of accident yes/no. Please explain  
\_\_\_\_\_  
\_\_\_\_\_

O,R&L Supervisor Signature \_\_\_\_\_ Date \_\_\_\_\_

Signature of Injured \_\_\_\_\_ Date \_\_\_\_\_

Signatue of Injureds supervisor \_\_\_\_\_ Date \_\_\_\_\_

*\*Use back side of this firm for further information*

## Purpose

The following site emergency plan has been written to provide response procedures to protect people and property during on-site construction emergencies or natural disaster situations at the [REDACTED] site. This plan identifies and assigns personnel to various emergency tasks and responsibilities, thus creating the Site Emergency team. This plan coordinates between the Site Emergency Team and CV personnel to ensure an effective response.

## Considerations

[REDACTED] located at [REDACTED] (the construction site) is situated in an easily accessible between Middletown Ave and I-91 in North Haven, CT. Due to its proximity to I-91 and Tilcon/Amtrak rail lines, consideration will be given in this report to railway and/or roadway accidents. Additionally, consideration will be given to possible flooding conditions from the Quinnipiac River. Also, because the work will be on-going during hurricane season, this has been included in the hazard analysis sheet below. *Of primary importance will be construction site emergencies and accidents (see the Hazard Analysis Sheet below)*

Natural Hazards & Disasters	Possibility	Property Impact	Employee Impacts	Total	Comments
Flooding	1	1	1	3	
Rail	1	1	1	3	
Highway	1	1	1	3	
Haz-mat off-site	1	1	1	3	
Ice/Snow	0	0	0	0	Not applicable during this time
Hurricane/Wind Tornado	1	1	1	3	Work performed during hurricane season/loss of utilities
On-site Safety Hazards	Possibility	Property Impact	Employee Impacts	Total	Comments
Fire	0	0	0	0	
Haz-mat on-site	0	0	0	0	
Electric	0	0	0	0	
Head/Hearing/Eyes	0	0	0	0	
Respiratory	0	0	0	0	
Welding	0	0	0	0	
Scaffolds	0	0	0		
Falls	0	0	0		
Trenches	0	0	0		
Demo	0	0	0		
Steel Erection	0	0	0		

### Legend:

**Possibility:** 0. unlikely possibility; 1. low possibility; 2. may or high possibility; 3. likely

**Property Impact:** 0. No impact; 1. low impact - slight property damage; 2. moderate impact - moderate property damage; high impact - destruction of property damage

**Employee Impact: 0. No impact : 1. low impact** - few hours lost productivity: 2. **moderate impact** - loss of wages, serious bodily injury: **high impact** - loss of employment, loss of life

\*After factoring each impact item, those with high priority totals will be planned for first.

## Capability Assessment

The Dianon site has been surveyed for people and equipment resources that are on site or that may be needed to respond to either a natural disaster or site accident.

### Employee Skills

**Site Superintendent** - 40 hours OSHA certified  
CPR certified

**Assistant Site Superintendent** - 40 hours OSHA certified  
CPR certified

**Safety Officer** - 40 hours OSHA certified  
CPR certified

### Subcontractor Skills

OSHA 40 hour trained, specific employees  
OSHA 10 hour trained (all other employees)  
O, P&L safety approved  
Mandatory tool box talk attendance

### Facility

Permanent and functioning sprinkler system  
Monitored fire alarm  
Smoke Alarms - as demo proceeds alarms will be off-line in areas  
Partial Basement - below grade safety/shelter space

### Equipment

Fire Extinguishers - nine (9) per floor  
Cell phones  
Lap top computers  
Signal horns

### Local Response Capability

**Shelton Volunteer Fire Department** - 225 firefighters, 4 companies,  
Pine Rock Park Station 4 located approx. 3.5 miles from Dianon site  
Medical emergency response provided by Echo Hose Hook & Ladder Paramedics  
and Valley EMS  
Mutual Aid: Stratford, Seymour, Ansonia

**Shelton Police Department** - 54 sworn officers  
Emergency Services Unit comprised of the Special Response Team

## General Response Procedures

Primary planning and response to an emergency and/or natural hazard or disaster affecting the [REDACTED] site will be through a cooperative effort between on-site personnel, the *Site Emergency Coordinator aka Site Superintendent*, the *O,R&L Emergency Officer aka the O,R&L Safety Officer*, the *O,R&L Emergency Director (ED)* and local emergency responders.

**The O,R&L Emergency Officer (EO)** is responsible for making protective action decisions and resource decisions and develop protocol.

**The Site Emergency Coordinator (SEC)** is responsible for activating the Site Emergency Plan, implementing protective actions procedures and coordinating response activities.

**The O,R&L Emergency Director (ED)** is responsible for overseeing all policies and procedures placed in action and consulting during critical construction operations.

## Site Emergency Team

O,R&L has created a [REDACTED] Site Emergency Team to respond to on-site accidents, emergencies and natural disasters. In addition to the Site Emergency Coordinator, other O,R&L personnel regularly scheduled on-site may be assigned emergency team responsibilities and are designed to coincide as much as possible with their normal day-to-day functions.

The Site Emergency Team for the Dianon site will be as follows:

### Emergency Director – [REDACTED]

Primary Responsibilities:

- 1) Assist with development of the site emergency plan
- 2) Review plans and make changes as appropriate
- 3) Review recordkeeping as appropriate
- 4) Inspect site twice monthly and advise findings and suggestions

### Emergency Officer/Safety Officer (EO) – [REDACTED]

Primary Responsibilities:

- 5) Develop the site emergency plan
- 6) Authorize the site emergency plan
- 7) Appoint personnel to perform emergency tasks
- 8) Authorize the use of organization resources as appropriate
- 9) Develop and oversee recordkeeping as appropriate

### Site Emergency Coordinator (SEC) – [REDACTED]

Primary Responsibilities:

- 1) Maintain current Site Emergency Plan
- 2) Test the plan on a regular basis
- 3) Train and activate personnel to perform emergency tasks (including tool box talks)
- 4) Organize and maintain an emergency control center (ECC)
- 5) Activating the emergency plan when required
- 6) Notifying local government emergency authorities as required
- 7) Implementing decisions and directives from the EO and ED

## Assistant Emergency Coordinator (ASEC) - [REDACTED]

### Primary Responsibilities:

As required at the direction of the SEC

### Emergency Control Center

The [REDACTED] emergency control center (ECC) will be located in the O,R&L construction trailer parked on the north end of the [REDACTED] building at the overhead garage doors. It has the following capabilities:

Phone  
Fax  
Copy machine  
Scanner  
Work space

### Emergency Procedures

Different emergency situations will require unique response procedures and are detailed in this section.

### Hurricane/Wind/Tornado Procedure

In this scenario, the Emergency Director in concert with the Site Emergency Coordinator (SEC) is responsible for making protective actions decisions based on:

NOAA reports  
Commercial radio and TV forecasts

### Emergency Director Response:

- 1) Notify SEC of forecasted weather conditions
- 2) Authorize use of organization resources by SEC

### Site Emergency Coordinator Response:

- 1) Activate ECC to monitor weather conditions
- 2) Clear site of all personnel
- 3) Advise personnel to seek shelter if necessary (see site plan below)
- 4) Check work areas to ensure all personnel have received warning
- 5) Remove all loose debris or potentially loose debris and/or secure
- 6) Batten down all equipment outdoors or move to safe interior location
- 7) Account for all personnel in shelter area
- 8) When situation is over, determine if personnel release is safe/unsafe
- 9) Sound all clear if safe
- 10) If site has received damage, ECC will remain open to coordinate recovery efforts
- 11) Coordinate any actions required with Shelton emergency responders
- 12) Assess damage
- 13) Coordinate any utility startups, site clearing etc.
- 14) Remain in constant communication with EO

### Warning Signal

Seek Shelter - Three (3) short releases of safety air horn

All clear - One (1) long release of safety horn

**Utility and Other Necessary Emergency Contacts:**

Service	Company	Telephone Number
Electric	United Illuminating	1-800-772-5584
Natural Gas	Southern Ct. Gas	1-800-513-8898
Water	Aquarion	1-203-445-7310
Telephone	SNET/ATT	1-800-272-4321

**Chemical Spill (RT 8) Procedure**

In this scenario, the Site Emergency Coordinator (SEC) is responsible for making protective actions decisions based on specifics of the accident.

**Site Emergency Coordinator Response:**

- 15) Activate ECC to monitor conditions
- 16) Advise personnel to seek shelter if necessary (see site plan below)
- 17) Check work areas to ensure all personnel have received warning
- 18) Account for all personnel in shelter area
- 19) When situation is over, determine if personnel release is safe/unsafe
- 20) Sound all clear if safe
- 21) If injuries have ensued or area is unsafe, dial 911
- 22) If unsafe, request personnel vacate facility and premise immediately
- 23) Coordinate any actions required with Shelton emergency responders
- 24) Assess damage
- 25) Remain in constant communication with EO

**Warning Signal**

Seek Shelter - Three (3) short releases of safety air horn.

All clear - One (1) long release of safety horn

**Fire Prevention Plan**

In this scenario, the Site Emergency Coordinator (SEC) is responsible for organizing and enforcing efforts to prevent a fire from occurring in the construction site workplace.

**Major Fire Hazards/Ignition Sources**

Hot work such as welding and cutting  
Solvents and adhesives use and storage of  
Propane and/or other necessary gases  
Heat producing equipment  
On-site smoking

**Controls**

**Storage**

1. Store propane and other gas/welding cylinders outside in secure, well ventilated areas;
2. Store flammable materials such as solvents and adhesives in lockable steel containers or remove from site daily;
3. Ensure propane and other gas cylinders are turned off when not in use especially when the site is vacated at the end of the work day;
4. Ensure propane and other gas/welding equipment and fittings are properly maintained, including hoses and fittings;

#### Hot Work

1. Ensure hot work such as welding or cutting is tightly controlled,
2. Make sure fire extinguishers are located at hot work areas and are in a serviceable condition
3. Check areas around and under where hot work has been carried out for smoldering an hour after work is finished
4. Do not leave tar boilers or other equipment unattended;

#### General

1. Keep the site tidy and make sure rubbish is cleared daily
2. Avoid unnecessary stockpiling of combustible materials such as polystyrene and store what is necessary away from ignition sources;
3. Bear in mind that explosive or flammable atmospheres can develop when solvents or adhesives are used in enclosed areas
4. Never use petrol or similar accelerants inside the building
5. Ensure that there is NO SMOKING in the building
6. Discuss and review emergency plan including fire prevention and response at all weekly tool box talks
7. Carry out fire drills if necessary
8. Make regular checks to ensure that fire precautions are in place
9. Display fire action notices including emergency exit routes on each floor and in construction trailer
10. This is a NO SMOKING site
11. All stairways and access of thereof must not be blocked in any way
12. All doors leading out of the building must have fully functional push bars and be free to open by occupants inside the building
13. Directions to the nearest emergency medical facility are clearly posted in the construction trailer and on the working premise

#### Fire Alarm

If a fire breaks out the alarm should be raised by the person who discovers it by a clear and loud shout "FIRE", and everyone on-site should immediately proceed to vacate the building.

The SEC and Assistant SEC will alert all floors of the building and mandate immediate evacuation.

Should the fire be controllable, the SEC or Assistant SEC can douse the fire with a fire extinguisher however not before calling 911. Firefighting efforts should NOT be undertaken if the fire is larger than can reasonably be undertaken with a 5 lb. 2ABC fire extinguisher. At no time shall O,R&L Construction employees and/or their subcontractors put their life in danger to extinguish a fire.

Generally, the assembly point for all evacuations will be at the O,R&L Construction trailer at the north end of the building

#### Means of Escape



The main principle is escape is that there should always be an alternative escape route for each floor at the site. Due to the nature of the early demolition and construction and the changing floor plan space, it may be easy for workers to easy to forget where the fire exits are therefore, as the demolition and re-construction progresses the SEC will update workers as to the escape routes on each floor on a weekly basis and post that information in the site trailer (ECC) and at all entrances and exits of each floor.

### **Firefighting equipment**

The equipment needed depends on the risk of fire occurring and the type of materials stored and used. The primary tool for fire fighting will be the use of 911 and the use of hand held 5lb. 2ABC fire extinguishers. The type of equipment provided at Dianon will be:

1. Fire extinguishers (5 lb 2ABC) located throughout the work area (nine (9) per floor)
2. Fire extinguishers (5lb 2ABC) can be moved to accommodate protection for special operations
3. One (1) (5lb 2ABC) fire Extinguishers must be located adjacent to each stairway.
4. Extinguishers must be in good working order and maintained per NFPA No. 10A-1970
5. All on-site personnel must be trained in the basic use of the fire extinguishers and basic fire fighting techniques.
6. The building is fully outfitted with working sprinklers that, in a fire event, will release as required.

### **On-Site Safety Plan**

A pre-project meeting will be held to discuss the safety requirements of this project. Mandatory attendance at this meeting is:

- O,R&L Safety Consultant
- O,R&L Safety Officer
- O,R&L Project Manager
- O,R&L Site Superintendent
- O,R&L Assistant Site Superintendent (if required)

Hazards and safety controls will be considered at this meeting and include but not be limited to:

- Vehicular traffic
- Pedestrian traffic
- Site Signage
- Temporary walkways
- Security
- Fencing
- Utilities
- Call Before You Dig
- Subcontractor Training
- Chemical Safety
- Confined Space Safety
- Electrical Safety
- Emergencies
- Fire Safety
- Gases
- Hazcom Communication
- Lockout/Tagout
- Materials Handling & Storage
- Noise
- PPE
- Ladders & Scaffolds
- Fall Protection & Post Fall Rescue Plan
- Tools

- Sanitation
- Other

A Site Safety Evaluation Checklist will then be filled out to identify site specific issues and their controls. The evaluation sheet will be adjusted as required by the site activities and inspections and will remain as a working document for safety purposes. The checklist will remain on-site for the duration of the project.

**Minimum Safety Inspections:**

- O,R&L Safety Officer - One time monthly, random visits
- O,R&L Safety Consultant - Twice monthly, planned visits
- O,R&L Safety Consultant - Planned visits during critical operations
- Weekly Tool Box Talks
- Daily inspection by Site Superintendent (SEC) or Assistant Site Superintendent
- CONNOSHA inspections twice during construction period - planned
- CNA inspections - random

SAMPLE



## **Chapter 2 Injury and Illness Prevention Program**

### ***Written Plan***

Every employer should have a written Injury and Illness Prevention plan. This is our plan. Please read it carefully. While no plan can guarantee an accident free work place, following the safety procedures set forth in this manual will significantly reduce the risk of danger to you and your co-workers. Thank you for all our safety efforts.

### ***Introduction to Our Program***

State and federal law, as well as company policy, make the safety and health of our employees the first consideration in operating our business. Safety and health in our business must be a part of every operation, and every employee's responsibility at all levels. It is the intent of O,R&L to comply with all local, state and federal laws concerning the operation of the business and the health and safety of our employees and the public. To do this, we must constantly be aware of conditions in all work areas that can produce or lead to injuries. No employee is required to work at a job known to be unsafe or dangerous to his or her health. Your cooperation in detecting hazards, reporting dangerous conditions and controlling workplace hazards is a condition of employment. Inform your supervisor immediately of any situation beyond your ability or authority to correct. Employees will not be disciplined or suffer any retaliation for reporting a safety violation in good faith.

### ***Safety Goals***

- 1) Reduce the number of injuries and illnesses to an absolute minimum
- 2) Educate O,R&L employees to all safety rules and regulations
- 3) Educate all O,R&L subcontractors to all safety rules and regulations

### ***Individual Cooperation/Agreement To Participate***

O,R&L maintains our safety and health program conforming to the best practices of our field. To be successful, such a program must embody proper attitudes towards injury and illness prevention on the part of managers, supervisors and employees. It requires the cooperation in all safety and health matters, not only of the employer and employee, but also between the employee and all co-workers. Only through such a cooperative effort can a safety program in the best interest of all established and preserved.



# health & safety manual

constructing a safe & sustainable future

Prevention of occupationally induced injuries and illnesses is of such consequence that it will be given precedence over operating productivity. To the greatest degree possible, management will provide all mechanical and physical protection required for personal safety and health, but our employees must bear primary responsibility for working safely. A little common sense and caution can prevent most accidents from occurring.

The information in this manual constitutes a written injury and illness prevention program. While O,R&L cannot anticipate every workplace hazard, the following general principals should guide your conduct. To be safe, you must never stop being safety conscious.

Study the guidelines contained in this manual. Discuss the workplace situation with your supervisor. Attend all company sponsored training and safety meetings. Read all posters and warnings. Listen to instructions carefully. Follow the Code of Safe Work Place Practices (Section 3 contained herein). Participate in accident investigations as requested. Accept responsibility for the safety of others.

By signing the acknowledgement at the end of this handbook, each employee promises to read and implement this injury and illness prevention program. If you don't understand any policy, please ask your supervisor.

## ***Responsible Safety Officer***

In accordance with O,R&L safety and injury prevention program and to ensure stronger safety commitment, O,R&L Construction has developed the "Safety Team" concept. Each member of the team has defined responsibilities. Together, the team implements and maintains O,R&L's safety program. Throughout the manual, where "Responsible Safety Officer" is referred to, "Safety Team" can be substituted.

O,R&L's Director Administration/Safety {Jeri Hayes} coordinates with the Safety Consultant/Trainer in the development of O,R&L's health and safety program and monitors adherence to safety policies and procedures. Other duties include scheduling (5) safety meetings annually, ensuring that the company manual and all mandatory OSHA postings are current. The Director Administration/Safety maintains records that pertain to health & safety including OSHA logs, injury & illness reports and training records. Also, materials including Tool Box Talks are disseminated to superintendents and collected for record. Follow up with Insurance claims as necessary.

O,R&L's Safety Consultant {Mark O'Connell} is an OSHA Outreach instructor. The safety consultant conducts Safety Audits, provides technical guidance, and assists in the development of O,R&L's safety education and training programs. The Safety Consultant conducts the safety



training at the safety meetings. The consultant interprets OSHA regulations and conducts compliance training with staff.

O,R&L's Safety Engineer is responsible for conducting monthly site safety audits to monitor field compliance. A written report is completed (checklist) and pertinent information reviewed with Project Manager and Director of Administration/Safety. Other duties include working with the Safety Consultant/Trainer to develop an onsite safety plan for each project. The Safety Engineer orders site supplies as requested or needed by superintendents.

1. Develop and implement rules of safe practices for each function within the company.
2. Develop and implement safe operating rules for use of electrical and mechanical equipment consistent with manufacturer's recommendations and specifications.
3. Develop and implement a system to encourage employees to report unsafe conditions immediately.
4. Conduct a thorough investigation of each accident, whether or not it results in an injury, to determine the cause of the accident and to prevent recurrence. In cases of a known injury accident, the investigation shall proceed only after consultation with O,R&L attorneys, who shall direct the investigation (the product of which investigation shall be considered the work product of the attorney).
5. Instruct supervisors in safety responsibilities.
6. Develop and implement a program of employee safety education.
7. Conduct scheduled and unscheduled inspections to identify and correct unsafe working conditions. Special attention shall be given to notice of serious concealed dangers.
8. Maintain records of training, periodic inspections, corrective actions and investigations as required by law.

Overall responsibility and authorization for implementing the injury and illness prevention program is vested in, the Responsible Safety Officer. Management fully supports the Responsibility Safety Officer. As part of the job, the Responsible Safety Officer will supplement this written injury and illness prevention program by: establishing workplace objectives and safety recognition programs; working with all government officials in both accident investigation and safety inspection procedures; maintaining safety and individual training records; encouraging reporting of unsafe conditions and promoting a safe workplace. Some of these responsibilities will be delegated to your immediate supervisor for implementation.

### ***Responsible Supervisor (Superintendent)***

Supervisors (Superintendents) are also vested with special duties concerning the safety of employees. The supervisors are key figures in the establishment and success of O,R&L's injury and

illness prevention program. They have primary responsibility for actually implementing the injury and illness prevention program, especially as it relates directly to the workplace. Supervisors are responsible for being familiar with safety and health hazards to which employees are exposed, how to recognize them, the potential effects of these hazards, and rules and procedures for maintaining a safe workplace. Supervisors shall convey this information to the employees at the workplace, and shall investigate accidents according to the accident investigation policies contained in this manual

### ***Safety Rules for All Employees***

It is the policy of O,R&L that everything possible will be done to protect you from accidents, injuries and/or occupational disease while on the job. Safety is a cooperative undertaking requiring an ever-present safety consciousness on the part of every employee. If an employee is injured, positive action must be taken promptly to see that the employee receives adequate treatment. No one likes to see a fellow employee injured by an accident. Therefore, all operations must be planned to prevent accidents. To carry out this policy, the following rules will apply:

1. All employees shall follow the safe practices and rules contained in this manual and such other rules and practices communicated on the job. All employees shall report all unsafe conditions or practices to the proper authority, including the supervision on the project, and, if corrective action is not taken immediately, a governmental authority with proper jurisdiction over such practices.
2. O,R&L will implement these policies by requesting that employees observe and obey all rules and regulations necessary to maintain a safe work place and safe work habits and practices.
3. Good housekeeping must be practiced at all times in the work area. Clean up all waste and eliminate any dangers in the work area.
4. Suitable clothing and footwear must be worn at all times. Personal protective equipment (hardhats, respirators, eye protection, hearing protection, gloves) will be worn whenever needed.
5. All employees will participate in safety meetings conducted by the O,R&L Safety Officer six (6) times annually.
6. Anyone under the influence of intoxicating liquor or drugs, including prescription drugs that might impair motor skills and judgement, shall not be allowed on the job.
7. Horseplay, scuffling and other acts which tend to have an adverse influence on safety or well being of other employees are prohibited.
8. Work shall be well planned and supervised to avoid injuries in the handling of heavy materials and while using equipment.
9. No one shall be permitted to work while the employee's ability or alertness is so impaired by fatigue, illness, or other causes that it might expose the employee or others to injury.
10. Employees should be alert to see that all guards and other protective devices are in proper places and adjusted, and shall report deficiencies promptly to the superintendent.

11. Employees shall not handle or tamper with any electrical equipment, machinery, or air or water lines in a manner not within the scope of their duties, unless they have received specific instructions.
12. All injuries must be reported to the project superintendent immediately so that arrangements can be made for medical and/or first aid treatment.
13. When lifting heavy objects, use the large muscles of the leg instead of the smaller muscles of the back.
14. Do not throw things, especially material and equipment. Dispose of all waste properly and carefully. Bend all exposed nails so they do not hurt anyone removing the waste.
15. Wear steel toes shoes and/or construction quality boots at all times.
16. Chemicals should not be used without fully understanding their toxic properties and without the knowledge required to work with these chemicals safely.

In addition, the following caveats should be considered by all employees:

1. Employee should never undertake a job that appears to be unsafe.
2. Employee is not expected to undertake a job until he/she has received adequate safety instructions, and is authorized to perform the task.
3. Employees must report any unsafe conditions to the job site supervisor and the Responsible Safety Officer.
4. Any work-related injury or illness must be reported to the job site supervisor or Responsible Safety Officer immediately.
5. Incorporate safety into every job procedure. No job is done efficiently unless it has been done safely.
6. Know and obey safe practice rules.
7. Know that disciplinary action may result from a violation of the safety rules.
8. Report all injuries immediately, no matter how slight the injury may be.
9. Caution fellow workers when they perform unsafe acts.
10. Don't take chances.
11. Ask questions when there is any doubt concerning safety.
12. Don't tamper with anything you do not understand.

### ***Safety and Health Training***

Employee training is the most important elements of any injury and illness prevention program. Such training is designed to enable employees to learn their jobs properly, bring new ideas to the workplace, reinforce existing safety policies and put the injury and illness prevention program into action. ***Safety education requires employee participation at all times.***

Safety training workshops will occur (at a minimum of ) six (6) times annually, or more as required.



# health & safety manual

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Training is required for management, supervision and employees alike. The content of each training session will vary, but each session will attempt to teach the following:

1. each employee will learn when personal protective equipment is required or necessary, and how to use and maintain the equipment in good condition.
2. each employee will learn how to work safely during specific construction operations
3. each employee will learn the specific hazards unique to specific construction operations
4. each employee will learn what to do in case of emergencies

## ***Periodic Safety Training Meetings***

O,R&L will also perform periodic safety training in the form of weekly Tool Box Talks and general project safety meetings as required. The purpose of these meetings is to convey safety information and answer employee questions. The format of most meetings will be to review, in language understandable to every employee, the content of the injury prevention program, special work site hazards, serious concealed dangers, and safety data sheets, etc.. Whenever a new practice or procedure is introduced into the workplace, it will be thoroughly reviewed for safety.

## ***Communication***

Managers, supervisors and employees should communicate their commitment to safety and make sure that all employees are familiar with the elements of the safety program. O,R&L communicates with its employees orally, in the form of directions and statements from your safety officer, written, in the form of directives and this manual, periodic training sessions and by example.

*O,R&L welcomes and encourages safety suggestions at any time. All such suggestions will be responded to personally and by the safety coordinator for consideration and possible implementation*

## ***Accident Prevention Policy Posting***

A copy of this manual will be provided to each O,R&L employee and can be found in the job site trailer.

It is the policy of O,R&L to provide a safe and clean workplace and to maintain sound operating practices. Concentrated efforts shall produce safe working conditions and result in efficient, productive operations. Safeguarding the health and welfare of our employees cannot be stressed too strongly.

Accident prevention is the responsibility of all of us. Department heads and supervisors at all levels shall be responsible for continuous efforts directed toward the prevention of accidents. Employees are responsible for performing their jobs in a safe manner.



Each employee has a personal responsibility to prevent accidents. You have a responsibility to your family, to your fellow workers and to the Company. You will be expected to observe safe practice rules and instructions relating to the efficient handling of your work.

Your responsibilities include the following:

- Incorporate safety into every job procedure. No job is done efficiently unless it has been done safely.
- Know and obey safe practice rules.
- Know that disciplinary action may result from a violation of the safety rules.
- Report all injuries immediately, no matter how slight the injury may be.
- Caution fellow workers when they perform unsafe acts.
- Don't take chances.
- Ask questions when there is any doubt concerning safety.
- Don't tamper with anything you do not understand.
- Report all unsafe conditions or equipment to your supervisor immediately.

The observance of safe and clean work practices, coupled with ongoing compliance of all established safety standards and codes, will reduce accidents and make our Company a better place to work.

### ***Safety Committees***

O,R&L recognizes that cooperative effort is required to ensure a safe operation. For this reason, the Company has established a Safety Committee, composed of employees and management representatives. It is the duty of this committee to cooperate to maintain safe working conditions throughout the Company, to advise and educate employees in safe working practices, to investigate accidents and their causes, and to seek preventative measures.

Meetings are held at least quarterly to consider the regular monthly inspection report, make recommendations for improvement of conditions, review and analyze accident reports, and to attend to any other business involving safety. If you would like to become part of the Safety Committee, now or in the future, please let the Responsible Safety Officer know of your interest.

### ***Hazard Identification & Abatement***

This written safety and health plan sets out a system for identifying workplace hazards and correcting them in a timely fashion. Please review it carefully with your supervisor. Remember, safety is everyone's responsibility.

## *Safety Audits*

The best method to establish a safer workplace is to study past accidents and worker compensation complaints. By focusing on past injuries, O,R&L hopes to avoid similar problems in the future. Therefore, whenever there is an accident, and in many cases upon review of past accidents, you maybe be requested to participate in a safety audit interview. During the interview, there will be questions about the nature of the investigation and the workplace safety related to the incident. Please answer these questions honestly and completely. Also, please volunteer any personal observations and/or suggestions for improved workplace safety.

Based upon the study of past accidents and industry recommendations, a safety-training program has been implemented. In addition to other preventative practices, there will be a group discussion of the cause of the accident and methods to avoid the type of accidents and injury situations experienced in the past. Work rules will be reviewed and modified based upon the study or these accidents.

In addition to historical information, workplace safety depends on workplace observation. Your supervisor is responsible for inspecting your working area daily before and while you are working, but this does not mean you are no longer responsible for inspecting the workplace also. Each day, before you begin work, inspect the area for any dangerous conditions. Inform your supervisor of anything significant, so other employees and guests are advised. You may also be given written communications regarding unsafe conditions or serious concealed dangers. Review this communication carefully and adjust your workplace behavior to avoid any danger or hazards. If you are unclear or unsure of the significance of this written communication, contact your supervisor and review your planned actions before starting to work. It is better to wait and check, then to go ahead and possibly cause an injury to yourself and others. Managers must provide written notice to employees of any serious concealed dangers of which they have actual knowledge. In addition to providing written notice of all serious concealed dangers to employees managers are required to report serious concealed dangers to either OSHA or an appropriate administrative agency within fifteen (15) days, or immediately if such danger would cause imminent harm, unless the danger is abated.

Merely identifying the problem is not sufficient. The danger must be reported to the appropriate supervisor and the Responsible Safety Officer, who then will correct the problem. If the danger cannot be corrected, then all employees will be warned to take protective action so that the danger will not result in any injuries.

## *Workplace Inspections*

In addition to the examination of records, work place safety inspections will occur periodically approximately every 30 days, when conditions change, or when a new process or procedure is



implemented. During these inspections, there will be a review of the injury and illness prevention policy and O,R&L code of safe work practices.

## *Accident Investigation*

A primary tool used by O,R&L to identify the areas responsible for accidents is a thorough and properly completed accident investigation. Accident investigation is carried out to determine the cause or causes so that appropriate action can be taken to prevent reoccurrences and to protect our interest in the event of litigation. All accidents must be investigated no matter how small. The results of each investigation will be reduced to writing and submitted for review by management and O,R&L's insurance risk management advisors, and, if the accident resulted in serious injury, to Company attorneys. If the accident resulted in serious injury, the procedure will be directed by the attorneys to provide the most reliable evidence or description legally permissible. All investigations pursuant to the directions of legal counsel will be protected by all applicable privileges, if any. The attorney will provide more detail on this topic during the investigation.

Every job location will have on site, one digital camera, preferably with capacity to take pictures after any occurrence.

If an accident happens take immediate charge of the situation and control all activities within the accident area. **MAKE SURE 911 and ALL EMERGENCY PERSONNEL are NOTIFIED IMMEDIATELY.** Restrict access by unneeded persons and provide adequate access for emergency personnel.

A written report should be prepared from notes and diagrams made at the scene, or a portable Dictaphone will be used to record direct eyewitness statements as near to the actual time of observation as possible. All statements should include the time and date given, and the town or county where the statement was made. If the statement is intended to be used in court proceedings, a suitable jurat is required, otherwise, a simple statement that the description is sworn to be true under penalty of perjury with the date, place and time should be included. All pictures should be similarly identified. Let people know on tape that they are being recorded. Also, make sure that the names and addresses and day and evening phone numbers of all eye witnesses are noted or recorded.

If a formal police report or other official investigation is conducted by any government agency, get the name and badge number of the official, or a business card, and find out when a copy of the official report will be available to the public. If you are requested to make a statement, you have the right to have the Company lawyer attend your statement at no cost to you.

A satisfactory accident report will answer the following questions:

1. What happened? The investigation report should begin by describing the accident, the injury sustained, the eye witnesses, the date, time and location of the incident and the date and time of the report. Remember: who, what, when, where and how are the questions that the report must answer.
2. Why did the accident occur? The ultimate cause of the accident may not be known for several days after all the data are analyzed. However, if an obvious cause suggests itself, include your conclusions as a hypothesis at the time you give your information to the person in charge of the investigation.
3. What should be done? Once a report determines the cause of the accident, it should suggest a method for avoiding future accidents of a similar character. This is a decision by the Responsible Safety Officer and the supervisor on the project, as well as top management. Once a solution has been adopted, it is everyone's responsibility to implement it.
4. What has been done? A follow up report will be issued after a reasonable amount of time to determine if the suggested solution was implemented, and if so, whether the likelihood of accident has been reduced.

## ***Records***

O,R&L maintains records of employee training, hazard identification and abatement, and accident investigation.

## ***OSHA Records Required***

Copies of required accident investigations and certification of employee safety training shall be maintained by the Responsible Safety Officer. A written report will be maintained on each accident, injury or on-the-job illness requiring medical treatment. A record of each such injury or illness is recorded on OSHA Log and Summary of Occupational Injuries Form 300 according to its instructions. Every year, a summary of all reported injuries or illnesses is posted no later than February 1, for one month, until March 1, on OSHA Form 200. These records are maintained for five (5) years from the date of preparation.

## ***Reporting***

All serious accidents must be reported to OSHA. In cases of hospitalization or death, a full investigation with copies to governmental authorities will be required. In less serious cases, the investigation report must be presented to the company for disclosure to its insurance carrier and for remedial action at the work site.

## Chapter 3 General Code of Safe Work Practices

### *General Fire Safety*

Local fire departments must be made aware of each construction site, its location and specific hazards. Make sure they are notified of any special job conditions that may arise. Contact them to insure that they are confined space rescue certified if any confined space work is to take place.

All fire doors and shutters must be maintained in good operating condition. Fire doors and shutters should be unobstructed and protected against obstructions, including their counterweights. Fire door and shutter fusible links must be in place. All automatic sprinkler water control valves, if any, air and water pressures should be checked routinely. The maintenance of automatic sprinkler systems is assigned to the Responsible Safety Officer. Sprinkler heads should be protected by metal guards if they could possibly be exposed to damage. Proper clearance must be maintained below sprinkler heads.

Portable fire extinguishers should be provided in adequate number and type and are located throughout the facility. Fire extinguishers are mounted in readily accessible locations. Fire extinguishers are recharged regularly and the date of last inspection noted on their tags. All employees are periodically instructed in the use of extinguishers and fire protection procedures. Notify the Responsible Safety Officer of any damage to fire protection equipment.

### *Proper Clothing*

Proper safety equipment is necessary for your protection. The Company provides the best protective equipment it is possible to obtain. Use all safeguards, safety appliances, or devices furnished for your protection and carry out all regulations that may concern or affect your safety. Wear your gear properly – all snaps and traps fastened, cuffs not cut or rolled.

Your supervisor will advise you as to what protective equipment is required for your job.

### *Housekeeping*

Good housekeeping not only improves the appearance of the work place, it also helps prevent fires, accidents and personal injuries. Clean work benches, machines, lockers and floors also enable you to maintain a high standard of quality in your work.

For your safety, do not leave tools, scrap, or materials piled on the floor where someone may stumble over them, or overhead where there is a danger of them falling. When piling material, be careful not to exceed a safe height. Do not pile anything in front of or against fire fighting apparatus, electrical equipment or drinking fountains.



## *Smoking*

Smoking is **STRICTLY PROHIBITED** on all O,R&L construction sites.

## *Power Actuated Tools*

The employees using powder-actuated tools must be properly trained and will be issued a card as proof of that training. Some of the powder-actuated tools being used have written approval of Division of Occupational Safety and Health. Check to see which tools require a certification and which certificates have been issued.

Each powder-actuated tool should be stored in its own locked container when not being used. Signs measuring at least 7” by 10” and in bold face typed reading “**POWDER-ACTUATED TOOL IN USE**” must be placed conspicuously when the tool is being used.

All powder-actuated tools must be left unloaded until they are actually ready to be used. Each day before using, each powder-actuated tool must be inspected for obstructions or defects.

The powder-actuated tool operators must have and must use appropriate personal protective equipment such as hard hats, safety goggles, safety shoes and ear protectors whenever they are using the machines.

## *Lockout-Tagout Procedures*

All machinery or equipment capable of movement must be de-energized or disengaged and blocked or locked out during cleaning, servicing, adjusting or setting up operations, whenever required. The locking-out of the control circuits in lieu of locking-out main power disconnects is prohibited. All equipment control valve handles must be provided with a means for locking out. The lock-out procedure requires that stored energy (i.e. mechanical, hydraulic, air) be released or blocked before equipment is locked out for repairs.

Appropriate employees are provided with individually keyed personal safety locks. Employees are required to keep personal control of their key (s) which they have safety locks in use. Employees must check the safety of the lockout by attempting a start up after making sure no one is exposed.

Where the power disconnecter does not also disconnect the electrical control circuit, the appropriate electrical enclosures must be identified. The control circuit can also be disconnected and locked out.

## *Welding, Cutting and Brazing*

Only authorized and trained personnel are permitted to use welding, cutting or brazing equipment.

All operators must have a copy of the appropriate operating instructions and are directed to follow them. Hot work permits are required prior to the start-up of any welding, cutting or brazing operations.

Compressed gas cylinders should be regularly examined for obvious signs of defects, deep rusting, or leakage. Use care in handling and storing cylinders, safety valves, relief valves and the like, to prevent damage. Precaution must be taken to prevent mixture of air or oxygen with flammable gases, except at a burner or in a standard torch. Only approved apparatus (torches, regulators, pressure-reducing valves, acetylene generators, manifolds) may be used.

Cylinders must be kept away from sources of heat. It is prohibited to use cylinders as rollers or supports. Empty cylinders must be appropriately marked, their valves closed and valve-protection caps on.

Signs reading: **DANGER-NO SMOKING, MATCHES, OR OPEN LIGHTS**, or equivalent must be posted. Cylinders, cylinder valves, couplings, regulators, hoses and apparatus must be kept free of oily or greasy substances. Care must be taken not to drop or strike cylinders.

Unless secured on special trucks, all regulators must be removed and valve-protection caps put in place before moving cylinders. All cylinders without fixed hand wheels must have keys, handles, or non-adjustable wrenches on stem valves when in service. Liquefied gases must be stored and shipped valve-end up with valve covers in place. Before a regulator is removed, the valve must be closed and gas released from the regulator. All employees are instructed never to crack a fuel-gas cylinder valve near sources of ignition. Red is used to identify the acetylene (and other fuel-gas) hose, green for oxygen hose, and black for inert gas and air hose. All pressure-reducing regulators must be used only for the gas and pressures for which they are intended.

The open circuit (No Load) voltage of arc welding and cutting machines must be as low as possible and not in excess of the recommended limits. Under wet conditions, automatic controls for reducing no-load voltage must be used. Grounding of machine frame and safety ground connections of portable machines must be checked periodically. Electrodes must be removed from the holders when not in use. All electric power to the welder must be shut off when no one is in attendance.

Suitable fire extinguishing equipment must be available for immediate use before starting to ignite the welding torch. The welder is strictly forbidden to coil or loop welding electrode cable around his/her body.

All wet welding machines must be thoroughly dried and tested before being used. All work and electrode lead cables must be frequently inspected for wear and damage, and replaced when needed. All connecting cable lengths must have adequate insulation. When the object to be welded cannot be moved and fire hazards cannot be removed, shields must be used to confine heat, sparks and slag.

Fire watchers will be assigned when welding or cutting is performed in locations where a serious fire might develop. All combustible floors must be kept wet, covered by damp sand, or protected by fire-resistant shields. When floors are wet down, personnel should be protected from possible electric shock.

When welding is done on metal walls, precautions must be taken to protect combustibles on the other side. Before hot work is begun, used drums, barrels, tanks and other containers must be so thoroughly cleaned that no substances remain that could explode, ignite or produce toxic vapors. It is required that eye protection, helmets, hand shields and goggles meet appropriate standards.

Employees exposed to the hazards created by welding, cutting or brazing operations must be protected with personal protective equipment and clothing. Check for adequate ventilation where welding or cutting is performed. When working in confined spaces, environmental monitoring tests should be taken and means provided for quick removal of welders in case of emergency.

\*Ref. OSHA 1910.119; 1910.252

### *Compressors and Compressed Air*

All compressors must be equipped with pressure relief valves and pressure gauges. All compressor air intakes must be installed and equipped to ensure that only clean, uncontaminated air enters the compressor. Every air receiver must be provided with a drain pipe and valve at the lowest point for the removal of accumulated oil and water. Compressed air receivers must be periodically drained of moisture and oil. All safety valves shall be tested frequently and at regular intervals to determine whether they are in good operating condition. A current operating permit issued by the Division of Occupational Safety and Health shall be maintained. The inlet of air receivers and piping systems must be kept free of accumulated oil and carbonaceous materials.

**Caution:** Never use compressed air as a means to blow dirt, debris or similar material off of your clothing or work surfaces.

\*Ref. OSHA 1926.302; 1926.308

### *Compressed Gas and Cylinders*

Cylinders with a water weight capacity over 30 pounds must be equipped with means for connecting a valve protector device, or with a collar or recess to protect the valve. Cylinders must be legibly marked to identify clearly the gas contained. Compressed gas cylinders should be stored only in areas which are protected from external heat sources such as flame impingement, intense radiant heat, electric arcs or high temperature times. Cylinders must not be located or stored in areas where they will be damaged by passing or falling objects, or subject to tampering or unauthorized persons.



Cylinders must be stored or transported in a manner to prevent them from creating a hazard by tipping, falling or rolling. All cylinders containing liquefied fuel gas must be stored or transported in a position so that the safety relief device is always in direct contact with the vapor space in the cylinder. Valve protectors must always be placed on cylinders when the cylinders are not in use or connected for use. All valves must be closed off before a cylinder is moved, when the cylinder is empty, and at the completion of each job.

Low pressure fuel-gas cylinders must be checked periodically for corrosion, general distortion, cracks, or any other defect that might indicate a weakness or render them unfit for service. The periodic check of low pressure fuel-gas cylinders includes a close inspection of the cylinder's bottom.

### ***Hoists and Auxiliary Equipment***

Every overhead electrical hoist shall be equipped with a limit device to stop the hook travel at its highest and lowest points of safe travel. Check these limits without a load to ensure the device is working correctly. Each hoist should automatically stop and hold any load up to 125 percent of its rated load if its actuating force is removed. Check this periodically under controlled conditions. Make sure that the rated load of each hoist is legibly marked and visible to the operator. Stops should be provided at the safe limits of travel for trolley hoists.

The controls of hoists should be plainly marked to indicate direction of travel or motion. Every cage-controlled hoist must be equipped with an effective warning device. Close-fitting guards or other suitable devices should be installed on hoists to assure hoist ropes will be maintained in the sheave grooves.

All hoist chains or ropes must be of sufficient length to handle the full range of movement for the application, while maintaining two full wraps on the drum at all times. All nip points or contact points between hoist ropes and sheaves, which are permanently located within seven (7) feet of the floor, ground or working platform, must be guarded. It is prohibited to use chains or rope slings that are kinked or twisted.

The operator should avoid carrying loads over people. Only employees who have been trained in the proper use of hoists are allowed to operate them.

### ***Industrial Trucks-Forklifts***

Only trained personnel should be allowed to operate industrial trucks. Lift Truck Operating rules must be posted and will be strictly enforced.

When operating any industrial truck, substantial overhead protective equipment will be provided

on high lift rider equipment. Directional lighting is also provided on each industrial truck that operates in an area with less than 2 foot candles per square foot of general lighting.

Each industrial truck must have a warning horn, whistle, gong or other device which can be clearly heard above the normal noise in the area where operated. Before using a forklift, check that the brakes on each industrial truck are capable of bringing the vehicle to a complete and safe stop when fully loaded. The parking brake must effectively prevent the vehicle from moving when unattended. When motorized hand and hand/rider trucks are operated, and when the operator releases the steering mechanism, make sure that both brakes are applied and power to the motor shut off. Maintenance records are available so that a driver can check on the servicing of the truck in case of questions.

When an industrial truck operates in areas where flammable gases, vapors, combustible dust or ignitable fibers may be present in the atmosphere, the vehicle must be approved for such locations with a tag showing such approval posed on the vehicle itself.

Industrial trucks with internal combustion engines, operated in buildings or enclosed areas, should be carefully checked to ensure that the operation of the vehicle does not cause harmful concentration of dangerous gases or fumes.

## *Spraying Operations*

In any spraying operation there should be adequate ventilation before starting any spraying job. As to the conditions of the area where the spray job is to be done, consideration should be taken before beginning work. If the area is enclosed, does it require mechanical ventilation? Before working, make sure that the area is free of combustible materials, and that there are "No Smoking" signs adequately posed and easily seen. If mechanical ventilation is provided when spraying in enclosed areas, air should not be recirculated so as to avoid contamination. There should be adequate space and ventilation for all drying areas.

Also in an enclosed area, spray operations must be at least 20 feet from flames, sparks, operating electrical motors and other ignition sources. The spray area should be free from any hot surfaces. Any solvent used in the cleaning process should not have a flash point of 100 degrees or less. If portable lamps are used to illuminate the spray areas they must be approved for the location and must be suitable for use in a hazardous area.

Approved respiratory equipment will be provided and must be used when appropriate during spraying operations. If a sprinkler system is within the confines of the spraying area operation, it should be in working order and will be inspected semi-annually to make sure that it is in operating condition.

If a spraying booth is used for the spraying operation, it must be made of metal, masonry or other

noncombustible material. Make sure that “**NO SMOKING**” signs are posted in spray areas, paint rooms, paint booths and paint storage areas. The spray booth must be completely ventilated. Booth floors and baffles must be easily cleaned and noncombustible. Ducts and access doors must be easily cleaned. Lighting fixtures for both outside and inside the spray booth must be enclosed in clear see-through sealed panels. Electric motors for exhaust fans must be placed outside the booth. Belts and pulleys must be completely enclosed. Drying apparatus should be located in a well ventilated area in the booth and properly grounded.

Infrared drying apparatus must be kept out of spray area during a spraying operation.

## *Confined Spaces*

Before entry into a confined space, all impellers, agitators, or other moving equipment contained in the confined space must be locked-out. Ventilation must be either natural or mechanically provided into the confined space. All hazardous or corrosive substances that contain inert, toxic, flammable or corrosive materials must be valved off, blanketed, disconnected and separated. Atmospheric tests should be performed to check for oxygen content, toxicity and explosive concentration. Atmospheric tests must be performed on a regular basis in a confined area where entry is required. The area must also be checked for decaying vegetation or animal matter that could produce methane. Adequate lighting must be provided within the space. If the confined area is located below the ground or near where motor vehicles are operating, care must be taken that vehicle exhaust or carbon monoxide does not enter the space.

When personnel enter a confined area, assigned safety standby employees who are alert to the work being done, are able to sound an alarm if necessary and to render assistance, must be in the area. These standby employees must be trained to assist in handling lifelines, respiratory equipment, CPR, first aid, and be able to employ rescue equipment that will remove the individual from the confined area. Standby personnel should be in teams of two (2) during such an operation or else within the vicinity if working separately. There must also be an effective communication system utilized while the operation is occurring.

When equipment which utilizes oxygen, such as salamanders, torches or furnaces, is used in a confined space, adequate ventilation must be provided to guarantee oxygen content and combustion for the equipment. When this equipment is used, adequate measures must be taken to assure that exhaust gases are vented outside the enclosure. When gas welding or burning is used, hoses must be checked for leaks. Compressed bottled gas must be outside the area and torches must be lit outside the area also. The atmosphere must be tested each time before lighting a torch.

\*Ref. OSHA 1910.146

## *Environmental Controls*

All employees must be aware of the hazards involved when working with chemicals and the remedies that need to be used when an accident does occur. A training program will give instructions on how to handle the chemical being used and first aid to be applied to victims of chemical exposure. First aid and caution signs will be conspicuously posted so as to alert individuals on a constant basis. Charts identifying the chemicals utilized in the workplace, their symptoms and effects must also be posted. The workers must know what the acceptable level of exposure to a chemical is and what safety systems must be in place when working with a chemical. Staff should also be aware of new chemical products which may be available that are less harmful, and they must ensure that facilities are adequately ventilated when using chemicals on the premises.

Spray painting operations done in spray rooms or booths must be equipped with an appropriate exhaust system. Periodic inspections must be made of the booth and noted on an inspection tag posted on the booth.

If welding is done, the welder should be certified. In the area of operation where the welding is taking place, the welder must be aware of ventilation available, the type of respirator that can be used in the area, and if exposure time or other means will suffice as a safe and adequate measure when welding as to the fumes that will be emitted. Welders should also be supplied with protective clothing and a flash shield during welding operations.

When forklifts and other vehicles are used in buildings or other enclosed areas, carbon monoxide levels must be kept below maximum acceptable concentration.

Noise levels also present a potential hazard. Noise levels within a facility must be at acceptable levels and if not, steps must be taken to reduce the level using recommended engineering controls.

When fibrous materials such as asbestos are being handled, the necessary precautions must be taken to protect the employee from the material. The material must be labeled, along with signs conspicuously posted that these materials are being used in the area. Employees should be aware of effective methods used to prevent emission of airborne asbestos fibers, silica dust and other similar hazardous materials. Some of the recommended methods of controlling the emission of these materials are by using water and vacuuming, rather than blowing and sweeping, the materials. Machinery such as grinders, saws and other tools that produce a fine airborne dust must be vented to an industrial collector or central exhaust system. In any ventilation system the system should be designed and operated at an airflow and volume necessary for proper application and effectiveness. In the design of the ventilation system the ducts and belts must be free of obstructions and slippage.



As with all operations, there must be written standards on the procedures for the equipment, description of the job task, usage of the protective equipment provided, such as the selection and use of respirators, and when they are needed.

Any water that is provided to an employee throughout the facility should be clearly identified as to whether it is for drinking, washing or cooking. All restrooms must be kept clean and sanitary.

Employees should be screened before taking positions that may expose them to hazards they are not physically capable of handling. An employee who takes an assignment which requires physical labor must be trained to lift heavy loads properly so as to not damage themselves physically. If the work assignment involves dealing with equipment that produces ultra-violet radiation, the employee must be properly protected or given the correct protective clothing. An employee posted to an assignment on a roadway where there is heavy traffic must be given the designated protective clothing (bright colored traffic orange warning vest) and safety training regarding the hazards or this job.

## ***Hazardous Chemical Exposures***

In any company which utilizes chemical substances, a training program on handling, hazards, storage, exposure risks, symptoms of chemical exposure, and first aid needs to be part of any new employee training. There must also be follow-up training sessions as to any new chemical or processes that may be initiated by the company. Follow-up training sessions act as a reinforcement of safety standards that need to be followed on a daily basis.

In a training program, employees will learn acceptable levels of chemical exposure, proper storage and labeling of chemicals, and usage of protective clothing and equipment for handling chemicals. They will also learn about potential fire and toxicity hazards, when not to have a chemical in a confined area, or to store in closed containers, usage of eye wash fountains and safety showers, and the necessary posting of open, and dangerous areas. It is important that an employee recognize the Threshold Limit Values or Permissible Exposure Limits of airborne contaminants and physical agents in the workplace.

A procedural manual or set of instruction must be part of the program, with periodic inspections that clearly indicate whether an employee may be mishandling a chemical or endangering himself or others. Part of the manual or procedures must establish a standard of when and how to deal with chemical spills, neutralizing, and disposing of spills or overflows.

These procedures must also be posted in an area that is easily accessible for reference usage.

First Aid training and equipment will be routine in any facility where chemicals are used. Employees must know how to handle equipment in emergency situations, what equipment needs to be used and whether the equipment is adequate for the situation.



## ***Hazardous Substances Communication – Right To Know***

When hazardous substances are used in the workplace, a hazard communication program dealing with Safety Data Sheets (SDS), labeling and employee training will be in operation. SDS material will be readily available for each hazardous substance used. A training program plus regular question and answer sessions on dealing with hazardous materials will be given to keep employees informed.

The program will include an explanation of what an SDS is and how to use and obtain one; SDS contents for each hazardous substance or class of substances; explanation of the “Right to Know”; identification of where employees can see the employer’s written hazard communication program and where hazardous substances are present in their work area; the health hazards of substances in the work area, how to detect their presence, and specific protective measures to be used; as well as informing them of hazards of non-routine tasks and unlabeled pipes.

\*Ref. 1910.1200

## ***Electrical***

The workplace will be aware of the OSHA Electrical Safety Orders and will comply with the same. Employees will be required to report any hazard to life or property that is observed in connection with a job, electrical equipment or lines. Employees will be expected to make preliminary inspections or appropriate tests to determine conditions before starting work. When equipment or lines are to be serviced, maintained or adjusted, employees must be aware of open switches. Lockouts must be tagged whenever possible.

Equipment such as electrical tools or appliance must be grounded or of the double insulated type. Extension cords being used must have a grounding conductor. The workplace supervisor must be aware if multiple plug adaptors are prohibited.

If ground-fault circuit interrupters are installed on each temporary 15 or 20 ampere, 120 volt AC circuit at locations where construction, demolition, modifications, alterations or excavations are being performed, temporary circuits must be protected by suitable disconnecting switches or plug connectors with permanent wiring at the junction.

Electricians must be aware of the following:

Exposed wiring and cords with frayed or deteriorated insulation must be repaired or replaced. Flexible cords and cables must be free of splices or taps.

Clamps or other securing means must be provided on flexible cords or cables at plugs, receptacles, tools, equipment. The cord jacket must be held securely in place.

All cord, cable and raceway connections must be intact and secure.

In wet or damp locations, electrical tools and equipment must be appropriate for the use or location, or otherwise protected.

The location of electrical power lines and cables (overhead, underground, under floor, other side or walls) must be determined before digging, drilling or similar work is begun.

All metal measuring tapes, ropes, hand lines or similar devices with metallic thread woven into the fabrics are prohibited for use where they could come in contact with energized part of equipment or circuit conductors.

The use of metal ladders is prohibited in areas where the ladder or the person using the ladder could come in contact with energized parts of equipment, fixtures or conductors.

All disconnecting switches and circuit breakers must be labeled to indicate their use or equipment served.

A means for disconnecting equipment must always be opened before fuses are replaced.

All interior wiring systems must include provisions for grounding metal parts or electrical raceways, equipment and enclosures.

All electrical raceways and enclosures must be fastened securely in place.

All energized parts of electrical circuits and equipment must be guarded against accidental contact by approved cabinets or enclosures.

Sufficient access and working space will be provided and maintained around all electrical equipment to permit ready and safe operations and maintenance.

All unused openings (including conduit knockouts) in electrical enclosures and fittings must be closed with appropriate covers, plugs or plates.

Electrical enclosures such as switches, receptacles, and junction boxes must be provided with tight-fitting covers or plates.

Disconnecting switches for electrical motors in excess of two horsepower must be capable of opening the circuit when the motor is in a stalled condition without exploding. (Switches must be horsepower rated equal to or in excess of the motor hp rating.)

Low voltage protection must be provided in the control device of motor driven machines or equipment which could cause injury from inadvertent starting.



A motor disconnecting switch or circuit breaker must be located within sight of the motor control device.

**Motors:** a) must be located within sight of their controller; b) must have their controller disconnecting means capable of being locked in the open position; c) or must have separate disconnecting means installed in the circuit within sight of the motor.

A controller for a motor in excess of two horsepower must be rated equal to but not in excess of the motor it services.

Employees who regularly work on or around energized electrical equipment or lines will be instructed in cardiopulmonary resuscitation (CPR) methods.

Employees will be trained on how to work on energized lines or equipment over 600 volts.

\*Ref. OSHA 1910.333

## *Noise*

Noise levels should be considered on every jobsite, and proper methods should be used to minimize employee exposure to noise. Ambient noise should be considered, as well as noise created by specific operations. Engineering controls will be used to reduce excessive noise levels. When engineering controls are not feasible, administrative controls (i.e. worker rotation) will be used to minimize individual employee exposure to noise. An ongoing preventive health program will be utilized to educate employees in safe levels of noise, exposure, effects of noise on their health, and use of personal protection. Approved hearing protective equipment (noise attenuating devices) will be available to every employee working in areas where continuous noise levels exceed 85 dB. To be effective, ear protectors must be properly fitted and employees will be instructed in their use and care.

## *Fueling*

Where flammable liquids are used, employees will be trained to deal with spillage during fueling operations, how it is to be cleaned, the types and designs of fueling hoses and the specific types of fuel it can handle, whether fueling is being done with a nozzle that is gravity flow system or self-closing, how to avoid spills and recognize that if a spill does occur, the safety of restarting an engine.

Employees must be aware that an open flame or light near any fuel is prohibited when fueling or the transfer of fuel is occurring. "NO SMOKING" signs will be posted conspicuously.



## *Piping Systems*

Substances that are transported through piping need to be identified by color or labeling. Signs must be posted identifying the substance being transported through the pipes as to whether it is hazardous and where turn-off valves, connections and outlets are located. All tags used for labeling will be of a durable material with distinguishable and clearly written print.

When non-potable water is piped through a facility, outlets or taps, notices will be posted to alert employees that it is unsafe and not to be used for drinking, washing or personal use. When pipelines are heated by electricity, steam or other external sources, warning signs or tags placed at unions, valves, or other serviceable parts will be part of the system.

## *Material Handling*

In the handling of materials, employees must know the following:

There must be safe clearance for equipment through aisles and doorways.

Aisle ways must be designated, permanently marked, and kept clear to allow unhindered passage.

Motorized vehicles and mechanized equipment will be inspected daily or prior to use.

Vehicles must be shut off and brakes must be set prior to loading or unloading.

Containers of combustibles or flammables, when stacked while being moved, must be separated by dunnage sufficient to provide stability.

If dock boards (bridge plates) are used when loading or unloading operations are taking place between vehicles and docks, precautions must be observed.

Trucks and trailers will be secured from movement during loading and unloading operations.

Dock plates and loading ramps will be constructed and maintained with sufficient strength to support imposed loading.

Hand trucks must be maintained in safe operating condition.

Chutes must be equipped with sideboards of sufficient height to prevent the handled materials from falling off.

At the delivery end of rollers or chutes, provisions must be made to brake the movement of the handled materials.

Pallets must be inspected before being loaded or moved.

Hooks with safety latches or other arrangements will be used when hoisting materials, so that slings or load attachments won't accidentally slip off the hoist hooks. Securing chains, ropes, chockers or slings must be adequate for the job to be performed.

When hoisting material or equipment, provisions must be made to assure no one will be passing under the suspended loads.

### ***Transporting Employees and Materials***

When employees are transporting either employees or materials, they must have an operator's license for that classification of vehicle and be certified or trained in the operation of the vehicle. For a safety program to be effective, they must also have knowledge of First Aid courses and safety equipment, as well as vehicle and how it operates.

As employees are transported by truck, provisions must be provided to prevent their falling from the vehicle. Vehicles should be in good working condition, inspected on a regular basis and must be equipped with lamps, brakes, horns, mirrors, windshields and turn signals in good working order. If the vehicle transports numerous individuals it must be equipped with handrails, steps, stirrups or similar devices, placed and arranged so that employees can safely mount or dismount.

Safety measures to ensure passenger safety should be observed. When cutting tools with sharp edges are carried in the passenger compartment, they must be placed in closed boxes or secured containers. Carrying flares and two reflective type flares and a fire extinguisher must be part of the standard emergency equipment carried in the vehicle at all times.

### ***Ventilation***

In the operation of any facility ventilation system, there needs to be a design to integrate several systems of control which will expel contaminants and provide clean air. The systems must take into consideration the volume and velocity that will be needed to successfully remove contaminants. The system must not fail in the case of emergency situation where two contaminants are exposed to each other when a fire or explosion occurs. In the design of the system, clean-out ports or doors that are provided at intervals will not exceed 12 feet in all horizontal runs of exhaust ducts. The system must be operational so that it will not offset the functions of other operations.

### ***Ergonomics***

With the introduction of computers into the workplace, new areas of physical debilitation have been recognized. There new potential hazards have required a redesigning of both the workplace and how employees work. A set of standards will be developed and practiced with this new technology.



Furniture will be adjustable, positioned and arranged to minimize strain on all parts of the body. The glare of a computer screen will be minimized by a glare screen to prevent eye strain. Repetitive motions can harm, back, shoulders, neck, wrists and other parts of the body, so employees will not proceed with a task when they are physically feeling an impairment. Each employee will be entitled to a rest break.

### ***Crane Checklist***

With the operation of cranes there are several functional areas to be considered. Cranes should be inspected on a biannual basis with the inspection certificate available when a question arises. The crane must be utilized in an operation which does not violate OSHA regulations. Cranes will be visually inspected for defective components prior to any work shift. Electrically operated cranes will be effectively grounded, preventative maintenance established, have a clearly visible load; operating controls clearly identified; a fire extinguisher provided at the operator's station; rated capacity visibly marked; an audible warning device mounted on the crane and sufficient illumination. Crane design shall be such that the boom will not fall over backwards when equipped with boom stops.

### ***Safety Posters***

O,R&L is required to post certain employment related information. The required information is maintained in the office and job trailers where employees can find the following required posters:

Various state and federal orders regulating the Wages, Hours and Working Conditions in certain industries.

Site Specific safety & Informational Posters

Pay Day Notice

Anti-Discrimination Poster

Equal Employment Opportunity is the Law (EEOC form)

OSHA Safety and Health Protection on the Job

Notice of Workers Compensation Carrier

Notice to Employees: Unemployment Insurance and Disability Insurance Notice: Employee Polygraph Protection Act (form WH 1462)

Access to Medical and Exposure Records

Notice to Employees: Time Off to Vote

OSHA 300 Log – Feb 1 – April 30 (annually)

## *Personal Protective Equipment Clothing*

1. Where there is a danger of flying particles or corrosive materials, employees must wear protective goggles and/or face shields provided [or approved] by O,R&L.
2. Employees are required to wear safety glasses at all times in areas where there is a risk of eye injuries such as punctures, contusions or burns.
3. Employees who need corrective lenses are required to wear only approved safety glasses, protective goggles, or other medically approved precautionary procedures when working in areas with harmful exposures, or risk of eye of eye injury.
4. Employees are required to wear protective gloves, aprons, shields and other means provided in areas where they may be subject to cuts, corrosive liquids and/or harmful chemicals.
5. Hard hats must be worn in areas subject to falling objects, and at all times while at construction sites.
6. Appropriate footwear including steel toed shoes must be worn in an area where there is any risk of foot injuries from hot, corrosive, poisonous substances, falling objects, crushing or penetrating action.
7. When necessary employees must use the approved respirators which are provided for regular and emergency use.
8. All safety equipment must be maintained in sanitary condition and ready for use. Report any defective equipment immediately.
9. An eye wash facility is located in all trucks. If any irritant gets into an employee's eyes, call for medical assistance immediately and flush the eye out with clean water.
10. A shower is provided for emergencies. Ask your supervisor for more details on use of this facility.
11. Food may not be eaten in work areas, or in places where there is any danger of exposure to toxic materials or other health hazards. Ask your supervisor to identify safe eating places.
12. In cases where the noise level exceeds certain levels, ear protection is required.
13. In cases of cleaning toxic or hazardous materials, protective clothing provided must be worn.
14. If an O,R&L employees uses their own PPE, O,R&L Construction will require that the adequacy, maintenance & sanitation of the equipment be maintained regularly and that such maintenance will be inspected periodically by the O,R&L Safety Officer.

## *Hardhats*

At O,R&L, hardhats are **MANDATORY**. Sometimes a person fails to wear a hardhat, either through forgetfulness or through underestimating the risk of head injury which can be prevented by wearing one. Remember that all it takes is a carelessly dropped tool or piece of material coming down on your head to cause severe injury or even death. There are a number of workers

disabled with various type of head injuries and vision problems because they didn't wear a hardhat.

When you wear a hardhat, wear it right. Keep it squarely on your head with the inside band properly adjusted. See your supervisor if you are having trouble adjusting the hardhat.

## ***Work Environment, General***

Work sites must be clean and orderly. Work surfaces must be kept dry or appropriate means taken to assure the surfaces are slip-resistant. Spills must be cleaned up immediately. All combustible scrap, debris and waste must be stored safely and removed promptly. Combustible dust must be cleaned up with a vacuum system to prevent the dust from going into suspension. The accumulated combustible dust must be removed routinely. Metallic or conductive dust must be prevented from entering or accumulation on or around electrical enclosures or equipment.

Waste containers must be covered. Oily and paint soaked rags are combustible and should be discarded in sealable metal containers only. Paint spray booths, dip tanks and paint areas must be cleaned regularly.

All oil and gas fired devices should be equipped with flame failure controls that will prevent flow of fuel if pilots or main burners are not working. Ask your supervisor where these controls are located.

Make sure all pits and floor openings are either covered or otherwise guarded.

## ***Walkways***

All aisles and passageways must be kept clear. Also, aisles and passageways should be clearly marked. Wet surfaces must be covered with non-slip material and all holes properly covered or marked with warning guards. All spills must be cleaned up immediately, and caution sign placed on all wet or drying surfaces.

In cases of passageways used by forklifts, trucks or other machinery, use a separate aisle for walking, if available. If no separately marked aisle is available, use extreme caution. Remember, walking in a passageway used by machinery is like walking in the middle of the street used by cars: You may have the right of way, but the heavier vehicle can't always see you and can't always stop in time. The key to moving around in such circumstances is to stop, look and listen and then move when there is no danger. Make eye contact with the drivers of moving vehicles so that you know that they know you are there.

Equipment must be properly stored so that sharp edges do not protrude into walkways. Changes in elevations must be clearly marked, as must passageways near dangerous operations like welding, machinery operation or painting. If there is a low ceiling, a warning sign must be posted. If the



walkway or stairway is more than thirty (30) inches above the floor or ground, it must have a guardrail.

If an employee is aware of any breach of these standards, please inform the workplace supervisor.

### ***Floor and Wall Openings***

Be careful when working near floor and wall openings. All floor openings (holes) should be guarded by a cover, guardrail or equivalent barrier on all sides except at the entrance to stairways and ladders. Toe boards must be installed around the edges of a permanent floor opening. Skylights must be able to withstand at least 200 pounds pressure. Glass used in windows, doors and walls (including glass block) must be able to withstand a human impact, and if required by code, be shatterproof “safety glass”. Before beginning work at a new location, inspect it to insure that all floor openings which must remain open, such as floor drains, are covered with grates or similar covers. In roadways and driveways, covers with capacity to carry a truck rear axle load of at least 20,000 pounds must protect all manholes and trenches. In office buildings, fire resistive construction requires that the doors and hallway closures be properly rated and be equipped with self-closing features. Be sure that there are at least two (2) fire emergency exits accessible from your location at all times.

### ***Work Area, General***

Fire extinguishers must remain accessible at all times. Means of egress should be kept unblocked, well-lighted and unlocked during work hours. Excessive combustibles (paper) may not be stored in work areas.

Aisles and hallways must be kept clear at all times. Designated employees have been trained to respond to a fire or other emergency. Workplaces are to be kept free of debris, floor storage and electrical cords.

Adequate aisle space is to be maintained. File cabinet drawers should be opened one at a time and closed when work is finished.

Proper lifting techniques are to be used by employees to avoid over exertion and strain when carrying loads. No alcohol or any intoxicating substance may be consumed prior to or during work.

### ***Driving***

Drive safely. If O,R&L vehicles are used, seat belts and shoulder harnesses are to be worn at all times. Vehicles must be locked when unattended to avoid criminal misconduct. Do not exceed the speed limit. Vehicles must be parked in legal spaces and must not obstruct traffic. Do not park in handicapped marked spaces. Defensive driving must be practiced by all employees. Employees



should park their vehicles in well-lighted areas at/or near entrances to avoid criminal misconduct. The use of cell phones while driving an O,R&L vehicle is strictly forbidden.

## ***Tool Maintenance***

Faulty or improperly used hand tools are a safety hazard. All employees shall be responsible for ensuring that tools and equipment (both company and employee-owned) used by them or other employees at their workplace are in good condition. Hand tools such as chisels, punches, etc., which develop mushroom heads during use, must be reconditioned or replaced as necessary. Broken or fractured handles on hammers, axes and similar equipment must be replaced promptly. Worn or bent wrenches should be replaced regularly. Appropriate handles must be used on files and similar tools.

Appropriate safety glasses, face shields, etc., must be worn while using hand tools or equipment which might produce flying materials or be subject to breakage. Eye and face protection must be worn when driving in tempered spuds or nails.

Check your tools often for wear or defect. Jacks must be checked periodically to assure they are in good operating condition. Tool handles must be wedged tightly into the heads of tools. Tool cutting edges should be kept sharp enough so the tool will move smoothly without binding or skipping. When not in use, tools should be stored in a dry, secure location.

## ***Ladders***

Check ladders each and every time you climb. Ladders should be maintained in good condition; joints between steps and side rails should be tight; hardware and fittings securely attached; and moveable parts operating freely without binding or undue play. Non-slip safety feet are provided on each ladder. Ladder rungs and steps should be free of grease and oil. Employees are prohibited from using ladders that are broken, missing steps, rungs or cleats, or that have broken side rails or other faulty equipment.

It is prohibited to place a ladder in front of door openings toward the ladder except when the door is blocked open, locked or guarded. It is prohibited to place ladders on boxes, barrels or other unstable bases to obtain additional height. Face the ladder when ascending or descending.

Be careful when you climb a ladder. Do not use the top step of ordinary stepladders as a step. When portable rung ladders are used to gain access to elevated platforms, roofs, etc., the ladder must be always extend at least 3 feet above elevated surface.

It is required that when portable rung or cleat type ladders are used, the base must be so placed that slipping will not occur, unless it is lashed or otherwise held in place.

All portable metal ladders must be legibly marked with signs reading “CAUTION” – “Do Not Use

Around Electrical Equipment”. Employees are prohibited from using ladders as guys, braces, skids, gin poles, or for other than their intended purposes. Only adjust extension ladders while standing at a base (not while standing on the ladder or from a position above the ladder). Metal ladders should be inspected for tears and signs of corrosion. Rungs of ladders should be uniformly spaced at 12 inches, center to center.

\*Ref. OSHA 1926.1051; 1926.1060

### ***Portable Power Tools***

Portable power tools pose a special danger to employees because they are deceptively small and light, yet they can do great bodily harm if used improperly or poorly maintained. These rules apply to all power tools, but are especially important when handling portable saws, drills and power screw drivers.

Check your equipment before you use it. All grinders, saws and similar equipment should be equipped with appropriate safety guards. Power tools should not be used without the correct shield, guard, or attachment, recommended by the manufacturer.

Portable circular saws must be equipped with guards above and below the base shoe. Circular saw guards should be checked periodically and before each use to assure they are not wedged up, thus leaving the lower portion of the blade unguarded.

All rotating or moving parts of equipment should be guarded to prevent physical contact. All cord-connected, electrically-operated tools and equipment should be effectively grounded or of the approved double insulated type. Effective guards must be in place over belts, pulleys, chains, sprockets, on equipment such as concrete mixers, air compressors, etc. If portable fans are provided, they must be equipped with full guards or screens having openings ½ inch or less.

Do not attempt to lift heavy objects without proper equipment. Hoisting equipment will be made available for lifting heavy objects, with hoist ratings and characteristics appropriate for the task.

Power tools are either battery operated or wired. If battery operated, don't under-estimate their power. A small electric drill or power screw driver can cause a sever injury if it lands in the wrong place. While not usually a shock hazard, the battery pack contains toxic chemicals and does emit a low voltage electric current. Don't drop or incinerate the battery pack, or a tool with a self-contained power source.

Hard wired equipment can be portable or fixed. Typically used with extension cords, the more powerful had wired equipment can be portable or fixed. Typically used with extension cords, the more powerful hard wired equipment presents a double safety problem: the actual equipment plus its electrical power source. Ground-faulted circuit interrupters must be provided on all temporary



electrical 15 and 20 ampere circuits used during periods of construction. Pneumatic and hydraulic hoses on power-operated tools should be checked regularly for deterioration or damage.

## ***Abrasive Wheel Equipment (Grinders)***

The work rest used should be kept adjusted to within 1/8 inch of the wheel. The adjustable tongue on the top side of the grinder should be kept adjusted to within 1/4 inch of the wheel. The side guards should cover the spindle, nut and flange and 75 percent of the wheel diameter. Bench and pedestal grinders should be permanently mounted. Goggles or face shields should always be worn when grinding. The maximum RPM rating of each abrasive wheel should be compatible with the RPM rating of the grinder motor. Fixed or permanently mounted grinders must be connected to their electrical supply system with metallic conduit or by other permanent wiring method.

Each grinder should have an individual on and off control switch. The switch should be easily accessible anytime you operate the machine. Each electrically operated grinder is effectively grounded. Do not defeat the grounding mechanism, especially by using non-three prong plug adapters.

Note the method by which new abrasive wheels are mounted. Visually inspect and ring test new abrasive wheels.

The dust collectors and powered exhausts provided on grinders must be used in operations that produce large amount of dust. The splash guards mounted on grinders that use a coolant should be mounted so that no one is ever splashed with the coolant.

The work area around a grinder must be kept clean at all times. It is your responsibility as operator of any machine to ensure the necessary safety precautions are taken before using the machine.

## ***Combustible Materials***

All combustible scrap, debris and waste materials (oily rags, etc.) must be stored in covered metal receptacles and removed from the work site promptly. Proper storage to minimize the risk of fire, including spontaneous combustion must be practiced. Only approved containers and tanks are to be used for the storage and handling of flammable and combustible liquids. All connections on drums and combustible liquid piping, vapor and liquid must be kept tight. All flammable liquids should be kept in closed containers when not in use (e.g. parts-cleaning tanks, pans, etc.).

Bulk drums of flammable liquids must be grounded and bonded to containers during dispensing. Storage rooms for flammable and combustible liquids must have explosion-proof lights. Storage rooms for flammable and combustible liquids should have mechanical or gravity ventilation.

Liquefied petroleum gas must be stored, handled and used in accordance with safe practices and standards.

No smoking signs must be posted on liquefied petroleum gas tanks. Liquefied petroleum storage tanks should be guarded to prevent damage from vehicles. All solvent wastes and flammable liquids should be kept in fire-resistant, covered containers until they are removed from the work site.

Vacuuuming should be used whenever possible rather than blowing or sweeping combustible dust. Fire separators should be placed between containers or combustibles or flammables when stacked one upon another to assure their support and stability. Fuel gas cylinders and oxygen cylinders must be separated by distance, fire resistant barriers, etc., while in storage.

Fire extinguishers are selected for the types of materials and placed in areas where they are to be used. These fire extinguishers are classified as follows: Class A – Ordinary combustible materials, fires. Class B – Flammable liquid, gas or grease fires. Class C – Energized-electrical equipment fires.

Appropriate fire extinguishers must be mounted within 75 ft. of outside areas containing flammable liquids, and within 10 ft. of any inside storage area for such materials. All extinguishers must be serviced, maintained and tagged at intervals not to exceed one year. Extinguishers should be placed free from obstructions or blockage. All extinguishers must be fully charged and in their designated places unless in use.

Where sprinkler systems are permanently installed, are the nozzle heads arranged so that water will not be sprayed into operating electrical switch boards and equipment? Check to see that heads have not been bent or twisted from their original position.

“NO SMOKING” rules will be enforced in areas involving storage and use of hazardous materials. “NO SMOKING” signs have been posted where appropriate in areas where flammable or combustible materials are used and/or stored. Safety cans must be used for dispensing flammable or combustible liquids at point of use. All spills of flammable or combustible liquids must be cleaned up promptly.

Storage tanks should be adequately vented to prevent the development of excessive vacuum or pressure as a result of filling, emptying or atmosphere temperature changes. Storage tanks are equipped with emergency venting that will relieve excessive internal pressure caused by fire exposure.



## Chapter 4 Responsible Safety Officer

### *General Statement*

In accordance with O,R&L safety and injury prevention program and to ensure stronger safety commitment, O,R&L Construction has developed the “Safety Team” concept. Each member of the team has defined responsibilities. Together, the team implements and maintains O,R&L’s safety program. **Throughout the manual, where “Responsible Safety Officer” is referred to, “Safety Team” can be substituted.**

O,R&L’s Director Administration/Safety {Jeri Hayes} coordinates with the Safety Consultant/Trainer in the development of O,R&L’s health and safety program and monitors adherence to safety policies and procedures. Other duties include scheduling (5) safety meetings annually, ensuring that the company manual and all mandatory OSHA postings are current. The Director Administration/Safety maintains records that pertain to health & safety including OSHA logs, injury & illness reports and training records. Also, materials including Tool Box Talks are disseminated to superintendents and collected for record. Follow up with Insurance claims as necessary.

O,R&L’s Safety Consultant {Mark O’Connell} is an OSHA Outreach instructor. The safety consultant conducts Safety Audits, provides technical guidance, and assists in the development of O,R&L’s safety education and training programs. The Safety Consultant conducts the safety training at the safety meetings. The consultant interprets OSHA regulations and conducts compliance training with staff.

O,R&L’s Safety Engineer is responsible for conducting monthly site safety audits to monitor field compliance. A written report is completed (checklist) and pertinent information reviewed with Project Manager and Director of Administration/Safety. Other duties include working with the Safety Consultant/Trainer to develop an onsite safety plan for each project. The Safety Engineer orders site supplies as requested or needed by superintendents.

### *Duties*

By law, the Responsible Safety Officer is the person designated by the company with the duty and authority to implement and maintain O,R&L’s Injury and Illness Prevention Program. The Responsible Safety Officer is assigned the responsibility of providing technical guidance and services in the field of health and safety needed by O,R&L management. To fulfill this objective the Responsible Safety Officer is required to:

Provide management at all levels with information, advice, and assistance needed to formulate O,R&L’s health and safety policy, directives, procedures and standards.

Assist management at all levels in establishing and maintaining a healthful and safe working



# health & safety manual

constructing a safe & sustainable future

environment free from unacceptable risks, in conformance with OSHA health and safety guidelines and in compliance with applicable standards, codes, and regulations.

Monitor operations within O,R&L and, where appropriate at off-site facilities, provide management with the information needed to maintain a healthful and safe working environment, free from unacceptable risks.

Develop and provide general safety education and training programs.

Assist in the development of specific job safety training programs.

Develop plans and train response personnel to control emergency situations (earthquake, radiation, injury, fire, etc.).

Provide health and safety support services assigned by the Company Officer to whom the Responsible Safety Officer reports.

Maintain a staff of specialists or consultants knowledgeable in all areas of safety.

Prepare and maintain O,R&L's Health and Safety Manual and other documents that relate to safety.

Specify proper protective equipment for issuing to employees.

Check plans of all new projects for construction safety, industrial safety, and other safety reviews as required by OSHA and O,R&L regulations.

Stop hazardous operations where life hazard or major property damage is imminent and follow with documented evidence.

To carry out its responsibilities, the Responsible Safety Officer maintains a staff of specialists and outside consultants in the appropriate environment, health, and safety disciplines.

These disciplines include:

Construction Safety

Engineering Services

Environmental Protection

Industrial Hygiene

Laser Safety

Non-destructive Testing

Occupational Safety



Radiation Safety

Safety Training and Education

Seismic Safety

### ***Common Functions***

All the functions of the Responsible Safety Officer include the following areas of responsibilities:

Environmental Monitoring, including both workplace and office data collection and measurement techniques.

Decontamination and Waste Disposal.

Safety Resource Library Maintenance. The Responsible Safety Officer should either maintain or have the Company maintain a library that contains copies of codes, standards, safety manuals, and reports that regulate O,R&L's safety program. The library also contains copies of texts and reports regarding health and safety.

Industrial Hygiene and Environmental Protection.

Maintain extra protective clothing, safety glasses and safety shoes for guests and existing employees needing temporary replacement of their protective equipment.

## Chapter 5 Chemical Safety

### *Introduction*

The objective of this chapter is to provide guidance to all O,R&L employees and participating subcontractors who use hazardous materials so that they may perform their work safely. Many of these materials are specifically explosive, corrosive, flammable, or toxic; they may have properties that combine these hazards. Many chemicals are relatively non-hazardous by themselves but become dangerous when they interact with other substances, either in planned experiments or by accidental contact.

To avoid injury and/or property damage, persons who handle chemicals in any area of the Company must understand the hazardous properties of the chemicals with which they will be working. Before using a specific chemical, safe handling methods must always be reviewed. Supervisors are responsible for ensuring that the equipment needed to work safely with chemicals is provided. The cost of this equipment is borne by the Company.

### *Hazcom Plan*

On May 25, 1986 the Occupational Safety and Health Administration (OSHA) placed in effect the requirements of a new standard called Hazard Communication (29 CFR 1910.1200). This standard establishes requirements to ensure that chemical hazards in the workplace are identified and that this information, along with information on protective measures, is transmitted to all affected employees.

This section describes how O,R&L employees are informed of the potential chemical hazards in their work area so they can avoid harmful exposures and safeguard their health. Components of this program include labeling, preparing a safety data sheet (SDS), and training.

With regard to SDS, O,R&L has limited coverage under the OSHA Hazard Communication Standard. The Company is required to maintain only those sheets that are received with incoming shipments for the following reasons: the Company commonly uses small quantities of many different hazardous materials for short periods of time; that the hazards change, often unpredictably; many materials are of unknown composition and most workers are highly trained.

### *Responsibilities of Supervisors/Management*

Identify hazards for respective work areas. Ensure hazards are properly labeled.  
Obtain/maintain copies of safety data sheets, as required, of each hazardous material used in the work area and make them accessible to employees during each work shift.

Have the written Hazard Communication Program available to all employees.



Provide hazard-specific training for employees.

Identify hazardous materials in the hazard review section of the O,R&L purchase requisition form.

***Employees must:***

Attend safety training meetings.

Perform operations in a safe manner.

Notify management immediately of any safety hazards or injuries.

When ordering materials, identify hazardous chemicals in the hazard review section of the O,R&L purchase requisition form.

***The Responsible Safety Officer must:***

Develop a written Hazard Communication Program.

Maintain a central file of safety data sheets.

Review and update O,R&L stock safety labels. Provide generic training programs.

Assist supervisors in developing hazard-specific training programs. Oversee the Hazard Communication Standard written policy and implementation plans.

Alert on-site contractors to hazardous materials in work areas.

Alert on-site contractors that they must provide to their employees information on hazardous materials they bring to the work site.

The number of hazardous chemicals and the number of reactions between them is so large that prior knowledge of all potential hazards cannot be assumed. Therefore, when the chemical properties of a material are not fully known, it should be assumed hazardous and used in small quantities as possible to minimize exposure and thus reduce the magnitude of unexpected events.

**The following general safety precautions should be observed when working with chemicals:**

Keep the work area clean and orderly.

Use the necessary safety equipment.

Carefully label every container with the identity of its contents and appropriate hazard warnings.

Store incompatible chemicals in separate areas.

Substitute less toxic materials whenever possible.

Limit the volume of volatile or flammable material to the minimum needed for short operation periods.

Provide means of containing the material if equipment or containers should break or spill their contents.

Follow the requirements of the manual, if systems that can generate pressure or are operated under pressure are involved.

Provide a back-up method of shutting off power to a heat source if any hazard is involved.

Obtain and read the Safety Data Sheets.

### ***Task Evaluation***

Each task that required the use of chemicals must be evaluated to determine the potential hazards associated with the work. This hazard evaluation must include the chemical or combination of chemicals that will be used in the work, as well as other materials that will be used near the work. If a malfunction during the operation has the potential to cause serious injury or property damage, an Operational Safety Procedure (OSP) must be prepared and followed. Operations must be planned to minimize the generation of hazardous wastes. Additionally, unused chemicals should be recycled.

### ***Superintendents Responsibility***

Superintendents are responsible for establishing safe procedures and for ensuring that the protective equipment needed to work with the chemicals is available. Superintendents must instruct their workers about possible hazards, safety precautions that must be observed, possible consequences of an accident, and procedures to follow if an accident does occur. This superintendent is required to enforce the proper use of protective equipment and the established safety practices.

To supplement the superintendent's training, the Responsible Safety Officer will conduct training courses and materials on selected topics. In addition, safety data sheets and safety information, including hazards, health effects, potential routes of exposure, proper handling precautions, and emergency procedures on specific chemicals, are available through the Responsible Safety Officer's office.

It is the responsibility of employees and all who work at O,R&L sites to understand the properties of the chemicals with which they will work and to follow all precautions that apply to each specific task.

When faced with an unexpected threat of malfunction, injury, or damage, employees are expected to choose a course of action that provides the most protection to themselves and to others in the area. Every employee is expected to report to the supervisor any unsafe condition seen in the area that would not permit him/her to work safely.

The Responsible Safety Officer assists employees and supervisors to work safely by providing information on the hazardous properties of materials, recommending methods for controlling the



hazards of specific operations, and by monitoring the work environment.

## ***Effects on Reproduction***

Both men and women may be exposed to hazardous agents that can cause infertility or result in genetic damage that is passed on to offspring. These agents include ionizing radiation, alcohol, cigarette smoke, pharmaceuticals, and some of the thousands of different chemicals that are used in home or workplace. Although many of these have been tested to determine whether they cause acute (immediate) effects on the body, few have been studied to see if they cause cancer (carcinogens), birth defects (teratogens), or genetic defects (mutagens). Even fewer have been studied to see if they can cause infertility, menstrual disorders, or other disorders relating to reproduction.

The primary path for hazardous substances to reach an unborn child is through the placenta. Scientists now believe that most chemical substances or drugs can cross this barrier with varying degrees of ease and enter the system of the developing fetus. Thus, many chemicals and drugs that enter a pregnant woman's body (through breathing, swallowing, absorption through the skin, etc.) will eventually enter the mother's blood circulation and find their way into the unborn child.

In general, the important questions of exactly how much of the toxic substance that enters the mother's body will reach the fetus or what concentration the fetus can tolerate without harmful effects are not yet answered.

The fetus may be the most vulnerable in the early weeks of pregnancy, but it is also at risk later in the pregnancy. In light of the potential harm of workplace exposures to both a pregnant woman and her developing fetus, it is very important and required by O,R&L policy for the woman to inform the Responsible Safety Officer of her pregnancy immediately.

## ***Airborne Contaminants***

Exposures by inhalation of airborne contaminants (gases, vapors, fumes, dusts, and mists) must not exceed the levels listed in the latest edition of Threshold Limit Values of Airborne Contaminants (TLV) published by the American Conference of Governmental Industrial Hygienists. These TLV levels refer to airborne concentrations of substances and represent conditions under which it is believed that workers may be repeatedly exposed without adverse effect.

In all cases of potentially harmful exposure, feasible engineering or administrative controls must first be established. In cases where respiratory protective equipment, alone or with other control measures, is required to protect the employee, the protective equipment must be approved by the Responsible Safety Officer, for each specific use.

## *Safety Equipment*

Eyewash fountains are required if the substance in use presents an eye hazard. The eyewash fountain must provide a soft stream or spray of aerated water.

In areas where a corrosive chemical or rapid fire hazard exists, safety showers must be provided for immediate first aid treatment of chemical splashes and for extinguishing, clothing fires. The shower must be capable of drenching the victim immediately in the event of an emergency.

Eyewash fountains and safety showers should be located close to each other so that, if necessary, the eyes can be washed while the body is showered. Access to these facilities must always remain open. In case of accident, flush the affected part for at least 15 minutes. Report the accident to the Responsible Safety Officer immediately.

Safety shields must be used for protection against possible explosions or splash hazards. Company equipment must be shielded on all sides so that there is no line-of-sight exposure of personnel. The sash on a chemical fume hood is a readily available partial shield. However, a portable shield must also be used, particularly with hoods that have vertical-rising sashes rather than horizontal-sliding sashes.

## *Labels*

All containers (including glassware, safety cans, plastic squeeze bottles) must have labels that identify their chemical contents. Labels should also contain information on the hazards associated with the use of the chemical.

## *Chemical Storage*

The separation of chemicals (solids or liquids) during storage is necessary to reduce the possibility of unwanted chemical reactions caused by accidental mixing. Explosives such as picric acid should be stored separately outdoors. Use either distance or barriers (e.g., trays) to isolate chemicals into the following groups:

Flammable liquids (e.g., acetone, benzene, ethers, alcohols). Place in approved fire lockers.

Other liquids (e.g., chloroform, trichloroethane).

Acids (e.g., nitric, sulfuric, hydrochloric, perchloric). \* Treat acetic acid as a flammable liquid.

Bases (e.g., sodium hydroxide, ammonium hydroxide).

Lips, strips, or bars should be installed across the width of reagent shelves to restrain the chemicals in case of earthquake.

Chemicals must not be stored in the same refrigerator used for food storage. Refrigerators used for storing chemicals must be appropriately identified by placing a label on the door (labels may be obtained from Responsible Safety Officer).

## ***Emergencies***

In case of an emergency, consider any of the following actions if appropriate:

Evacuate people from area.

Isolate the area.

If the material is flammable, turn off ignition and heat sources.

Call the Fire Department or 911 for assistance.

Wear appropriate personal protective equipment.

Pour Sorb-all or appropriate neutralizing agent on spill.

Clean up; place waste in plastic bag for disposal.

Chemical spill cleanup materials are available from stores as listed below:

Flammable solvent spill kit

Flammable solvent absorbent

Acid spill kit

Acid spill absorbent

Caustic (base) spill kit

Caustic (base) absorbent

Safety equipment kit (contains scoops, sponge, safety glasses, disposal bags, etc.)

Cabinet to hold kits

## ***Disposal of Chemicals***

All O,R&L employees, participating subcontractors and visitors using hazardous chemicals are responsible for disposing of these chemicals safely.

Federal and state regulations mandate strict disposal procedures for chemicals. To comply with these regulations all persons using Company facilities must observe these procedures.

## *Routine Disposal of Chemicals*

In general, the disposal of hazardous chemicals to the sanitary sewer is not permitted. The Responsible Safety Officer will advise on the proper disposal of chemical wastes.

In using chemical waste storage containers, certain procedures must be observed, as listed below:

Incompatible chemicals must not be mixed in the same container (e.g., acids should not be mixed with bases; organic liquids should not be mixed with strong oxidizing agents).

Waste oils must be collected in 55-gallon drums. Disposal solids, and explosive materials must be stored in separate containers.

The following requirements must be met as a condition for pickup and disposal of chemicals by the Responsible Safety Officer:

Chemicals must be separated into compatible groups. Leaking containers of any sort will not be accepted.

Dry materials (gloves, wipes, pipettes, etc.) must be securely contained in plastic bags and over packed in a cardboard box. Packages that are wet or have sharp protruding objects will not be accepted for pick up.

Unknown chemicals will require special handling. The responsible department must make every effort to identify the material that is to be disposed. If all the user's attempts to identify the waste chemicals have failed, the Responsible Safety Officer will accept the waste and analyze the material. For more information call the Responsible Safety Officer.

Each breakable container must be properly boxed. Place all bottles in plastic bags, then place in a sturdy container and use an absorbent cushioning material that is compatible with chemicals. Each primary container must be labeled with content, amount, physical state, and the percentage breakdown of a mixture.

Each box must have a complete list of contents or description written on an official Responsible Safety Officer hazardous materials packing list. Blank packing lists are available from the Responsible Safety Officer.

For safety purposes, boxes must be of a size and weight so that one person can handle them. Boxes that exceed 45 pounds or 18 inches on a side cannot be safely handled by one person and will not be acceptable for pick up.



## ***General Housekeeping Rules:***

Maintain the smallest possible inventory of chemicals to meet your immediate needs. Periodically review your stock of chemicals on hand.

Ensure that storage areas, or equipment containing large quantities of chemicals, are secure from accidental spills.

Rinse emptied bottles that contain acids or inflammable solvents before disposal.

Recycle unused laboratory chemicals wherever possible.

## ***DO NOT:***

Place hazardous chemicals in salvage or garbage receptacles.

Pour chemicals onto the ground.

Dispose of chemicals through the storm drain system.

Dispose of highly toxic, malodorous, or lachrymatory chemicals down sinks or sewer drains.

\*Ref. OSHA 1910.1200

## Chapter 6 Confined Spaces

### *Definitions*

A confined space is defined as any structure that must be entered and that has or may contain dangerous concentrations of hazardous gases or vapors or an oxygen deficient atmosphere.

Entry to these spaces must be rigorously controlled to prevent serious injury or death.

### *Hazardous Conditions*

Hazardous conditions include, but are not limited, to the following:

An atmosphere containing less than 19.5% oxygen (normal air contains 20.9% oxygen). This is usually the result of oxygen displacement by inert gases such as nitrogen, argon, helium or sulfur hexafluoride.

Flammable gases and vapors (e.g., methane, ethane, propane, gasoline, methyl-ethyl ketone, alcohol).

Toxic gases and vapors (e.g., hydrogen sulfide, nitrogen dioxide, 1,1,1 trichloroethane, perchloroethane, methylene chloride).

### *Hazard Prevention*

The primary objective is to prevent oxygen deficiency or other hazardous condition. This must be accomplished by accepted engineering control measures, such as general and local ventilation and substitution of materials. Only when such controls are not possible should respiratory protection be used.

Written operating procedures governing the identification, testing, and entry into a confined space with a potential for oxygen deficiency must be established by the operating personnel and approved by the Responsible Safety Officer.

Monitoring devices, audible alarms, warning lights, and instructional signs should be installed where there is a potentially oxygen-deficient atmosphere. These installations must be approved by the Responsible Safety Officer.

Before entering a confined space, the steps below must be followed:

An entry permit must be issued to the worker by the responsible supervisor and reviewed by the Responsible Safety Officer.



Air quality must be tested to determine the level of oxygen and toxic or flammable air contaminants.

Air purging and ventilation must be provided whenever possible.

The confined space must be isolated from supply lines capable of creating hazardous conditions.

Lock-out procedures must be used to secure electrical systems, pressure systems, piping, machinery, or moving equipment.

If a person must enter a confined space containing hazardous gases, the procedures below must be followed:

Protective equipment must be worn, including air supply respirator plus harness and lifeline.

At least one person must be stationed outside the confined space, with suitable respirator.

Communication with personnel in the confined space must always be maintained.

\*Ref. OSHA 1910.146



## **Chapter 7 Electrical Safety**

### ***Policy***

It is the policy of O,R&L to take every reasonable precaution in the performance of work to protect the health and safety of employees and the public and to minimize the probability of damage to property. The electrical safety requirements contained in this chapter are regulations set forth by O,R&L.

### ***Employee Responsibility***

All O,R&L personnel are responsible for all aspects of safety within their own groups. The Responsible Safety Officer is responsible for providing information, instruction, and assistance, as appropriate, concerning O,R&L electrical safety requirements and procedures.

Individual employees are responsible for their own and their co-workers' safety. This means:

Become acquainted with all potential hazards in the area in which they work.

Learn and follow the appropriate standards, and hazard-control methods.

Never undertake a potentially hazardous operation without consulting with appropriate supervision.

Stop any operation you believe to be hazardous.

Notify a supervisor of any condition or behavior that poses a potential hazard. Wear and use appropriate protective equipment.

Immediately report any occupational injury or illness to the Responsible Safety Officer, any on site Medical Services Department and the appropriate supervisor.

Each employee acting in a supervisory capacity has specific safety responsibilities. These include:

Developing an attitude and awareness of safety in the people supervised and seeing that individual safety responsibilities are fully carried out.

Maintaining a safe work environment and taking corrective action on any potentially hazardous operation or condition.

Ensuring that the personnel he/she directs are knowledgeable and trained in the tasks they are asked



to perform.

Ensuring that safe conditions prevail in the area and that everyone is properly informed of the area's safety regulations and procedures.

Ensuring that contract personnel are properly protected by means of instructions, signs, barriers or other appropriate resources.

Ensuring that no employee assigned to potentially hazardous work appears to be fatigued, ill, emotionally disturbed, or under the influence of alcohol or drugs (prescription, over the counter medicinal or otherwise).

Management at every level has the responsibility for maintaining the work environment at a minimal level of risk throughout all areas of control.

### **Each manager:**

Is responsible for being aware of all potentially hazardous activities within the area of responsibility.

May assign responsibility or delegate authority for performance of any function, but –

Remains accountable to higher management for any oversight or error that leads to injury, illness, or damage to property.

### ***Procedures***

It is the policy of O,R&L to follow the fundamental principles of safety, which are described below. A clear understanding of these principles will improve the safety of working with or around electrical equipment.

Practice proper housekeeping and cleanliness. Poor housekeeping is a major factor in many accidents. A cluttered area is likely to be both unsafe and inefficient. Every employee is responsible for keeping a clean area and every supervisor is responsible for ensuring that his or her areas of responsibility remain clean.

Identify hazards and anticipate problems. Think through what might go wrong and what the consequences would be. Do not hesitate to discuss any situation or question with our supervisor and coworkers.

Resist “hurry-up” pressure. Program pressures should not cause you to bypass the thoughtful

consideration and planned procedures.

**Design for safety.** Consider safety to be an integral part of the design process. Protective devices, warning signs, and administrative procedures are supplements to good design but can never fully compensate for its absence. Completed designs should include provisions for safe maintenance.

**Maintain for safety.** Good maintenance is essential to safe operations. Maintenance procedures and schedules for servicing and maintaining equipment and facilities, including documentation of repairs, removals, replacements, and disposals, should be established.

**Document your work.** An up-to-date set of documentation adequate for operation, maintenance, testing and safety should be available to anyone working on potentially hazardous equipment. Keep drawings and prints up to date. Dispose of obsolete drawings and be certain that active file drawings have the latest corrections.

**Have designs reviewed.** All systems and modifications to systems performing a safety function or controlling a potentially hazardous operation must be reviewed and approved at the level of project engineer or above.

**Have designs and operation verified.** All systems performing safety functions or controlling a potentially hazardous operation must be periodically validated by actual test procedures at least once a year, and both the procedures and actual tests must be documented.

**Test equipment safety.** Tests should be made when the electrical equipment is de-energized, or, at most, energized with reduced hazard.

**Know emergency procedures.** All persons working in areas of high hazard (with high-voltage power supplies, capacitor banks, etc.) must be trained in emergency response procedures, including cardiopulmonary resuscitation (CPR) certification.

### ***Working with Energized Equipment***

This section contains safety requirements that must be met in constructing electrical equipment and in working on energized electrical equipment. Special emphasis is placed on problems associated with personnel working on hazardous electrical equipment in an energized condition. Such work is permissible, but only after extensive effort to perform the necessary tasks with the equipment in a securely de-energized condition has proven unsuccessful, or if the equipment is so enclosed and protected that contact with hazardous voltages is essentially impossible.

### ***Definitions:***

The following definitions are used in this discussion of electrical safety.

**Authorized Person:** An individual recognized by management as having the responsibility for and expertise to perform electrical procedures in the course of normal duties. Such individuals are normally members of electronic or electrical groups.

**Backup Protection:** A secondary, redundant, protective system provided to de-energize a device, system, or facility to permit safe physical contact by assigned personnel. A backup protective system must be totally independent of the first-line protection and must be capable of functioning in the event of total failure of the first-line protective system.

**Companion:** A co-worker who is cognizant of potential danger and occasionally checks the other worker.

**Electrical Hazard:** A potential source of personnel injury involving, either directly or indirectly, the use of electricity.

**Direct Electrical Hazard:** A potential source of personnel injury resulting from the flow of electrical energy through a person (electrical shocks and burns).

**Indirect Electrical Hazard:** A potential source of personnel injury resulting from electrical energy that is transformed into other forms of energy (e.g., radiant energy, such as light, heat, or energetic particles; magnetic fields; chemical reactions, such as fire, explosions, the production of noxious gases and compounds; and involuntary muscular reactions).

**First Line Protection:** The primary protective system and/or procedure provided to prevent physical contact with energized equipment.

**General Supervision:** The condition that exists when an individual works under a supervisor's direction but not necessarily in the continuous presence of the supervisor.

**Grounding Point:** The most direct connection to the source of a potential electrical hazard such as the terminals of a capacitor. Such a point must be indicated by a yellow circular marker.

**Grounds, Electrical:** Any designated point with adequate capacity to carry any potential currents to earth. Designated points may be building columns or specially designed ground-network cabling, rack, or chassis ground. Cold water pipes, wire ways, and conduits must not be considered electrical grounds.

**Grounds, Massive:** Large areas of metal, concrete, or wet ground that make electrical isolation difficult or impossible.

**Implied Approval:** Approval is implied when a supervisor, knowing the qualifications of an individual, assigns that individual a task, or responsibility for, a device, system, or project.

**Qualified Person:** An individual recognized by management as having sufficient understanding of a device, system, or facility to be able to positively control any hazards it may present.

### **Must, Should, and May:**

**Must** indicates a mandatory requirement.

**Should** indicate a recommended action.

**May** indicates an optional or permissive action, not a requirement or recommendation.

**Safety Watch:** An individual whose sole task is to observe the operator and to quickly de-energize the equipment, using a crash button or circuit breaker control in case of an emergency, and to alert emergency personnel. This person should have basic CPR training.

### ***Type of Hazards***

The degree of hazard associated with electrical shock is a function of the duration, magnitude, and frequency of the current passed by the portion of the body incorporated in the circuit. The current that can flow through the human body with contacts at the extremities, such as between the hand or head and one or both feet, depends largely on the voltage. Body circuit resistance, even with liquid contacts (barring broken skin) will probably be not less than 500 ohms. The current flow at this resistance at 120 volts is 240 milliamperes.

Recognition of the hazards associated with various types of electrical equipment is of paramount importance in developing and applying safety guidelines for working on energized equipment. Three classes (in order of increasing severity) of electrical hazards have evolved.

### ***Class A Hazard***

Class A electrical hazard exists when all the following conditions prevail:

The primary AC potential does not exceed 130 volts rms.

The available primary AC current is limited to 30 amperes rms.

The stored energy available in a capacitor or inductor is less than 5 joules ( $J=CV^2/2=L12/2$ ).

The DC or secondary AC potentials are less than 50 volts line to line and/or to ground or the DC or secondary AC power is 150 volt-amperes (V-A) or less.

Although the voltages and currents may be considered nominal, a “Class A” electrical hazard is potentially lethal. This class is particularly dangerous because of everyday familiarity with such sources, an assumed ability to cope with them, and their common occurrence is less guarded exposures.

### ***Class B Hazard***

A Class B electrical hazard has the same conditions as a Class A hazard except that the primary AC potential is greater than 130 volts rms, but does not exceed 300 volts rms.

### ***Class C Hazard***

A Class C electrical hazard classifications prevail for all situations when one or more of the limitations set in Class B is exceeded.

### ***Employee Attitude***

The attitudes and habits of personnel and the precautions they routinely take when working on energized equipment are extremely important. There are three modes of working on electrical equipment.

### ***Mode 1: Turn off the Power***

All operations are to be conducted with the equipment in a positively de-energized state. All external sources of electrical energy must be disconnected by some positive action (e.g., locked-out breaker) and with all internal energy sources rendered safe. “Mode 1” is a minimum hazard situation.

### ***Mode 2: Latent Danger***

All manipulative operations (such as making connections or alterations to or near normally energized components) are to be conducted with the equipment in the positively de-energized state. Measurements and observations of equipment functions may then be conducted with the equipment energized and with normal protective barriers removed. “Mode 2” is a moderate-to-severe hazard situation, depending on the operating voltages and energy capabilities of the equipment.

### ***Mode 3: Hot Wiring***

“Mode 3” exists when manipulative, measurement, and observational operations are to be conducted with the equipment fully energized and with normal protective barriers removed.

“Mode 3” is a severe hazard situation that should be permitted only when fully justified and should be conducted under the closest supervision and control. One knowledgeable person should be involved in addition to the workers (s). Written permission may be required.

Work on Class B or Class C energized circuitry must only be done when it is absolutely necessary.

### ***Safety Glasses***

Either safety glasses or a face shield must be worn when working on electrical equipment.

### ***Personal Protective Devices***

For work on any energized circuitry with a Class B or Class C hazard, the use of personal protective devices (e.g., face shields, blast jackets, gloves, and insulated floor mats) is encouraged, even if not required.

### ***Elevated Locations***

Any person working on electrical equipment on a crane or other elevated location must take necessary precautions to prevent a fall from reaction to electrical shock or other causes. A second person, knowledgeable as a safety watch, must assume the best possible position to assist the worker in case of an accident.

### ***Chain of Command***

The supervisory chain must be identified for normal operation and development, servicing, or testing of hazardous equipment.

An up-to-date set of instructions for operation, maintenance, testing, and safety should be provided and made readily available to anyone working on hazardous equipment.

As many tests as practicable should be made on any type of electrical equipment in the un-energized condition, or at most, energized with reduced hazard.

All covering, clothing, and jewelry that might cause hazardous involvement must be removed.

Adequate and workable lock-out/tag-out procedures must be employed.

A person in a hazardous position who appears to be fatigued, ill, emotionally disturbed, or under the influence of alcohol and/or drugs (medicinal, or otherwise) must be replaced by a competent backup person, or the hazardous work must be terminated.

Supervisors and workers must be encouraged to make the conservative choice when they are in

doubt about a situation regarding safety.

Training sessions and drills must be conducted periodically to help prevent accidents and to train personnel to cope with any accidents that may occur. CPR instruction must be included.

An emergency-OFF switch, clearly identified and within easy reach of all high-hazard equipment, should be provided. Also, this switch may be used to initiate a call for help. Resetting an Emergency-OFF switch must not be automatic but must require an easily understandable overt act.

Automatic safety interlocks must be provided for all access to high-hazard equipment. Any bypass of such an interlock should have an automatic reset, display conspicuously the condition of the interlocks, and ensure that barriers cannot be closed without enabling the interlock.

All equipment should have convenient, comfortable, and dry access.

Communication equipment (e.g., fire alarm box, telephone) should be provided near any hazardous equipment. Its location should be clearly marked to ensure that the person requesting assistance can direct the people responding to a call for help to the emergency site quickly.

Any component that in its common use is non-hazardous, but in its actual use may be hazardous, must be distinctively colored and/or labeled. (An example might be a copper pipe carrying high voltage or high current.)

Periodic tests of interlocks to ensure operability must be performed and documented at least yearly.

### ***Protective Systems***

Equipment must be designed and constructed to provide personnel protection. First-line and backup safeguards should be provided to prevent personnel access to energized circuits.

Periodic tests must be established to verify that these protective systems are operative.

### ***Safety Practices***

Additional safety practices are described below.

**Cable Clamping:** A suitable mechanical-strain-relief device such as a cord grip, cable clamp, or plug must be used for any wire or cable penetrating an enclosure where external movement or force can exert stress on the internal connection. Grommets, adlets, or similar devices must not be used as strain relief.

**Emergency Lighting:** There must be an emergency lighting system that activates when normal power fails in Class C conditions.

**Flammable and Toxic Material Control:** The use of flammable or toxic material must be kept to a

minimum. When components with such fluids are used, a catch basin or other approved method must be provided to prevent the spread of these materials should the normal component case fail.

**Isolation:** All sources of dangerous voltage and current must be isolated by covers and enclosures. Access to lethal circuits must be either via screw-on panels, each containing no less than four screws or bolts, or by interlocked doors. The frame or chassis of the enclosure must be connected to a good electrical ground with a conductor capable of handling any potential fault current.

**Lighting:** Adequate lighting must be provided for easy visual inspection.

**Overload Protection:** Overload protection and well marked disconnects must be provided. Local “off” controls must be provided on remote-controlled equipment.

All disconnects and breakers should be clearly labeled as to which loads they control.

**Power:** All ac and dc power cabling to equipment not having a separate external ground but having wire-to-wire or wire-to-ground voltage of 50 volts or more must carry a ground conductor unless cabling is inside an interlocked enclosure, rack, grounded wire way, or conduit, or feeds a commercial double-insulated or UL-approved device. This requirement will ensure that loads such as portable test equipment, temporary or experimental, is grounded. UL-approved devices such as coffeepots, timers, etc., used per the manufacturer’s original intent are permissible.

**Rating:** All conductors, switches, resistors, etc., should be operated within their design capabilities. Pulsed equipment must not exceed either the average, the rms, or the peak rating of components. The equipment should be derated as necessary for the environment and the application of the components.

**Safety Grounding:** Automatic discharge devices must be used on equipment with stored energy of 5 joules or more. Suitable and visible manual grounding devices must also be provide to short-to-ground all dangerous equipment while work is being performed.

### *Safety Practices*

Because a wide range of power supplies exist, no one set of considerations can be applied to all cases. The following classification scheme may be helpful in accessing power-supply hazards.

### *Safety Practices, High Voltage*

The following check list must be used as a guide for circuits operating at 130 volts or more or storing more than 5 joules. An enclosure may be a room, a barricaded area, or an equipment cabinet.

**Access:** Easily opened doors, panels, etc., must be interlocked so that the act of opening de-



energizes the circuit. Automatic discharge of stored-energy devices must be provided. Doors should be key-locked, with the same required key being also used for the locks in the control-circuit-interlock chain. This key must be removable from the door only when the door is closed and locked.

**Heat:** Heat-generating components, such as resistors, must be mounted so that heat is safely dissipated and does not affect adjacent components.

**Isolation:** The enclosure must physically prevent contact with live circuits. The enclosure can be constructed of conductive or non-conductive material. If conductive, the material must be electrically interconnected and connected to a good electrical ground. These connections must be adequate to carry all potential fault currents.

**Seismic Safety:** All racks, cabinets, chassis, and auxiliary equipment must be secured against movement during earthquakes.

**Strength:** Enclosures must be strong enough to contain flying debris due to component failure.

**Temporary Enclosure:** Temporary enclosures (less than 6-month duration) not conforming to the normal requirements must be considered Class C hazards.

**Ventilation:** Ventilation must be adequate to prevent overheating of equipment and to purge toxic fumes produced by a fault.

**Visibility:** Enclosures large enough to be occupied by personnel must allow exterior observation of equipment and personnel working inside the enclosure.

**Warning Indicators:** When systems other than conventional facilities represent Class C hazards, the systems should be provide with one of the following two safety measures: (1) A conspicuous visual indicator that is clearly visible from any point where a person might make hazardous contact or entry; and (2) A clearly visible primary circuit breaker or “OFF” control button on the front of the enclosure.

### ***Low Voltage-under 130 Volts***

Since they are not “high voltage,” such power sources frequently are not treated with proper respect, although these voltages are capable of producing fatal shocks.

In addition the obvious shock and burn hazards, there is also the likelihood of injuries incurred in trying to get away from the source of a shock. Cuts or bruises, and even serious and sometimes fatal falls, have resulted from otherwise insignificant shocks.

Power supplies of 300 volts or more, with lethal current capability, have the same hazards to an even greater degree. Because supplies in this category are considered Class C hazards, they must be treated accordingly.

High-voltage supplies that do have dangerous current capabilities are not serious shock or burn hazards in themselves and are therefore often treated in a casual manner. However, they are frequently used adjacent to lower-voltage lethal circuits, and a minor shock could cause a rebound into such a circuit. Also, an involuntary reaction to a minor shock could cause a serious fall (for example, from a ladder or from experimental apparatus).

The following are additional safety considerations for power supplies.

**Primary disconnect.** A means of positively disconnecting the input must be provided. This disconnect must be clearly marked and located where the workmen can easily lock or tag it out while servicing the power supply. If provided with a lockout device, the key must not be removable unless the switch or breaker is in the “off” position.

**Overload Protection.** Overload protection must be provided on the input and should be provided on the output.

### *Danger with Large Capacitors*

This section describes the hazards associated with capacitors capable of storing more than 5 joules of energy.

Capacitors may store hazardous energy even after the equipment has been de-energized any may build up a dangerous residual charge without an external source; “grounding” capacitors in series, for example, may transfer rather than discharge the stored energy. Another capacitor hazard exists when a capacitor is subjected to high currents that may cause heating and explosion. At one time, capacitors were called condensers and older capacitors may still bear this label in diagrams and notices.

Capacitors may be used to store large amount of energy. An internal failure of one capacitor in a bank frequently results in explosion when all other capacitors in the bank discharge into the fault. Approximately  $10^4$  joules is the threshold energy for explosive failure of metal cans.

Because high-voltage cables have capacitors, or its combustion products, may be toxic. Do not breathe the fumes from the oil in older capacitors.

The following are safety practices for capacitors:

**Automatic Discharge.** Permanently connect bleeder resistors should be used when practical. Capacitors in series should have separate bleeders. Automatic shorting devices that operate when

the equipment is de-energized or the enclosure is opened should be used. The time required for a capacitor to discharge to safe voltage (50 volts or less) must not be greater than the time needed for personnel to gain access to the voltage terminals – never longer than 5 minutes.

In the case of Class C equipment with stored energy in excess of 5 joules, an automatic, mechanical discharging device must be provided that functions when normal access ports are opened.

This device must be contained locally within protective barrier to ensure wiring integrity and should be in plain view of the person entering the protective barrier so that the individual can verify its proper functioning. Protection also must be provided against the hazard of the discharge itself.

**Safety Grounding.** Fully visible, manual-grounding devices must be provided to render the capacitors safe while they are being worked on. Grounding points must be clearly marked, and caution must be used to prevent transferring charges to other capacitors.

**Ground Hooks.** All ground hooks must:

Have conductors crimped and soldered.

Be connected such that impedance is less than 0.1 ohms to ground. Have the cable conductor clearly visible through its insulation.

Have a cable conductor size of at least a #2 extra flexible, or in special conditions a conductor capable of carrying any potential current.

Be in sufficient number to ground conveniently and adequately ALL designated points.

Be grounded and located at normal entry way when stored, in such a manner to ensure that they are used.

In Class C equipment with stored energy in excess of 5 joules, a discharge point with an impedance capable of limiting the current to 500 amperes or less should be provided. This discharge point must be identified with a yellow circular marker with a red slash and must be labeled “HI Z PT” in large readable letters. A properly installed grounding hook must first be connected to the current-limiting discharge point and then to a low-impedance discharge point (less than 0.1 ohm) that is identified by a yellow circular marker. The grounding hooks must be left on all of these low impedance points during the time of safe access. The low-impedance points must be provided, whether or not the HI-Z current-limiting points are needed. Voltage indicators that are visible from all normal entry points should also be provided.

**Fusing.** Capacitors used in parallel should be individually fused when possible to prevent

the stored energy from dumping into a faulted capacitor. Care must be taken in placement of automatic-discharge safety devices with respect to fuses. If the discharge will flow through the fuses, a prominent warning sign must be placed at each entry indication that each capacitor must be manually grounded before work can begin. Special knowledge is required for high-voltage and high-energy fusing.

Unused Terminal Shorting. Terminals of all unused capacitors representing a Class C hazard or capable of storing 5 joules or more must be visibly shorted.

### ***Danger with Large Magnets***

This section describes inductor and magnets that can store more than 5 joules of energy or that operate at 130 volts or more.

The following are some hazards peculiar to inductors and magnets:

The ability of an inductor to release stored energy at a much higher voltage than that used to charge it.

Stray magnetic fields that induce eddy currents in conductive material thereby causing heating and mechanical stress.

Time-varying stray fields that induce unwanted voltages at inductor or magnet terminals.

The following are safety practices for inductive circuits:

**Automatic Discharge.** Freewheeling diodes, varistors, thyrites or other automatic shoring devices must be used to provide a current path when excitation is interrupted.

**Connections.** Particular attention should be given to connections in the current path of inductive circuits. Poor connections may cause destructive arcing.

**Cooling.** Many inductors and magnets are liquid cooled. The unit should be protected by thermal interlocks on the outlet of each parallel coolant path, and a flow interlock should be included for each device.

**Eddy Currents.** Units with pulsed or varying fields should have a minimum of eddy-current circuits. If large eddy-current circuits are unavoidable, they should be mechanically secure and able to safely dissipate any heat produced.

**Grounding.** The frames and cores of magnets, transformers, and inductors should be grounded.

**Rotating Electrical Machinery.** Beware of the hazard due to residual voltages that exists until rotating electrical equipment comes to a full stop.

## *Safety Design*

Proper philosophy is vital to the safe design of must control applications. The following check list should be used as a guide.

**Checkout.** Interlock chains must be checked for proper operation after installation, after any modification, and during periodic routine testing.

**Fail-safe design.** All control circuits must be designed to be “fail-safe”. Starting with a breaker or fuse, the circuit should go through all the interlocks in series to momentary on-off switches that energize and “seal in” a control relay. Any open circuit or short circuit will de-energize the control circuit and must be reset by overt act.

**Interlock Bypass Safeguards.** A systematic procedure for temporarily bypassing interlocks must be established. Follow-up procedures should be included to ensure removal of the bypass as soon as possible. When many control-circuit points are available at one location, the bypassing should be made through the normally open contacts of relays provided for this purpose. In an emergency, these relays can be opened from a remote control area.

**Isolation.** Control power must be insulated from higher power circuits by transformers, contactors, or other means. Control power should be not more than 120 volts, ac or dc. All circuits should used the same phase or polarity so that no additive voltages (Class B or Class C hazard) are present between control circuits or in any interconnect system. Control-circuit currents should not exceed 5 amperes.

**Lock-out.** A keyed switch should be used in interlock chains to provide positive control of circuit use. To ensure power removal before anyone enters the enclosure, this same key should also be used to gain access to the controlled equipment.

**Motor Control Circuits** (Class B or Class C Hazards). All Class B or Class C motor circuits must have a positive disconnect within view of the motor, or if this is not practical, a disconnect that can be locked open by the person working on these motor circuits is acceptable.

**Overvoltage Protection.** Control and instrumentation circuits used with high-voltage equipment must have provision for shorting fault-induced high voltages to ground. High-voltage fuses with a high-current, low-voltage spark gap downstream from the high-voltage source are recommended. This also applies to all circuits penetrating high-voltage enclosures.

**Voltage Divider Protection.** The output of voltage dividers used with high voltages must be protected from overvoltage-to-ground within the high-voltage area by spark gaps, neon bulbs, or other appropriate means.

**Current Monitors.** Currents should be measured with a shunt that has one side grounded or with current transformers that must be either loaded or shorted at all times.

**Instrument Accuracy.** Instrumentation should be checked for function and calibration on a routine basis.

### *More than 300 Volts*

To work on systems with voltages greater than 300 volts (CLASS B or C HAZARD):

Open the feeder breaker, roll out if possible, tag out, and lock if in enclosure. If work is on circuits of 600 V or more, positive grounding cables should be attached to all three phases.

Tag should contain who, why and when information, and it is of vital importance because a person's life may depend on it. "Vital" in this case means that the presence and status of the tag are inviolate, the tag must not be altered or removed except by the person who attached it.

### *Less than 300 Volts*

To work on systems with voltages less than 300 volts (CLASS A HAZARD): Turn-off and tag the feeder breaker. Tag is inviolate except on projects where established circuit checkout procedure allows a qualified person to remove it and energize circuit after checkout is complete.

### *Motor Generator Systems*

For motor or generator work, primary feeder breaker must be opened, tagged and locked out if possible.

For generator-load work, motor-start permissive key must be removed by person doing work and restored when work is complete.

### *High Voltage*

To work on high voltage power supplies and enclosures use Class B or Class C hazard procedure specified in the safety requirements.

Access should always be by permissive key that interrupts input power when key is removed from control panel. Grounding of power supply output must occur either automatically when key is removed from control panel or manually before access door can be opened.

### *High Current*

To work on high current power supplies (normally for magnets), treat system as a high voltage power supply, if energy storage is 5 joules or more when system is off. If not, then requirements for

working on magnet are as follows:

If power supply is equipped with Kirk (trademark) or equivalent interlock, turn key and remove. This locks the input breaker in “off” position until key is reinserted and turned.

If power supply is not equipped with a Kirk (trademark) or equivalent interlock, turn off and tag input circuit breaker.

### *Working on Power Supplies*

The minimum requirements for working on any power supply is to turn power off and properly tag feeder circuit breaker external to power supply.

### *Electrical Lock-out/Tag-out procedures*

Electrical Lock-out/Tag-out procedure. When you have to do maintenance work on a machine, take these four steps to protect yourself and your co-workers from injury:

1. De-energize the machine if possible. Positively disconnect the machine from the power source. If there is more than one source of power, then disconnect them all.
2. If possible, lock out all disconnect switches. You must be given a lock and a key for each disconnect before you begin working on the machine.
3. Tag all disconnect switches. Use the yellow or red safety tags which state in large letters “**Danger....Do Not Operate**” or “**Danger Not Energize**” and which give the name of individual who locked out the equipment, date and time. The tag must also state “**DO NOT REMOVE THIS TAG**”. (The person who placed the tag may remove it only after the machinery maintenance has been completed.)
4. Test the equipment to insure it is de-energized before working on it. First, attempt to operate the equipment by turning it on normally. Next check all electrical lines and exposed areas with test equipment or a “lamp”. Finally short to ground any exposed connections using insulated grounding sticks. This test must be done even if the electrical connection is physically broken, such as pulling out a plug, because of the change of discharging components.

**A tag out only procedure may be used if the machine can not be locked out. If the machine is supplied electrical power from a single source, which is under the exclusive control of a trained and qualified repair person at all times and there are not any other persons in the repair area who could be harmed by the accidental energizing of the machinery, then tag out may be used instead of lock-out/tag out.**

### *Re-Energizing*

Many accidents occur at the moment of re-energizing. If the machinery is to be re-energized, all



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persons must be kept at a safe distance away from the machinery.

The re-energization can be performed only by a person who either performed the lock-out/tag out, a person acting under the immediate and direct commands of the original lock-out/tag out person, or, in the event of a shift change, or other unavailability of the original person, the original shall, before leaving, appoint a surrogate person and show him or her all steps taken to lock-out/tag out the equipment.

\*Ref. OSHA 1926.400 – 1936.449



## Chapter 8 Emergencies Site Emergency Evacuation Plan

### *Organization*

O,R&L requires that during every emergency an organized effort be made to protect personnel from further injury and to minimize property damage.

All of O,R&L's resources can be made available to respond to an emergency. Each supervisor must know what to do during an emergency in his or her area and must be certain that his or her employees understand their roles.

### *Building Emergency Plan*

A site emergency evacuation plan for is included in this chapter prepared.

A Building Manager and Deputy Manger must be appointed and oriented for each building or complex. Generally, the Building Manager is the person in charge of a building or facility. The Building Manager has specific responsibility for the preparation, updating and implementation of the emergency plan for this area. This responsibility includes recommending personnel to attend indoctrination and training programs.

Specifically, each plan must contain the following information and procedures as appropriate for each building:

The names of the Building Manager, Deputy Manger, and Assistant Manager(s).

A list of people with specific duties during an emergency and a description of their duties. For example, specific people should be assigned to supervise evacuation and to carry out a rapid search of the area (assuming this can be done safely).

Floor plans showing evacuation routes, the location or shutoff switches and valves for the utility systems (water, gas, electricity), and the locations of emergency equipment and supplies (including medical).

Indications on the floor plans of areas where specific hazards, (i.e., toxic, flammable, and/or radioactive materials) exist. Location and description of special hazards or hazardous devices should be included in the text together with shutdown procedures if applicable.

Designation of a primary assembly point for evacuees, well away from the building. An alternate site should also be designated in case the first choice cannot be used.

**Reentry procedures.** No one should reenter an evacuated building or area without specific instructions from the Building Manager or other person in charge.



Department Head and Supervisor responsibilities regarding emergency preparedness and action procedures.

Emergency plans for facilities or equipment requiring an Operational Safety Procedure (OSP).

### ***Operational Safety Procedures***

OSP's for individual facilities or pieces of equipment must include emergency plans for the facilities or equipment.

### ***Supervisors Responsibilities***

During an emergency, the supervisor must:

Ensure that those under his or her supervision are familiar with the plan for the building, particularly the recommended exit routes and how to report an emergency.

Render assistance to the person in charge during an emergency, as required.

Maintain familiarity with the shutdown procedures for all equipment used by those under his or her supervision.

Know the location and use of all safety equipment on his or her floor. Keep employees from reentering an evacuated area until reentry is safe.

### ***No Loitering Policy***

Employees not involved in the emergency must stay away from the scene and follow the instructions issued over the public address system or directly from the person in charge. The sounding of a fire bell means immediate evacuation by the nearest exit. Employees must not reenter an area that they have evacuated until notified that it is safe to return.

### ***Employee Responsibilities***

Employees, other than emergency-response groups, involved in any emergency greater than a minor incident are expected to act as follows:

If there is threat of further injury or further exposure to hazardous material, remove all injured persons, if possible, and leave the immediate vicinity. If there is no threat of further injury or exposure, leave seriously injured personnel where they are.

Report the emergency immediately by phone. State what happened, the specific location, whether anyone was injured, and your name and phone number.



Proceed with first aid or attempt to control the incident only if you can do so safely and have been trained in first aid or the emergency response necessary to control the incident.

Show the ranking emergency-response officer where the incident occurred, inform him or her of the hazards associated with the area, provide any other information that will help avoid injuries, and do as he or she requests.

## **O,R&L Construction Project Site Evacuation Plan**

This administrative procedure (AP) helps ensure the health and safety of persons at facility construction project during an emergency by describing procedures to be taken during possible emergency situations on the job and applies to all persons who may be within the facility during an emergency. This AP also complies with O,R&L Construction “Safety and Procedure Plan.”

Each project is located in a separate location with a different scope of work, therefore some emergency procedures may vary according to the characteristics associated with the job. However the basic evacuation procedure, sweep procedure and notification list will remain the same.

## **Notification of 911**

### **Call 911**

- If emergency response personnel are needed, (e.g., fire, serious injury, or other emergency that may pose an immediate threat to life or property);
- If a pull box alarm was pulled, tell the operator at 911 why the alarm was pulled;
- If the building was evacuated because of automatic alarm, or an announced alarm, give the operator at 911 any information gathered during the sweep and evacuation (e.g., broken water pipe, a toaster set off smoke detector, workers cut power line, or there is no visible sign of what signaled the alarm); or
- If a suspicious package was found

### **Immediate Threat**

Upon noticing any situation that may require an immediate evacuation do the following:

- Pull the handle on the nearest alarm pull box if available (Never use alarm pull boxes for suspicious packages)
- Announce the evacuation over the building-wide telephone paging system if available
- Announce the evacuation vocally to adjacent employees or contractors throughout the facility

### **Call 911**



Notify any adjacent building that may be threatened.

Notify appropriate personnel listed here, a copy of personnel phone numbers will be in the superintendent office or trailer.

- 911 Emergency Personnel
- Superintendent
- O,R&L Project Manager
- O,R&L Director of Construction
- Building Manager if possible
- Building Tenant if possible
- Building Owner

## **Potential Threats**

For incidents that do not pose an immediate threat to life or property, but carry the potential of such a threat, notify:

- Superintendent
- O,R&L Director of Construction (203) 483-2040
- Facility Manager if available

## **Non-Threatening Incidents**

Report incidents that pose no threat to life or property but may be reportable to the superintendent as soon as possible. The superintendent will contact the appropriate persons. These incidents must be reported to:

- Superintendent
- O,R&L Project Manager
- O,R&L Director of Construction (203) 483-2040
- Facility Manager if available
- 

## **Evacuation Procedure and Sweep Procedures**

If the superintendent is qualified to perform an operation and it is safe to do so, the superintendent may take short-term measures until emergency response arrive. The superintendent present is in charge until the emergency response personnel arrives.

Never perform any action that could endanger yourself or others, including remaining in the building to assist an injured person.

## **Immediate Evacuation**



If an immediate building evacuation is necessary,

- Sound a fire alarm at the nearest alarm pull box or announce a building wide evacuation
- Call 911
- Evacuate the building immediately
- If you are the last person out of a room close the door behind you as you exit
- Make all other appropriate notifications listed above
- Go to the appropriate muster area
- Wait for emergency personnel to arrive at the site to give further guidance

## **Evacuation for a Potentially Serious Situation**

- Call 911; always call 911 if there is a serious injury
- Evacuate the immediate area
- Take an appropriate action, such as roping off the area or placing someone at each entry point, to prevent unauthorized entry into the area
- Post the area
- If safe, feasible, and necessary, implement appropriate equipment shutdown procedures in area
- Make any applicable notifications listed in Attachment A

## **Handicapped Employee and Handicapped Visitor Evacuation**

Handicapped refers to a physical condition that could impede a person's ability to promptly evacuate the building or notify others of an emergency situation. Any employee having a handicap, permanent or temporary, which would hinder their timely evacuation, must notify the superintendent. The superintendent will assign the appropriate personnel to assist that individual during an evacuation or, at a minimum, assure the individual is evacuated to the assembly area.

If the emergency responder assistance is required, the assigned assistant shall immediately notify the assembly point leader so personnel and equipment can be requested immediately through the Emergency Personnel.

Any handicapped visitor is the responsibility of his/her escort. Upon evacuation, the escort will assist the visitor out of the building to the assembly area.

## **Muster Areas**

The primary muster area location will be designated prior to the start of the project. The muster area always be upwind of the incident or emergency regardless of the nature of the emergency. The superintendent employee will proceed to the appropriate muster area and serve as on-site



commander and assembly point leader until emergency response personnel arrive. If the primary muster area is unsuitable for any reason the onsite commander may choose an alternate area after all personnel have been accounted for.

## **Sweep Procedures**

Upon activation of alarm, audible, visual or vocal all persons should immediately report to the appropriate muster area. The superintendent will be responsible for sweeping the general work area that is occupied.

Upon notice to evacuate the building, the designated foreman for each task will sweep their designated work area, checking for remaining personnel and/or obvious hazards/problems, and proceed immediately to the muster area. After returning to the building after the emergency, the person who performed the sweep will report to the superintendent.

Sweeps should be performed along normal exit routes and only if safe conditions. They should be conducted from top to bottom, back to front and interior to exterior. Sweep results should be communicated immediately to the incident commander by the superintendent. Under no circumstances should anyone reenter a building to perform a sweep. Sweeps should be followed up by accounting for all personnel at the muster area.

## **ACCOUNTABILITY PROCEDURES**

Because of the size, geographic location, and different activities in the building, the responsibility for tracking persons inside the building is split between the different individual tasks housed within the building. All persons check in with their respective organization at the muster area. All persons must remain at the muster area until being accounted for and released by the superintendent.

The following information summarizes the emergency equipment located within the superintendent office or trailer

- Assorted generators, electrical equipment, such as saws, grinders and plugs
- Fire extinguishers
- Safety Data Sheets

## **Reentry Procedures/Return to Normal Operation**

### **Reentry**

The first entry made after evacuation in order to perform mitigation or determine the area safe for building personnel to return must only be done by emergency response personnel at the direction of the Incident Commander. This decision will be made in conjunction with the facility representative at the Command Post and with all information available on building hazards, the



incident, and safety considerations.

All persons will remain in the muster area until their supervisor authorizes them to reenter. The on-scene commander authorizes reentry of site personnel. If an Incident Control Group is utilized, the incident commander authorizes reentry.

### **Return to Normal Operation**

Return to normal operation is the point in an incident when the facility is turned back over from the incident commander to superintendent or building manger. The facility representative must participate in a face-to-face briefing with the incident commander to determine any recovery tasks that may still need to be accomplished as a result of the incident. If there are none, the facility may be reoccupied immediately. Otherwise the responsible facility representative will direct personnel when to return. All personnel must remain at the muster area until the incident commander authorized reentry.



## Chapter 9 Building Management and Construction

### *Introduction*

O,R&L's buildings and equipment must equal or exceed existing legal standards for safety, fire prevention, sanitation, architectural barriers, health protection, and resistance to seismic forces. Safeguards must provide built-in protection against injury to personnel or damage to property and include methods for limiting the consequences of accidents. Protection systems must permit the most effective work conditions consistent with effective safeguards.

Since physical plant facilities are the responsibility of the Engineering Department, the following matters related to engineering and construction must be referred to the Engineering Department:

New construction or alteration of buildings, building facilities, fixed equipment, outside utilities such as cooling towers, electrical substations, underground pipes, conduits or vaults, roadways, parking lots, walkways, landscaping, sewers, and drainage systems.

Plans under consideration that will affect any structure or physical plant facility because of size of the project, loads, vibration, temperature requirement, humidity control, radiation background, or ventilation requirement, or any code-related feature of the facility.

### *Engineering Responsibilities*

The Engineering Department is responsible for planning, construction and alterations involving physical plant facilities. Job control by the Engineering Department includes obtaining all required official approvals; requesting new account numbers; initiating requisitions, materials orders, and job orders; and administrating all subcontracts pertaining to the project.

To initiate new construction or alterations, a request is submitted to the Engineering Department. The submission must inform the Plant Engineering Department of the proposed use and any special safety requirements for the project. The Responsible Safety Officer will assist the Engineering Department in determining the need for developing specific safety criteria and facilities.

### *Structural Alterations*

Plant alterations that are necessary for safety or to improve safety should be carried out expeditiously. Requests for such alterations or additions, and job orders for such projects, should be conspicuously marked as safety projects. The Responsible Safety Officer establishes appropriate priorities for these safety projects.

### *Hazardous Materials*

Hazardous materials must be handled and stored in enclosures that 1) protect the worker by means





appropriate to the hazard and 2) protect the casual or unwitting passerby from hazards or access to hazards. These aims are achieved by work enclosures such as hoods, glove boxes, fire safes, and fenced areas. Applicable construction criteria for such work enclosures are given below.

## ***Standards***

The standards and recommendations of the American Conference of Governmental Industrial Hygienists (ACCGIH) will be followed.

## ***Hazmat Glove Boxes***

Glove boxes for use with radioisotopes or other hazardous materials will be purchased or built and installed only with the approval of the Responsible Safety Officer.

## ***Fences***

Fences of suitable type must be provided wherever unauthorized access can lead to personnel injury or property damage. Protective from such serious hazards as high level radiation, high pressure, or exposed high voltage requires special considerations. Vehicle gates must be at least 12 ft. wide.

## ***General Requirements***

The following general requirements apply to all buildings:

Construction should be of non-combustible or fire-rated materials as much as possible.

Building Manager must ensure that the floors of traffic corridors are unobstructed and meet code requirement.

All work areas should have the following:

At least two unobstructed exits if total floor area is over 250 sq. ft.

A smooth wall finish and smooth, impermeable work surfaces.

Automatic fire detection and suppression systems.

Adequate ventilation.

Additional requirements for manufacturing, industrial or production areas are as follows:

Safety enclosures or barriers for high energy systems.

Warning signals for safety interlocks for high energy systems or equipment.



Adequate grounding devices for electrical systems as required by the National Electric Code and this manual.

Proper design of pressurized gas systems in accordance with this manual.

Additional requirements for chemical handling areas are as follows:

Process and special ventilation in accordance with the ACGIH standards and recommendations.

Safety storage arrangements for chemicals.

Emergency eye wash and shower facilities.

### *Contractors*

In addition to the full and part-time employees on the O,R&L payroll, important work is performed by personnel through contract arrangements. These non-O,R&L persons are sometimes referred to as contract or subcontract personnel. Nevertheless, the safety obligations of subcontractor personnel are the same as those of the O,R&L employees. This is to ensure that O,R&L property is protected from damage and that all employees, payroll or non-payroll, are protected from work injury and illness. O,R&L is required by law to make its facilities as safe as possible for the protection of the employees of its contractors and subcontractors, as well as any other visitor.

### *Construction Safety*

Construction safety is closely monitored by the various on-site construction supervisors, job site coordinators, owner, architects, engineers, government and private inspectors, contractor's and subcontractor's safety officials and O,R&L's Responsible Safety Officer, all of whom must work closely together. Each contractor and subcontractor must supply the name of its designated safety official for that job site to O,R&L's Responsible Safety Officer before being allowed to commence work on the site. In addition, the following definitions and procedures formalize the safety responsibilities and duties of all those persons involved with construction site management.

### *Construction Leadership*

The following definitions describe personnel referred to in these procedures.

**Construction Inspector.** The person assigned by O,R&L to monitor subcontractor activities for construction compliance with the subcontract specifications and drawings.

**Responsible Safety Officer.** The person assigned to monitor construction safety.



**Architect/Engineer (A/E).** The person assigned by O,R&L to ensure that a construction project is built according to contract documents and design intent may also be called the Project Architect, Project Engineer, or Project Manager.

**Subcontractor.** Firm responsible for actual construction and compliance with all safety regulations.

### *OSHA Regulations and Building Owner*

Responsible Safety Officer has been given the responsibility by O,R&L and OSHA for monitoring the safety of construction site activities and enforcing all OSHA regulations. The extent of monitoring will vary depending upon the type of activity the subcontractor is engaged in. The Responsible Safety Officer role after visiting a construction site is to advise the Construction Inspector and the Architect/Engineer wherever the subcontractor is in violation of a safe practice or unsafe condition exists. After notification by Responsible Safety Officer, the Construction Inspector and the Architect/Engineer are responsible for notifying the Subcontractor to take corrective action. The responsibility for correction of the problems rests with the Subcontractor. The Responsible Safety Officer will follow up to ensure that corrective action is being taken or had been taken by the Subcontractor. A record will be maintained by the Responsible Safety Officer giving the date, discrepancies noted, notifications given, and actions taken by Subcontractor.

### *Subcontractor Safety*

The Responsible Safety Officer is responsible for monitoring the safety performance of the Subcontractor. He/she will usually coordinate visits with the Construction Inspector, or if the Construction Inspector is not available, will carry on the monitoring activities. The Subcontractor's safety performance must be logged by the Responsible Safety Officer, and if necessary, referred in writing to the Construction Inspector and the Architect/Engineer for notification to the Subcontractor and subsequent action as appropriate by the Subcontractor.

### *Subcontractor Employees*

Except when responding to an emergency, personnel entering a construction site must:

Identify themselves to the Construction Inspector and/or Architect/Engineer upon arrival. State the purpose of their visit and the area to be visited.

Obey the on-the-job instructions, wear appropriate protective equipment, and follow any special



instructions given by the Construction Inspector.

Communicate with Subcontractor only through the Construction Inspector and the Architect/Engineer.

Notify the Construction Inspector when their visit is terminated.

The Responsible Safety Officer visits to construction sites will normally be limited. Instructions and/or recommendations from the Responsible Safety Officer must be directed to the Subcontractor in the presence of the Construction Inspector. In cases of imminent threat to life safety or severe hazard of injury, the Responsible Safety Officer Inspector may contact the Subcontractor without the presence of the Construction Inspector.

Operational problems relating to the safety will be coordinated by the Responsible Safety Officer and discussed directly with the Construction Inspector and/or the Architect/Engineer. The Construction Inspector and the Architect/Engineer will notify the Subcontractor of the need to fulfill his responsibilities.

### ***Subcontractors Project Safety Program***

The Subcontractor must submit a project safety program for review and acceptance before any on-site activities. The Safety Program must be acceptable to the Responsible Safety Officer, with copies of the accepted program going to the Construction Inspector, the Architect/Engineer, and the Contract Administrator. The subcontractor must comply with all rules and construction industry safety orders by OSHA.

### ***Pre-Job Construction Conferences***

The Construction Inspector must notify the Responsible Safety Officer of the subcontractor's on-site start date and discuss any unusual safety problems with the Responsible Safety Officer and the Architect/Engineer. In addition, Responsible Safety Officer and the Architect/Engineer will discuss any unusual safety problems at a construction pre-start meeting with the Subcontractor.

### ***Fire Permits***

The Subcontractor must call the Fire Department for a burn permit and describe where and what is to be burned. A Firefighter must meet with and visit the location with the superintendent where the burning is to take place and will instruct him/her in the precautions to be taken and the placement of fire extinguishers. In case of problems, the Firefighter's first points of contact are the Construction Inspector and the Architect/Engineer. However, in case of immediate fire hazard, he/she will contact the person creating the hazard directly. Fire permits may be issued on an extended



basis if appropriate.

### ***Fire Inspections***

Construction site fire safety inspections may be made at any time by any authorized representative. All discrepancies or problems observed must be in writing and addressed to the Construction Inspector and the Architect/Engineer.

### ***Stop Work Orders***

The O,R&L stop work procedure applies to all construction subcontractor activities. It must be used only where life-safety or hazard of severe injury situations exist, or where significant damage to equipment or property could occur if the operation continued. The Construction Inspector or Architect/Engineer of a construction project is responsible for directing the Subcontractor to stop an operation whenever he/she has reason to believe that continuing will lead to injury or damage to O,R&L or Subcontractor employees or property. The Responsible Safety Officer is authorized to request the Construction Inspector to have Subcontractor stop any operation they believe will lead to injury of O,R&L or Subcontractor personnel or damage to O,R&L or Subcontractor personnel or damage to O,R&L or Subcontractor property.

All work stoppages must be in writing to the Subcontractor and must reference Safety and Health or the Subcontractor's General Conditions, and, if known, the appropriate OSHA regulation. A safety memorandum must be issued by the Responsible Safety Officer after each instance of stopping work, with copies to the Construction Inspector, the Architect/Engineer, and the Contract Administrator. Work must not resume until authorized by O,R&L management.

An example of work stoppage situation would be having people working next to an upper-level edge not provided with edge barriers. A stop work notice would be issued and work would not resume until O,R&L management was satisfied that proper barriers were in place. When issuing a stop work order, only those areas of the construction project immediately involved in the hazardous situation are included in the order. Differences of opinion between the Responsible Safety Officer and the Construction Inspector or Architect/Engineer concerning a stop work order must be immediately referred to their supervisors or department heads. The Responsible Safety Officer's recommendations must be followed until the supervisors/department heads make a decision. In the absence of the Construction Inspector, the Responsible Safety Officer must direct the Subcontractor to stop an operation that the Responsible Safety Officer considers perilous to personnel or property. The Responsible Safety Officer must locate the Construction Inspector, the Architect/Engineer, or the department head and notify them of the action taken.

### ***Serious Accidents On Site***



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In the event of a serious accident on a construction site, the Construction Inspector, Architect/Engineer, or Responsible Safety Officer will determine if all work is to be immediately stopped. If work is stopped, all workmen in the immediate area are to be assembled by the Subcontractor until the Responsible Safety Officer has conducted an initial investigation, collected applicable information from witnesses, and determined whether work may resume. The person stopping work must initiate notification of Responsible Safety Officer and O,R&L's legal Counsel.

## Section 9A Excavation, Trenching and Shoring

### *Call Before You Dig*

Prior to beginning any excavation or trenching, all underground utilities must be notified and marked out through THE CALL BEFORE YOU DIG system.

### *Determining Who and When to Call*

Public Act 87-71 of the Connecticut State statute requires individuals who use power or mechanized equipment for the purpose of disturbing the sub-surface of the earth to provide advance notice of at least two full working days to the “Call Before You Dig” central clearinghouse prior to commencing proposed excavations.

### *Sec. 16-345-1. Definitions*

**Competent Person** is used in many OSHA standards and documents. An OSHA “competent person” is defined as “one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them”. [[29 CFR 1926.32\(f\)](#)]. By way of training and/or experience, a competent person is knowledgeable of applicable standards, is capable of identifying workplace hazards relating to the specific operation, and has the authority to correct them. Some standards add additional specific requirements which must be met by the competent person.

**Excavator** means a person, partnership, corporation or association, including a public utility or a person engaged as a contractor by a public utility or public agency, directly performing or engaged in the act of excavation, demolition or discharge of explosives.

Go to the following link below to get all the information regarding Call Before You Dig  
[http://www.cbyd.com/excavator\\_manual.html](http://www.cbyd.com/excavator_manual.html)

**Excavation** is any man made cavity or depression in the earth’s surface formed by earth removal, and producing unsupported earth conditions by reasons of the excavation.

**Trench** is a narrow excavation at least 4 feet deep and not over 15 feet wide.

**Angle of repose** is the greatest angle above the horizontal plane at which a material will lie naturally, without sliding.

## ***Excavation Requirements – Specific***

The following are some specific requirements in accordance with the OSHA regulations:

- All trenches or excavations over 4 feet deep will be benched, sloped or shored according to site specific trench safety plan.
- All trenches and excavations will have a safe ladder installed in accordance with the OSHA ladder regulations no more than 25 feet from working employees and will be relocated as the work progresses (trenches 4 feet or more in depth).
- No one shall enter any trench or excavation before a supervisor and competent person has inspected and determined it to be safe to enter and work. Do not enter a trench without authorization.
- Should any condition become hazardous while you are in a trench or excavation, you are to get out immediately.
- All excavated soil is to be placed away from the excavation edge according to OSHA standards (at least 2 feet) and to prevent it from falling back into the trench or excavation.
- Do not permit vehicles or equipment to operate too close to the trench or excavation, where vibrations could cause a cave-in.
- When shoveling, be sure to keep others at a safe distance.
- Never work alone while performing excavation, trenching, or shoring operations.
- Do not work in excavations where there is standing or accumulating water without the necessary precautions being taken to alleviate the hazard.
- Subcontractors working in confined areas will comply to all OSHA Regulations.
- Removal of all protective systems will begin at, and progress from, the bottom of the excavation or trench.
- Backfilling of the excavation will be accomplished with the removal of the protective system.

## ***Excavation Requirements – General***

The Site Supervision & Responsible Safety officer and or competent person shall enforce the following safety requirements for excavating work:

Prior to opening an excavation, effort shall be made to determine whether underground installations; i.e., sewer, telephone, water, fuel, electric, gas lines, etc. will be encountered, and if so, where such underground installations are located. When the excavation approaches the location of such an installation, the exact location shall be determined, and when it is uncovered, proper supports shall be provided for the existing installation. Utility companies, authorities and if necessary Local Municipal Agencies shall be contacted and advised of proposed work prior to the start of actual excavation.



Any subcontractor involved excavation activities, shall comply with OSHA's excavation law 1926.650, 1926.651, 1926.652 and 1926.653.

The walls and faces of all excavations in which employees are exposed to danger from moving ground shall be guarded by shoring, sloping to the proper angle of repose, or some other equivalent means.

The determination of the angle of repose and design of the supporting systems shall be based on careful evaluation of pertinent factors such as type of soil; possible variation in water content of the material while the excavation is open; anticipated changes in materials from exposure to air, sun, water, or freezing; loading imposed by structures, equipment, overlying material; and vibration from equipment, traffic, or other sources. The soils report shall be used as a guideline for cutting back the excavation sides to the proper angle of repose. Any shoring system being used on excavations 20' deep or less should use the suggested design systems as offered in the OSHA standard. Any shoring systems that are deeper than 20' or are different than the suggested OSHA designs shall have drawings on them. These drawings must be stamped by an in state P.E. Again copies of the shoring system drawings must be on site during the excavation activities with a copy given to the O,R&L Responsible Safety Officer.

All subcontractors or its second-tier subcontractor firm completing the excavation work shall have a Designated Competent Person on site during excavation operations. The excavation shall be inspected before and during excavation activities, after every rainstorm or other hazard-increasing occurrence.

**NOTE:** Subcontractor's Designated Competent Person shall be familiar with OSHA Excavation Laws and have the authority to stop work in the excavation at any time.

All excavations 4' deep or more shall require a means of egress every 25'. This means of egress may be a ladder, stairways or ramp.

In excavations which employees may be required to enter, excavated or other material shall be kept back at least 2 feet from the edge of the excavation.

Water shall not be allowed to accumulate in an excavation. Diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering an excavation and to provide adequate drainage of the area adjacent to the excavation.

Adequate physical barrier protection shall be provided at all remotely located excavations into which persons may fall and not be able to climb out because of steepness of sides. Wells, pits, shafts, etc., shall be barricaded or covered.



Walkways and ramps over excavations shall be constructed of 2 inch planking, or equivalent, on strong stringers, with guardrails on both sides.

If it is necessary to place or operate excavating machinery or trucks on a level above and near an excavation, the side of the excavation shall be sheet-piled or shored, and braced as necessary to resist the extra pressure of such superimposed loads.

When mobile equipment is used or allowed adjacent to excavations, substantial stop logs or barricades shall be installed.

Sides of trenches more than 4 feet deep shall be shored or sloped back to the angles of repose. Portable trench boxes or sliding trench shields may be used for the protection of employees in lieu of shoring or sloping. They shall be designed and constructed to provide protection equal to or greater than shoring required for the trench.

Open excavations in the public way shall be securely covered over with 2" planking, or 3/4 plywood or its equivalent, or guarded on all open sides with a standard guardrail during non-working hours.

All pits, shafts, or steep sided excavations shall be covered with 2" planking or 3/4" plywood, or its equivalent or guarded with a standard handrail on all open sides during non-working hours.

### ***Protection From Live Systems***

Prior to any work, that may accidentally interrupt live systems, (mechanical, electrical, sewerage, hydraulic, pneumatic, etc.); the subcontractor shall review and coordinate the work with the representative utility company, authority or Local Municipal Agency and with trades doing the work. Proper safeguards shall be implemented as required to prevent accidental interruption of such systems. Work requiring review and safeguards may include demolition and any blind penetration of floors, walls and ceilings.

All live systems whether they are mechanical, electrical, sewerage, hydraulic, pneumatic, etc. shall be properly identified and location verified. In the event these systems may have to be temporarily shut down, the authorized representative from the utility company or Local Municipal Agency shall shut the system and when necessary, reactivate it.

### ***General Notes***

For all excavations of trenches, which will exceed a depth of four feet, the Subcontractor's trench safety procedures shall meet the current standards established by OSHA on excavations, trenching, and shoring, all of which are incorporated herein by reference.

If details shown are not feasible due to unanticipated conditions, the Subcontractor shall notify the



Trench Safety Engineer for re-evaluation. These drawings assume all excavated areas remain free of water seepage or intrusion. Excavations shall be inspected after every storm or other hazard increasing occurrence to assure the continued safety of the trench. The Subcontractor shall seek guidance from the Trench Safety Engineer where needed.

When installing a support system, shoring will be applied by starting at the top of the trench excavation and working downward. All crossbeams, trench jacks, etc., will be placed in a true horizontal position. Support system removal shall begin at the bottom and proceed upward, performed from outside the trench.

Materials used for sheeting, sheet-piling, bracing, shoring, etc., shall be in good serviceable condition. Timbers used shall be sound and free from large or loose knots, shall be designed, and installed so to be effective to the bottom of the excavation.

Alternate design for use of steeper slopes or the use of supporting systems, i.e., piling, cribbing, shoring, etc., may be submitted by the Subcontractor for evaluation by the competent person.

Slopes shown shall be the maximum unless changed by the Trench Safety Plan from Subcontractor due to changing soil conditions. Slopes shown are for a short-term period, if excavations are open for more than 24 hours, the Trench Safety Plan from subcontractor shall be reevaluated.

Type "A" soil is a cohesive soil with an unconfined compressive strength greater than 3,000 psf. Type "B" soil is a cohesive soil with an unconfined compressive strength greater than 1,000 psf. and less than 3,000 psf. Type "C" soil is a cohesive soil with an unconfined compressive strength less than 1,000 psf., that is not flowing or submerged.

## **IMPORTANT NOTE**

**OSHA in Connecticut DOES NOT recognize any other soil; type except type C Even if its solid rock and had to be blasted it must be treated as if it is type C Soil.**

## Chapter 10 Fire Safety

### *Introduction*

Policy and planning for fire safety at O,R&L takes into account the special fire hazards for specific operating areas, the protection of high-value property, and the safety of employees. These ends are met by: \*Non-combustible or fire-rated materials and construction practices suitable to the assigned uses of the building and facilities. \*Alarm systems and automatic extinguishing systems. \*Availability of suitable hand extinguishers and local hose lines for use before firefighters arrive. \*Access to the professional fire department, always staffed and trained in the control of emergencies that could occur at the project site. (The Fire Department makes the initial response to all requests for emergency aid received on the emergency telephone number, 911). This chapter covers the fire safety responsibilities of employees and supervisors, and sets forth the fire safety rules and procedures.

### *Fire Department*

The local Fire Department is responsible for protecting people and property from fires, explosions, and other hazards through prevention and expeditious control of such events. In addition, the Fire Department provided first-response rescue and transportation services in medical emergencies.

The Fire Department's inspection staff is responsible for ensuring company-wide compliance with fire safety and protection requirements and for reviewing all plans and procedures for compliance with these requirements; for inspecting and testing automatic fire protection and alarm systems and ensuring their maintenance and repair; for conducting fire safety and protection inspections; and for providing fire prevention recommendations. Other responsibilities include training employees in fire safety equipment, practices, and procedures.

All these fire protection and response functions are performed in conformance with OSHA regulations, State law, O,R&L policies, and nationally recognized standards and guidelines for fire and life safety. The Fire Chief and the Fire Marshall have the authority to enforce applicable requirements of the Uniform Building Code; the Uniform Fire Code; National Fire Protection Association Codes (including the Life Safety Code), Standards, and the Recommended Practices; and the fire protection provisions of OSHA Orders.

All employees must immediately report fires, smoke, or potential fire hazards to the Fire Department by dialing 911.

All employees must conduct their operations in such a way as to minimize the possibility of fire. This means applying rules such as keeping combustibles separated from ignition sources, being careful about smoking, and avoiding needless accumulations of combustible materials. Superintendents are responsible for keeping their operating areas safe from fire.

The Responsible Safety Officer and the Fire Department will provide guidance and construction criteria with respect to fire and life safety as well as inspections. The provision and maintenance of fire detection systems and both automatic and manual fire extinguishing equipment is the responsibility of the Responsible Safety Officer. But the superintendent, who best knows the day-to-day nature of his/her operations, is responsible for notifying the Responsible Safety Officer of operations that change the degree of fire risk and will therefore require a change in the planned fire protection provisions.

### ***Superintendent Responsibilities***

Superintendents must ensure that their personnel are properly instructed regarding potential fire hazards involved in their work and around their workplaces, the proper precautions to minimize fires, and the procedures in case of fire. The local Fire Department and Responsible Safety Officer also offer formal courses and training materials on fire prevention and response: \* Fire Safety \* Fire-Extinguisher Operation \* Self-Contained Breathing Apparatus

### ***Class A Combustibles***

Class A combustibles are common materials such as wood, paper, cloth, rubber, plastics, etc. Fires in any of these fuels can be extinguished with water as well as other agents specified for Class A fires. They are the most common fuels to be found in non-specialized operating areas of the work place such as offices.

Safe handling of Class A combustibles means:

Disposing of waste daily.

Keeping work area clean and free of fuel paths, which can spread a fire once started.

Keeping combustibles away from accidental ignition sources such as hot plates, soldering irons, or other heat or spark-producing devices.

Keeping all rubbish, trash or other waste in metal or metal-lined receptacles with tight-fitting covers when in or adjacent to buildings. (Exception: wastebaskets of metal or of other material and design approved for such use, which are emptied each day, need not be covered.)

Using safe ash trays for disposal of smoking materials and making sure that the contents are extinguished and cold to the touch before emptying them into a safe receptacle.

Planning the use of combustibles in any operation so that excessive amounts need not be stored. Storing paper stock in metal cabinets and rags in metal bins with automatically closing lids.

Making frequent inspections and checks for noncompliance with these rules in order to catch fires in the potential stage.

## *Class B Combustibles*

Class B combustibles are flammable and combustible liquids (including oils, greases, tars, oil-base paints, lacquers) and flammable gases. Flammable aerosols (spray cans) are treated here. Cryogenic and pressurized flammable gases are treated elsewhere in this manual.

The use of water to extinguish Class B fires (by other than trained firefighters) can cause the burning liquid to spread carrying the fire with it. Flammable-liquid fires are usually best extinguished by excluding the air around the burning liquid. Generally, this is accomplished by using one of several approved types of fire-extinguishing agents, such as the following:

Carbon dioxide

ABC multipurpose dry chemical

Halon 1301 (used in built-in, total flood systems)

Halon 1211 (used in portable extinguishers)

Fires involving flammable gases are usually controlled by eliminating the source of fuel, i.e., closing a valve.

Technically, flammable and combustible liquids do not burn. However, under appropriate conditions, they generate sufficient quantities of vapors to form ignitable vapor-air mixtures. As a general rule, the lower the flash point of a liquid, the greater the fire and explosion hazard. It should be noted that many flammable and combustible liquids also pose health hazards.

**NOTE:** The flash point of a liquid is the minimum temperature at which it gives off sufficient vapor to form an ignitable mixture with the air near the surface of the liquid or within the vessel used.

It is the responsibility of the user to ensure that all Class B combustibles are properly identified, labeled, handled, and stored. If assistance is required, contact the Responsible Safety Officer. Safe handling of Class B combustibles means:

Using only approved containers, tanks, equipment, and apparatus for the storage, handling and use of Class B combustibles.

Making sure that all containers are conspicuously and accurately labeled as to their contents.

Dispensing liquids from tanks, drums, barrels, or similar containers only through approved pumps taking suction from the top or through approved self-closing valves or faucets.

Storing, handling, and using Class B combustibles only in approved locations, where vapors

cannot reach any source of ignition, including heating equipment, electrical equipment, oven flame, mechanical or electrical sparks, etc.

Never cleaning with flammable liquids within a building except in a closed machine approved for the purpose.

Never storing, handling, or using Class B combustibles in or near exits, stairways, or other areas normally used for egress.

In rooms or buildings, storing flammable liquids in excess of 10 gallons in approved storage cabinets or special rooms approved for the purpose.

Knowing the locations of the nearest portable fire extinguishers rated for Class B fires and how to use them.

Never smoking, welding, cutting, grinding, using an open flame or unsafe electrical appliances or equipment, or otherwise creating heat that could ignite vapors near any Class B combustibles.

### ***Electrical Fires***

There are many combustible materials, including electrical equipment, oxidizing chemicals, fast-reacting or explosive compounds, and flammable metals, which present specialized fire safety and extinguishing problems.

Refer to the other appropriate chapters of this manual for safe handling advice. If in doubt, request advice from the Responsible Safety Officer.

### ***Welding and Other Permits***

As part of the local Fire Department's program to control and reduce fire hazards, a permit system is in effect to cover welding, burning, or other operations with a high fire hazard.

Typically, operations that require a permit are:

Welding (arc, oxyacetylene, or heliarc) Soldering (which requires an open flame)

Use of a torch (for cutting, bending, forming, etc.)

Use of tar pots (for road work or roofing, etc.)

Open fires for any purpose

Spray painting



To obtain additional information or to request a permit for these operations, call the Responsible Safety Officer.

The use of these devices, whether privately or company owned, is allowed only where there is no chance of causing injury to personnel or of creating a fire hazard. This provision obviously required common sense in safely locating such devices and ensuring that they do not operate when they are unattended. These devices may not be used in locations where:

Flammable or explosive vapors or dusts may be present.

Smoking, eating or drinking are prohibited because toxic or radioactive materials may be present.

The area has been designated as unsafe for such devices.

The following practices should be carried out when operating portable heating appliances:

Do not place the appliance on unstable or readily combustible materials.

Maintain a clearance of at least 12 inches between the appliance and combustible materials.

Ensure that the appliance is approved by either Underwriters Laboratories, Inc., or Factory Mutual Research Corporation.

Connect the appliance directly to a proper electrical outlet using only the cord with which it was originally equipped. Do not use extension cords in lieu of permanent wiring.

Do not operate appliances during off hours if they are unattended unless they are controlled by a timer installed by an O,R&L electrician. The timer will automatically de-energize the appliance during off hours and energize it not more than 30 minutes before the arrival of personnel. If 24 hour operation is desirable, the proposed operation and arrangement must be reviewed by the local Fire Department and a permit obtained. This permit must be posted near the operation appliance for the information of off-shift personnel who may be checking the area.

### ***Portable Fire Extinguishers***

Fire extinguishers, rated not less than 2A, shall be provided for each 3000 feet of the protected building area, or major fraction thereof. Travel distance from any point of the protected area to the nearest fire extinguisher shall not exceed 100 feet. ABC fire extinguishers should be used wherever possible.

### ***Fire Detectors***

Several types of automatic fire detectors are used throughout O,R&L, according to particular needs and purposes. All of them will detect fire (by one of several means) and transmit an alarm to the



fire station. In the many buildings equipped with evacuation alarm bells, the automatic detectors activate those alarms, as do the manual pull boxes. In some cases, automatic extinguishing systems are activated by automatic detectors. The Fire Department always dispatches fire fighters and apparatus to the scene of any automatically actuated alarm.

### *Sprinkler Systems*

Many buildings are provided with automatic sprinkler systems. The sprinkler heads contain a fusible element (most commonly fused at 212 degrees F) which, on melting, opens the head and starts a spray of water. The resulting flow of water in the piping activates an alarm at the fire station, and fire fighters are dispatched.

Automatic sprinkler heads can be damaged if they are subjected to mechanical abuse. A protective cage should be installed where such damage is possible. Heat inadvertently applied to the sprinkler head can also activate the sprinkler when no actual fire is present. Normal heat sources should therefore be kept away from sprinkler heads. To avoid decreasing the flow or spread of water or alerting the spray pattern, do not allow material or furniture to be located too near the sprinkler head.

Allow at least 18 inches of clearance around sprinkler heads.

Sprinkler system control valves must be kept accessible for Fire Department use. Allow at least 3 feet of clearance (enough for a man to pass through easily) around such valves.

### *Alarm System*

In most buildings, evacuation alarm bells are automatically activated when fire is detected. They can also be activated manually at strategically located pull boxes. The emergency actions of personnel and the evacuation procedures for each building or operation area are usually set forth in the operational safety procedures for each building and posted near the main entrance or fire exit or elevator. Never use the elevator in case of a fire.

### *Fire Doors*

Automatic fire doors and dampers are provided at strategic points to close and block the spread of smoke and fire when these are sensed by automatic detectors. Automatic fire doors must never be blocked or left in disrepair so that they cannot close and latch automatically as intended in the event of a fire.

Self-closing fire doors are those doors designed and installed to close each time after being opened. They too must never be blocked, wedged, or tied open. If such doors must be kept open, the self-closers must be replaced with approved automatic smoke-activated release hold-open devices.

### *Mechanical Equipment Rooms*

Mechanical equipment rooms contain boilers, blowers, compressors, filters, electrical equipment, etc. Such rooms must be separated from other areas of a building by fire-resistant walls and doors. To maintain the integrity of these separations, the fire doors must never be left open.

Fan rooms house ventilation equipment which often includes automatic shut down and dampers activated by interlocking with the building smoke and fire detectors. Fire dampers and other automatic shut-down provisions must not be disabled without Fire Department approval (as for temporary maintenance procedures).

Mechanical equipment rooms and fan rooms must not be used for storage of any kind.

### ***Construction Areas***

Construction areas under control of either O,R&L or outside contractors must be maintained in a fire-safe condition and accessible to emergency response forces.

### ***Life Safety Code***

The Life Safety Code of the national Fire Protection Association, NFPA 101, requires that emergency lighting be provided for means of egress in certain areas.

The code states emergency lighting is required in exit corridors in any office-type building where the building is two or more stories in height above the level of exit discharge.

In industrial occupancies such as laboratories and shops, the Code requires emergency lighting in all exit aisles, corridors, and passage ways. Emergency lighting may be installed in areas where not required by the Code when such areas present an egress hazard during a power failure.

Although elevators are not considered a means of egress within the jurisdiction of the Life Safety Code, They do require emergency lighting. (Titles 8 and 24 require that emergency lighting be maintained in an elevator for a period of at least four hours.)

Several types of emergency lights that satisfy the specifications of the Life Safety Code are:

**Battery Type** – Only rechargeable batteries may be used. The rating of the battery must be such that it provides power for illumination for once and one-half hours in the event of a failure of normal lighting.

**Generator Type** – When emergency lighting is provided by an electric generator, a delay of not more than 10 seconds is permitted.

Exit sign lights, when burned out, should be reported to Maintenance for service.

### ***Exit Corridors***

Exit corridors must not be used for storage. The Life Safety Code, NFPA 101, requires that the buildings designed for human occupancy must have continuous and unobstructed exits to permit prompt evacuation of the occupants and allow necessary access for responding emergency personnel. The intent of the Code is to keep exits free from obstructions and clear of combustible materials. Attention to housekeeping, therefore, is very important. “Temporary” storage of furniture, equipment, supplies, or anything else is not permitted in exit ways. Combustibles, including recyclable waste paper, are not permitted in exit ways.

Metal lockers with ends and tops ferried to walls and that do not interfere with minimum exit width requirements may be installed in exit corridors when approved by the Fire Department and the Responsible Safety Officer.

The following requirements must be met for storage locker/cabinets:

Cabinets will be permitted on one side of the corridor only.

Cabinets must end at least 6ft from the corridor exit door.

Cabinet ends must be at least 12in. from the edge of the doorway on the latch side and from the edge of the door leaf when fully opened into the corridor.

The cabinets must be all metal construction with positive latches to prevent spillage of contents in the event of an earthquake.

All doors must return automatically to the closed position when not held open manually.

A 45 degree-angle fairing must be provided from the wall to the corridor corner of the cabinet. Fairing must be provided at both ends of cabinet or bank of cabinets. A 45 degree-angle fairing must be provided at the top of the cabinets from the outside corridor edge of cabinet to the wall.

All cabinets must be anchored to the wall firmly enough to withstand .5g of lateral acceleration (or a lateral load equal to ½ the total dead weight of the cabinet and its contents) in the event of an earthquake.

Liquids and chemicals are not to be stored in corridor lockers.

All cabinets must be kept locked, with only key being retained by the building Manager.

All cabinets must be labeled with the contents and the name, address, and telephone number of the assigned user.

Any deviation from the above requirements must be approved by Responsible Safety Officer.



## No Smoking

Smoking is forbidden in certain areas for the fire safety reasons. Such areas include the following:

Where flammable gases or liquids are stored, handled, or used.

Where significant quantities of combustible materials, such as paper, wood, cardboard, or plastics are stored, handled, or used.

Where liquid- or gaseous-oxygen is stored, handled, or used.
















Within 20 ft of a smoke detector.

In tape and record storage vaults and computer equipment areas.

All O,R&L construction sites are “No Smoking” sites. There are no exceptions to this rule.

\*Ref. OSHA 1926.50

TABLE F-1—FIRE EXTINGUISHERS DATA

	WATER TYPE				FOAM	CARBON DIOXIDE	DRY CHEMICAL			
							SODIUM OR POTASSIUM BICARBONATE		MULTI-PURPOSE ABC	
										
	STORED PRESSURE	CARTRIDGE OPERATED	WATER PUMP TANK	SODA ACID	FOAM	CO <sub>2</sub>	CARTRIDGE OPERATED	STORED PRESSURE	STORED PRESSURE	CARTRIDGE OPERATED
<b>CLASS A FIRES</b> WOOD, PAPER, TRASH HAVING GLOWING EMBERS 	YES	YES	YES	YES	YES	NO <small>(But will control small surface fires)</small>	NO <small>(But will control small surface fires)</small>	NO <small>(But will control small surface fires)</small>	YES	YES
<b>CLASS B FIRES</b> FLAMMABLE LIQUIDS, GASOLINE, OIL, PAINTS, GREASE, ETC. 	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES
<b>CLASS C FIRES</b> ELECTRICAL EQUIPMENT 	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES
<b>CLASS D FIRES</b> COMBUSTIBLE METALS 	SPECIAL EXTINGUISHING AGENTS APPROVED BY RECOGNIZED TESTING LABORATORIES									
METHOD OF OPERATION	PULL PIN-SQUEEZE HANDLE	TURN UPSIDE DOWN AND BUMP	PUMP HANDLE	TURN UPSIDE DOWN	TURN UPSIDE DOWN	PULL PIN-SQUEEZE LEVER	RUPTURE CARTRIDGE SQUEEZE LEVER	PULL PIN-SQUEEZE HANDLE	PULL PIN-SQUEEZE HANDLE	RUPTURE CARTRIDGE SQUEEZE LEVER
RANGE	30'-40'	30'-40'	30'-40'	30'-40'	20'-40'	2'-8'	5'-20'	5'-20'	5'-20'	5'-20'
MAINTENANCE	CHECK AIR PRESSURE GAUGE MONTHLY	WEIGH GAS CARTRIDGE ADD WATER IF REQUIRED ANNUALLY	DISCHARGE AND FILL WITH WATER ANNUALLY	DISCHARGE ANNUALLY—RECHARGE	DISCHARGE ANNUALLY—RECHARGE	WEIGH SEMI-ANNUALLY	WEIGH GAS CARTRIDGE—CHECK CONDITION OF DRY CHEMICAL ANNUALLY	CHECK PRESSURE GAUGE AND CONDITION OF DRY CHEMICAL ANNUALLY	CHECK PRESSURE GAUGE AND CONDITION OF DRY CHEMICAL ANNUALLY	WEIGH GAS CARTRIDGE—CHECK CONDITION OF DRY CHEMICAL ANNUALLY

## Chapter 11 Gases

### *Introduction*

This chapter contains guidelines and requirements for the safe use of flammable and/or compressed gases. It covers the use of flammable-gas piping systems, high-pressure gas cylinders, manifolded cylinders, and compressed air.

### *Hazards*

All gases must be used in a manner that will not endanger personnel or property in routine shop use or experimental operations. Hazards associated with handling and use of flammable and/or high-pressure gases including the following:

Injuries caused by flying objects accelerated by an explosion or pressure release;

Almost certain death if a flammable mixture is inhaled and then ignited; Asphyxiation;

Secondary accidents such as falls or electrical shocks;

Fire caused by ignition of flammable gases;

### *Relief Valves Required*

All systems, system components, and piping subject to over-pressures must be equipped with relief devices.

### *Operational Safety Procedures*

Equipment containing highly toxic gases requires an Operational Safety Procedure (OSP) and must comply with the requirements described in the chapters on chemical safety. If you are in doubt as to the hazards, toxicity, or safe operating practices for any gases, consult the Responsible Safety Officer.

### *Fire Risk*

Fire requires three elements: fuel, oxygen, and ignition. Any experiment or routine operation that places a flammable gas in the presence of an oxidant (air, oxygen) and an ignition source (spark, flame, high temperature) is extremely dangerous. To reduce the risk of fire, eliminate two of these three elements.

Thus, when using flammable gases, (1) eliminate ignition sources and (2) prevent mixing of fuel with air or oxygen. Contain or vent fuel.

Pyrophoric substances, which are materials that ignite spontaneously when exposed to air, require even more care. Minimize the use of oxygen in high concentration. Materials not normally considered combustible burn violently in high-oxygen atmospheres. Therefore, special precautions must be taken when working with high-oxygen concentrations.

## *Guidelines*

All personnel authorized to work with flammable gases must be familiar with the hazards and emergency measures that might be required in the event of an accident. For safe operations the following safety guidelines must be observed: A piping (schematic) diagram of the apparatus and an operating procedure that includes safety considerations and emergency instructions must be developed, and the installed piping must be inspected to ensure that it is installed as shown on the piping diagram. Only personnel authorized to work on the experiment are allowed in the operating area. Appropriate warning devices and signs, such as “Danger-Hydrogen” and “No Smoking and Open Flames,” must be posted on or near the work area and at the doors to the operating area. Flammable gas shutoff valves must be located outside flammable gas operating areas. Good housekeeping practices must be observed; unnecessary combustible material must be kept out of flammable gas operating areas. Flammable gas shutoff valves must be located outside flammable gas operating areas. Only the flammable gas cylinders actually required for the experiment are allowed in the operation area. Extra cylinders containing flammable gas are used inside a room or other confined area, and are connected to a common manifold, the regulators must be modified. The existing relief valves on the regulator must be replaced with two special relief valves connected to a metal vent line that terminates outside and above the building. Likewise, when the building occupancy is rated H7, as defined in the Uniform Building Code, all flammable gas regulators must have their relief valves vented to a vent line that terminates outside and above the building.

All ignition sources, e.g., welding torches, lit cigarettes, electric arcs, electrostatic charges, and pilot lights, must be kept away from flammable gases at all times.

Ventilation must be provided to prevent entrapment of flammable gases in closed areas. If the gas is lighter than air, overhead ventilation is required. Gases denser than air must be prevented from entering trenches and manholes where they can collect and form explosive mixtures with air.

Cracking a hydrogen gas cylinder valve before attaching the regulator is not recommended since the gas may be ignited by static charge or friction heating. Closing the valve stops the flame immediately.

Never use a flame to detect flammable gas leaks. Use soapy water or use other approved methods.

If a flammable gas cylinder is discovered with a small leak and the gas has not ignited, the cylinder must be moved carefully to a safe outside area. If the leak is serious or the gas has ignited, evacuate the area and call the O,R&L security department and the local Fire Department.

## *Hydrogen*

Hydrogen is a colorless, odorless, non-toxic, and highly flammable gas. It is the lightest gas, being only 0.07 times the density of air and having a rate of diffusion 3.8 times faster than air, which allows it to fill a confined space rapidly. The danger hydrogen poses is evident from its wide range of flammable mixtures: 4% to 75% in air and 4% to 94% in oxygen. Hydrogen-air mixtures can be ignited by an extremely low energy input, 0.02 millijoules, which is only 10% of the energy required to ignite a gasoline-air mixture. High pressure hydrogen leaks will usually ignite as a result of the static electricity generated by the escaping gas. The ignition temperature of hydrogen is 932 degrees F, its flame velocity is 270cm/sec (almost 10 times the velocity of a natural-gas flame), and it burns with a virtually colorless (invisible) flame at 3713 degrees F. If ignited, unconfined hydrogen and air mixtures will burn or explode depending on how close the mixture is to being stoichiometric. Confined mixtures may detonate (burn at sonic velocity) depending upon the mixture and the geometry of the confined space. Hydrogen is not toxic but can cause asphyxiation. See NFPA 50A, Standard for Gaseous Hydrogen Systems at Consumer Sites.

## *Oxygen*

Oxygen supports combustion but is itself nonflammable. Oxygen lowers the ignition point (in air) of flammable substances and causes them to burn more vigorously. Materials such as oil and grease burn with nearly explosive violence in oxygen, even in minute quantities. Therefore, oxygen cylinders must not be handled with greasy or oily hands or gloves and must not be stored near highly combustible materials such as oil, grease, or reserve acetylene. Oxygen must never be used to purge lines, to operate pneumatic tools, or to dust clothing- cloth, plastics, etc., saturated with oxygen burn explosively. Accordingly, oxygen cylinders must never be used as hat racks, clothes hangers, etc., since leaky fittings can result in accumulations of gas in the covering material.

Insects in oxygen “pigtailed” can ignite spontaneously and may cause sufficient heat and over-pressure to burst the pigtail, valve or manifold: don’t leave pigtailed disconnected for more than a few minutes.

Do not use white lead, oil, grease, or any other non-approved joint compound for dealing oxygen-system fittings. Threaded connections in oxygen piping must be sealed with joint compounds or Teflon tape approved for oxygen service. Litharge and water is recommended for service pressures above 300 psig (2.0 MPa). Gaskets must be made of non-combustible materials.

When high pressure oxygen cylinders are stored inside a building, they must be separated from flammable gas cylinders by at least 20 feet or by a fire-resistive partition.

## *Acetylene*



Acetylene is used principally with welding and cutting torches. Commercial acetylene gas is colorless and highly flammable with a distinctive garlic-like odor. Acetylene, in its free state under pressure, may decompose violently – the higher the pressure, the smaller the initial force required to cause an explosion. Therefore, acetylene is stored in acetone, which dissolves 300 times its volume of acetylene. Acetylene cylinders are filled with a porous filler material that holds the acetone. The combination of filler and acetone allows acetylene to be contained in cylinders at moderate pressures without danger of explosive decomposition. Full cylinder pressure is 250 psig at 70 degrees F.

**CAUTION:** when acetylene is withdrawn from its cylinder too rapidly, the gas cannot come out of solution fast enough, the downstream pressure drops, and the liquid acetone is thrown out of the cylinder and may limit the flow of the pressure reducing regulator.

**The following precautions are recommended when working with acetylene:**

To prevent flashbacks check valves are required in welding gas lines and at the welding/cutting torch. If the acetylene pressure drops, the oxygen pressure at the torch can push oxygen back up the acetylene line, where it can mix with acetylene and cause a flashback.

Copper must not be used in acetylene piping - copper forms an impact-sensitive copper acetylide.

NEVER use free acetylene gas outside the cylinder at pressures over 15 psig (30psia) – it can decompose violently.

Acetylene cylinders should be used or store only in an upright position to avoid the possibility of acetone leaking from the cylinder. If an acetone cylinder has been stored horizontally, the cylinder should be put upright and left in that position for about 30 minutes before being used.

When cylinders are empty of acetylene, valves must be closed to prevent evaporation of the acetone.

Acetylene cylinders may be filled only by the supplier.

### *Cylinders*

Only cylinders meeting Department of Transportation (DOT) regulations may be used for transporting compressed gases. Each cylinder must bear the required label for the compressed gas contained, except under certain specified conditions set forth in DOT regulations.

It is illegal to remove or to change the prescribed numbers or other markings on the cylinders- do not deface, cover, or remove any markings, labels, decals or tags applied or attached to the cylinder by the supplier. Each cylinder in use at O,R&L must carry a legible label or stencil identifying the



contents. Do not repaint cylinders unless authorized by the superintendent.

Compressed-gas containers must not contain gases capable of combining chemically, nor should the gas service be changed without approval by Responsible Safety Officer.

The cylinder-valve outlet connections on cylinders containing gas mixtures are provided by the gas supplier, based on the physical and chemical characteristics of the gases.

Gas mixtures having a flammable component must have a cylinder-valve outlet connection with left handed threads, even though the gas mixture is nonflammable, unless Responsible Safety Officer has authorized otherwise.

Regulators, gauges, hoses, and other appliances provided for use with a particular gas or group of gases must not be used on cylinders containing gases having different chemical properties unless information obtained from the supplier indicates that this is safe.

Gases must not be mixed at O,R&L sites in commercial DOT cylinders and must not be transferred from one DOT cylinder to another. Gases mixed at O,R&L must never be put into an O,R&L or vendor-owned compressed gas cylinder.

Vendor-owned cylinders must not be used for any purpose other than as a source of vendor supplied gas. Only the vendor may pressurize these cylinders.

It is illegal to transport a leaking cylinder (charged or partially charged) by common or contract carrier.

### ***Compressed Gases***

Compressed gases over (150 psig) are usually stored in steel cylinders manufactured according to DOT specifications. When the DOT was formed in 1969, it acquired responsibility for cylinder specifications, formerly issued by ICC. DOT regulations require the following markings on all cylinders:

Type of cylinder and pressure rating  
Serial number  
Inspection date

For example:

DOT3 AA2065 973487 6/70

DOT3 AA indicates DOT specification 3AA, which is a seamless alloy-steel cylinder of definite prescribed steel, not over 1000-lb water capacity, with at least 150-psi service pressure; 2065 is the service pressure at 70 degrees F. and the maximum refill pressure; 973487 is the manufacturer's

serial number; and 6/70 is the date of the initial qualifying test.

Old cylinders (made before 1970) will have “ICC” in the markings, whereas cylinders manufactured after 1970 will be marked “DOT”. The other identification markings are unchanged.

O,R&L owns cylinders for most of the common industrial gases and uses its own content identification color code. For non-Company-owned cylinders, which may, or may not, have a non-Company color code, the name of the gas painted on each cylinder, rather than the color code, should be used to identify the contents.

Mixed gas cylinders must be marked with an adhesive label placed on the shoulder of the cylinder. The label must contain a RED diamond for flammable gas or a GREEN diamond for nonflammable gas. The percentage of each gas component must be marked on the label and on a tag attached to the valve by the supplier. In addition, a circumferential white stripe must be painted near the shoulder of the cylinder to indicate mixed gas.

### ***Inspections***

All compressed gas cylinders, hoses, tubing and manifolds must be inspected frequently to ensure that they are free of defects that could cause a failure. Cylinders must be considered defective and rejected (or removed from service) if a valve is stiff, or a fitting leaks or if they contain dents, cuts, gouges, digs over 3 “ long, leaks (of any size) fire damage , or valve damage. All defective cylinders (O,R&L- or vendor owned) must be sent back to the manufacturer or vendor for test and repair. Hoses and fittings that appear worn must be replaced before the equipment is put to further use.

All standard size single compressed gas cylinders (200scf) that are used only at O,R&L, such as in fixed tube banks, must be pressure tested to 5/3 (1.67) of their DOT service pressure every 6 years.

### ***Cylinder Handling***

Compressed gases should be handled by experienced and properly instructed personnel. When in doubt about the proper handling of a compressed gas cylinder or its contents, consult Responsible Safety Officer.

Compressed gas cylinders are dangerous when handled incorrectly. Always assume that a cylinder is pressurized. Handle it carefully. Never throw, bang, tilt, drag, slide, roll or drop a cylinder from a truck bed or other raised surface. If a cylinder must be lifted manually, at least 2 people must do the lifting.

Because of their shape, smooth surface, and weight, gas cylinders are difficult to move by hand. A truck or an approved cylinder handcart must always be used to move a cylinder. Cylinders must be fastened in a metal cradles or skid boxes before they are raised with cranes, forklifts, or hoists.

Rope or chain lifting slings alone must not be used.

Cylinders, even empty ones, must never be used as rollers for moving materials, as work supports, etc.

If damaged, a cylinder can cause severe injuries, including lung damage from inhalation of toxic contents and physical trauma from explosion. A pressurized gas cylinder can become a dangerous projectile if its valve is broken off.

When a cylinder is not connected to a pressure regulator or manifold, or is otherwise not in use, it is extremely important that the cylinder valve be kept closed and the safety cap be kept in place - the cap protects the cylinder valve (do not lift cylinders by their caps). Notify the Responsible Safety Officer, giving details and serial number, if you believe that a foreign substance may have entered the cylinder or valve.

Cylinders containing compressed gases should not be subjected to a temperature above 125 degrees F. Flames, sparks, molten metal, or slag must never come in contact with any part of a compressed gas cylinder, pressure apparatus, hoses, etc. Do not place cylinders where they might become part of an electric circuit. When cylinders are used in conjunction with electric welding, ensure that the cylinders cannot be accidentally grounded and burned by the electric welding arc.

Cylinders must not be subjected to artificially low temperatures. Many ferrous metals become extremely brittle at low temperatures. The loss of ductility and thermal stress at low temperature may cause a steel cylinder to rupture.

Never attempt to repair, alter, or tamper with cylinders, valves, or safety relief devices.

### ***Working With Gases***

Always identify the contents of a gas cylinder before using it. If a cylinder is not clearly labeled, return it to the Responsible Safety Officer.

Before using a cylinder, be sure it is properly supported with two metal chains or the equivalent to prevent it from falling. Contamination of compressed gas cylinders by feedback of process materials must always be prevented by installation of suitable traps or check valves.

Suitable pressure-regulating devices and relief devices must always be used when gas is admitted to systems having pressure limitations lower than the cylinder pressure.

Gas cylinder valves can be “cracked” (opened slightly) momentarily before regulators are attached to blow dirt off the valve seats, but the valve outlet should always be pointed away from people or equipment. (Cracking the valve is not recommended with hydrogen because it can be ignited by static charge or friction.) After the regulator is securely attached to the cylinder valve, fully release (turn counter-clockwise) the pressure-adjusting screw of the regulator before opening the cylinder

valve. Open gas cylinder high pressure valves slowly; this gives compression heat time to dissipate and prevents “bumping” the gauges. Never use a wrench on any cylinder-valve hand wheel.

Keep removable keys or handles on valve spindles or stems while cylinders are in service. Never leave pressure in a system that is not being used. To shut down a system, close the cylinder valve and vent the pressure from the entire system. Equipment must not be disassembled while it is under pressure. Be aware that any valved -off portion of the system may still be under pressure; bleed the hose, line, or vessel before disassembly to ensure that there is not enough pressure energy stored in the trapped gas or in piping distortion to propel loose objects.

Connections to piping, regulators, and other appliances should always be kept tight to prevent leakage. Where hose is used, it should be kept in good condition.

Manifold pigtails should not be left disconnected for more than a few minutes. Certain insects are attracted to pure gases and will quickly clog these lines.

Never use compressed gas to dust off clothing; this may cause serious injury or create a fire hazard.

About 30psi gauge pressure (0.2 MPa) must be left in “empty” cylinders to prevent air from entering the cylinder and contaminating it; air contamination in a hydrogen cylinder is extremely dangerous.

Before a regulator is removed from the cylinder, close the cylinder valve and release all pressure from the regulator.

Before returning an empty cylinder, close the valve and replace the cylinder-valve protective cap and outlet cap or plug, if used.

### ***Cylinder Storage***

Cylinders not actively in use inside of buildings must be stored outside in areas approved by Responsible Safety Officer and must be fastened – with two metal chains or bars or in a fixture - to prevent them from falling if they are bumped or shaken, as during an earthquake.

When gases of different types are stored at the same location, cylinders must be grouped by types of gas, and the groups must be arranged in accordance with gases contained, e.g., flammable gases must not be stored near oxygen.

Charged cylinders and empty cylinders should be stored separately in an arrangement that permits removal of “old stock” (cylinders in storage the longest) with minimum handling of other cylinders.

Storage rooms or areas should be dry, cool, well ventilated, and, where practical, fire resistant; must have solid, level floors or storage surfaces; and must be away from traffic. Storage in sub-surface locations should be avoided. Cylinders must not be stored at temperatures above 125 degrees

F, or near radiators or other sources of heat, near sparking devices, or near salt or other corrosive chemicals. If stored outside, cylinders must be protected from continuous direct sunlight, extreme weather, or moisture.

### ***Superintendent Responsibilities***

Superintendents must make periodic surveys of regulators in their areas. Damaged, unreliable or otherwise defective regulators must be replaced immediately. All surplus regulators must be inspected, cleaned, adjusted and repaired, as required.

Immediately after its removal from a flammable, toxic and/or radioactive system, the entire regulator must be safely vented and purged. If in doubt about the hazard call the Responsible Safety Officer. Use only regulators of the approved type and design for the specific gas- and- cylinder combination to be employed. Ensure that threads and nipples (e.g. round, flat, conical) on regulators correspond to those on the cylinder-valve outlet (never force connections). Regulators with green-face gauges must be used only with oxygen.

Regulators designed for use on gas lines must not be used on gas cylinders; single-stage regulators are for use only up to 150psig (1.0 MPa) and must be used only for in-line installation.

Two-stage regulators for inert gases are equipped with two relief valves that protect the regulator diaphragms and gauges from excessive over- pressure. Relief valves on regulators for use with flammable, toxic, and/or radioactive gases must be vented to a safe location. The second stage of a two-stage regulator will normally be adjusted so that the low pressure output cannot exceed 67% of the highest reading on the low pressure output gauge; the low pressure output relief valve will be set to open at (or under) the highest reading on the low pressure output gauge. Users are cautioned that additional pressure-relief valves may be required to protect downstream equipment.

Single-stage cylinder regulators (except acetylene regulators) are equipped with a single relief device that is set to open at (or under) the highest reading on the output gauge. These regulators will be adjusted to limit the output pressure to 67% of the highest reading of the output gauge.

If piping and associated apparatus connected to the regulator discharge are rated at a pressure lower than the lowest possible setting of the low-pressure output relief valve on the regulator and, therefore, a leak in the regulator valve seat could cause damage to the connected apparatus, a separate relief valve must be installed in the downstream equipment to protect it from damage caused by over-pressurization.

### ***Diaphragm Failure***

Diaphragm failure permits the cylinder gas to escape to the surrounding atmosphere through holes in the regulator body. To reduce the probability of diaphragm failure, high pressure regulators are equipped with stainless steel diaphragms. Regulators for use with flammable and/or toxic gases can

be obtained with a bonnet fitting which allows the regulator to be vented.

### *Regulators, Vacuum Service*

If piping on the high- pressure side of a regulator is to be excavated through the regulator, it must be modified for vacuum service to prevent damage to the diaphragms and pressure gauges. Regulators modified for vacuum service must be so labeled.

### *Compressed Air*

Compressed air for general shop or laboratory use must be restricted to 30-psig (207-kPa) maximum pressure by restricting nozzles. Compressed air at pressures up to 100 psig (700-kPa) may be used to operate pneumatic tools, certain control instruments, and research equipment with properly designed over-pressure relief devices. Use of air-pressurized research equipment must be approved by the Responsible Safety Officer.

Building compressed air (house air) may be used to dry parts and to help accomplish many other jobs in the shop or laboratory, but always ensure that no one is in line with the air stream and always wear goggles or a face shield.

Compressed air must not be used for breathing unless it has been especially installed for this purpose and such use has been approved by Responsible Safety Officer.

Never apply air pressure to the body or use compressed air to clean clothing. Compressed air injected into the body openings can be fatal. Compressed air used to clean clothing drives particles into the fabric, where they can cause skin irritation and infections. Use a cloth brush.

Compressed air must not be used to transfer liquids from containers of unknown safe working pressure. A pressurized commercial drum of unknown pressure rating is a hazardous device; for example, a 55-gal (200liter) drum pressurized to 14.5 psig (100kPa) has a force on the drum head of about 3 tons. To transfer liquids use a pump or a siphon with a bulk aspirator. The transfer pressure for commercial- type liquid nitrogen dewars must be less than 14.5 psig. For most laboratory-type liquid nitrogen systems, transfer pressures of less than 5 psig are adequate. Compressed air must never be used for transferring liquid hydrogen or liquid helium.

When an automatic shut-off coupling is not used on air-operated tools, a short metal chain (or its equivalent) should be attached to the hose to prevent it from whipping in case it separates from the tool. When using an air-operated tool, shut off the compressed air and vent the hose before changing nozzles or fittings.

## Chapter 12 Mechanical Guarding Lock out/ Tag out

### *Introductions and Standards*

Mechanical guarding must encompass both the power transmission parts of all mechanical equipment and the points of operation on production machines.

Guards must be provided where rotational motion, nip points, and cutting, shearing, punching, and forming mechanisms can cause injury to personnel or damage to tools and equipment.

Mechanical guards must be designed or otherwise procured to meet the following specifications:

The guard must provide positive protection equal to that specified in ANSI B15.1.

The guard must be considered a permanent part of the machine or equipment, capable of being easily or quickly removed or replaced.

The guard must not interfere with efficient operation or maintenance of the machine or give discomfort to the operator.

The guard must not weaken the machine structure.

The guard must be designed for a specific job and a specific machine.

The guard must be durable, resistant to fire and corrosion, and easily repaired.

The guard must not present hazards, such as rough edges, splinters, pinch points, shear points, or sharp corners.

Methods of guarding that must be considered include the following:

Enclosing the operation (preferred)

Interlocking devices

Moving barriers

Removal devices

Remote Control

Two-handed tripping devices

Electronic safety devices



Machines designed for fixed locations must be securely anchored to the floor or bench to prevent walking or tipping. Employees may operate machinery only when properly trained and authorized to do so. Proper clothing and protective devices must be worn when specified by the supervisor or shop foreman.

**ELECTRICAL TAG OUT PROCEDURE** When you have to do maintenance work on a machine, take these four steps to protect yourself and your co-workers from injury:

1. De-energize the machine if possible. Positively disconnect the machine from the power source. If there is more than one source of power, then disconnect them all.
2. If possible, lock out all disconnect switches. You must be given a lock and a key for each disconnect before you begin working on the machine.
3. Tag all disconnect switches. Use the yellow or Red safety tags which state in large letters- **“Danger Do Not Operate”**, or **“Danger-Do Not Energize”** and gives the name of the individual who locked out the equipment, date and time. The tag must also state **“DO NOT REMOVE THIS TAG”** (except the person who placed the tag may remove it only after the machinery maintenance has been completed).
4. Test the equipment to insure it is de-energized before working on it. First, attempt to operate the equipment by turning on normally. Next check all electrical lines and exposed areas with test equipment or a “lamp”. Finally, short to ground any exposed connections using insulated grounding sticks. This test must be done even if the electrical connection is physically broken, such as pulling out a plug, because of the chance of discharging components. **A TAG OUT ONLY PROCEDURE MAY BE USED IF THE MACHINE CAN NOT BE LOCKED OUT. IF THE MACHINE IS SUPPLIED ELECTRICAL POWER FROM A SINGLE SOURCE, WHICH IS UNDER THE EXCLUSIVE CONTROL OF A TRAINED AND QUALIFIED REPAIR PERSON AT ALL TIMES AND THERE ARE NOT ANY OTHER PERSONS IN THE REPAIR AREA WHO COULD BE HARMED BY THE ACCIDENTAL ENERGIZING OF THE MACHINERY, THEN TAG OUT MAY BE USED INSTEAD OF LOCK OUT/TAG OUT.**

**Re-Energizing.** Many accidents occur at the moment of re-energizing. If the machinery is to be re-energized, all persons must be kept at a safe distance away from the machinery. The re-energization can be performed only by a person who either performed the lock out/tag out, a person acting under the immediate direction and commands of the original lock out/tag out person, or, in the event of a shift change, or other unavailability of the other person, then the original shall, before leaving, appoint a surrogate original person and show him or her all steps taken to lock out/tag out the equipment.



## ***O,R&L LOCKOUT-TAGOUT PROGRAM***

Serious accidents in the workplace can be caused by the uncontrolled release of hazardous energy (including electrical, mechanical, chemical, thermal, radioactive hydraulic or pneumatic energy or any combination of these.) Using the procedural steps in this document will help prevent injury to employees from the unexpected energizing or start- up of machinery, equipment, or systems or the release of stored hazardous energy.

Our program is based on 29 CFR 1910.147 which describe the Occupational Safety Health Administration (OSHA) minimum requirements for lockout/tagout procedures used for personnel protection.

The purpose of this program is to:

- Describe the procedural steps to be followed by the authorized employee, who must control the release of hazardous energy during servicing, maintenance, or modification of machinery equipment, or systems, and
- Present guidelines for the person who must prepare written lockout/tagout checklist

This document describes Owens, Renz & Lee (O,R&L) requirements for control of hazardous energy lockout/tagout for personnel protection. All employees and subcontractors must comply with these requirements.

Work on cord and plug connected electrical equipment that when unplugged contains no stored energy and cannot be unexpectedly energized or started up. In all cases, the plug must be under the exclusive control of the authorized employee performing the servicing, maintenance, or modification.

Work performed by journeyman electricians on, near or with conductors or equipment in electrical installations covered by specific requirements of 29 CFR 1910.

Installations under the exclusive control of electric utilities for the purpose of power generation, transmission, and distribution including related equipment for communication, control, or metering.

Hot-tap operations (welding a piece of equipment under pressure to install connections or accessories) involving transmission and distribution systems for gas, steam, water, or petroleum products if it is demonstrated that: (1) the continuity of services is essential, (2) shutdown of the system is impractical, and (3) there are documented procedural steps that use special equipment to provide proven protection for employees.

## Construction of New Facilities

### Procedural Steps

This section outlines the procedural steps that must be followed for locking and tagging out machines, equipment and systems before they are serviced, maintained, or modified and for restoring them to service.

### Determine if a Specific Written Lockout/Tagout Procedure is Required

You must check to see whether the seven conditions below are satisfied. If they are, a specific written lockout/tagout procedure is not required. You must follow the procedure on the back of the lockout/tagout record.

- The machine or equipment has no potential for stored or residual hazardous energy or the accumulation of stored hazardous energy after it is shut down.
- The machine has a single energy source that can be readily identified and isolated.
- The isolation and the lockout of the single energy source will completely de-energize and deactivate the machine or equipment.
- A single lockout device will lockout the machinery or equipment.
- The lockout device is under the exclusive control of the employee authorized to perform the service, maintenance or modification.
- The servicing, maintenance or modification does not create a hazard for other employees.
- The machine or equipment is isolated from the energy source and is locked out when service, maintenance, or modifications is being performed.

### Steps for Lockout/Tagout

- Prepare – When a written Lockout/Tagout procedure is required, an authorized employee must review it to understand the hazards involved and how to control them.
- Notify – An authorized employee must notify the building manager or the specific employee identified in the written Lockout/Tagout procedure that specific machinery, equipment or system in the area will be shut down and locked out.
- Shut Down – An authorized employee must shut down or ensure that the equipment, machinery, or system is/are shut down by using the normal stopping procedure.
- Isolate – An authorized employee must isolate the equipment, machinery, or system from

the energy source.

- Lockout/Tagout – The authorized employee must lock and tag out the energy-isolating device with locks and tags. A lock must always be accompanied by with a tag identifying contact name, company name, and phone number.
- Relieve or restrain stored hazardous energy – The authorized employee must relieve stored hazardous energy (such as energy in capacitors, springs, elevated machine members, rotating wheels, hydraulic systems by shorting, repositioning, blocking, bleeding down, or other appropriate action.
- Verify - The authorized employee must

Ensure that the equipment, machinery, or system is inoperable by using normal operating controls to attempt to start it;

After verifying the equipment is inoperable, perform all other required test to verify that isolation has been achieved and stored hazardous energy is relieved.

- Return all operating or control to neutral or off positions.

## Steps for Return to Service

The authorized employee must perform the following five steps to return the equipment, machinery, or systems to service. The steps must be followed for all written Lockout/Tagout procedures except those exempted.

- Check Equipment – The authorized employee must check the machine or equipment and the immediate area around it to ensure that nonessential items have been removed and the machinery, equipment, or systems are ready for safe operation.
- Check Work Area – The authorized employee must check the work area to ensure that all employees are safely positioned or removed from the area.
- Verify – the authorized employee must verify that the controls are in the neutral or off position.
- Remove Locks and Tags and Re-energize – the authorized employee who installed the locks and tags must remove them and may then re-energize the machine, equipment, or system.
- Notify - The authorized employee must notify the building manager or the specific employee identified in the written Lockout/Tagout procedure that the servicing maintenance, or modification is complete.



## **Temporary Removal of Locks and Tags for Testing or Positioning**

When a lock or tag must be temporarily removed from an energy-isolating device so that the machine or equipment may be energized to test or position it, the steps for return to service must be followed. If the Lockout/Tagout is to be restored the steps given in the previous section must be followed.

## **Shift or Personnel Changes**

Line managers must ensure that specific written Lockout/Tagout procedures are followed when machinery, equipment, or systems must be locked or tagged out over a shift or personnel change.

- Continued personnel protections over shift or personnel changes
- Orderly exchange of locks and tags from off-going to oncoming employees
- Orderly transfer of responsibility and information about systems status from the off-going to on-coming shift.

The on-coming shift personnel must sign the Lockout/Tagout record to indicate they have received and understand the Lockout/Tagout procedures.

## **Using Tag Only**

When machinery, equipment or systems can be locked out, they must be locked out.

If machinery, equipment or systems cannot be locked out, they must be tagged out with a level of safety equivalent to that of a lockout.

Tags must be securely attached to energy isolating devices so they cannot be inadvertently removed.

## **Alternate Removal of Locks and Tags when authorized employee is not available**

When the authorized employee who applied the locks and tags is not available to remove them, the line supervisor of the authorized employee must

- Confirm that this person is not available
- Remove the lock and tag by following the six steps for return to service
- Inform the authorized employee that his tag has been removed.
- Document alternative removal of locks and tags and notification of authorized employee.



## **Outside Contractors**

Contractors, subcontractors, and service vendors who lock and tag out equipment in the course of their work must communicate their individual lockout/tagout procedures through the contract administrator and the project manager prior to the start of operation. If a written lockout/tagout procedure is not supplied by the outside contractors, all outside contractors will follow the procedures described here.

## **Authorized Employee**

Employee who locks out or tags out systems, equipment, or machines to service maintain or modify. This employee is authorized by line management and is qualified by training and experience to service, maintain, or modify machinery, equipment or systems and to identify hazards associated with such machinery, equipment or systems.

## Chapter 13 Materials Handling

### *Introduction*

O,R&L requires that safety planning and practices for commonplace tasks be as thorough as for operations with unusual hazards. Commonplace tasks make up the greater part of the daily activities of most employees and, not unexpectedly, offer more potential sources of accidents with injuries and property damage. Every operation or work assignment begins and ends with handling materials. Whether the material is a sheet of paper (paper cuts are painful) or a cylinder of toxic gas, accident risks can be reduced with thorough planning. Identifying obvious and hidden hazards should be the first step in planning work methods and job practices. Thorough planning should include all the steps associated with good management from job conception through crew and equipment decommissioning.

Most of the material presented in this chapter is related to the commonplace and obvious. Nevertheless, a majority of the incidents leading to injury, occupational illness, and property damage stem from failure to observe the principles associated with safe materials handling and storage.

A less obvious hazard is potential failure of used or excessive motorized handling or lifting equipment. The Responsible Safety Officer must be notified whenever it is desired to acquire a crane, forklift truck, or other motorized handling or lifting equipment from excessed sources.

### *Lifting and Moving*

Lifting and moving of objects must be done by mechanical devices rather than by manual effort whenever this is practical. The equipment used must be appropriate for the lifting or moving task. Lifting and moving devices must be operated only by personnel trained and authorized to operate them. Employees must not be required to lift heavy or bulky objects that overtax their physical condition or capability.

### *Rigging*

Planning for safe rigging and lifting must begin at the design stage, and lifting procedures must be developed for assembly and installation. The lifting procedure should be developed and discussed with the rigging crew foreperson.

Responsibility for all rigging jobs is shared between the rigging crew and the customer. The customer is responsible for defining and requesting the move, for providing technical information on relevant characteristics of the apparatus, including special lifting fixtures when required, for providing suggestions on rigging and moving, and for assigning someone to represent them both

in planning and while the job is being carried out. The riggers are responsible for final rigging and carrying out whatever moves have been designated. Before any movement takes place, however, each representative must approve the rigging and other procedures associated with the intended move. Each must respect the responsibility and authority of the other to prevent or terminate any action he or she judges to be unsafe or otherwise improper.

The supervisor must make certain that the personnel know how to move objects safely by hand or with mechanical devices in the operations normal to the area and must permit only those employees who are formally qualified by training and certification to operate a fork truck, crane or hoist. The supervisor must enforce the use of safe lifting techniques and maintain lifting equipment in good mechanical condition.

Employees are required to observe all established safety regulations relating to safe lifting techniques.

The Responsible Safety Officer provides training programs followed by certification for employees who have demonstrated the ability to operate fork trucks of up to 4-ton capacity and for incidental crane operations that require no special rigging.

### ***Manual Lifting Rules***

Manual lifting and handling of material must be done by methods that ensure the safety of both the employee and the material. It is O,R&L policy that employees whose work assignments require heavy lifting be properly trained and physically qualified, by medical examination if deemed necessary.

The following are rules for manual lifting:

Inspect the load to be lifted for sharp edges, splinters and wet or greasy spots.

Wear gloves when lifting or handling objects with sharp or splintered edges. These gloves must be free of oil, grease, or other agents that may cause a poor grip.

Inspect the route over which the load is to be carried. It should be in plain view and free of obstructions or spillage that could cause tripping or slipping.

Consider the distance the load is to be carried. Recognize the fact your gripping power may weaken over long distances.

Size up the load and make a preliminary “heft” to be sure the load is easily within your lifting capacity. If it is not, get help.

If team lifting is required, personnel should be similar in size and physique. One person should act



as leader and give the commands to lift, lower, etc.

Two persons carrying a long piece of pipe or lumber should carry it on the same shoulder and walk in step. Shoulder pads should be used to prevent cutting shoulders and help reduce fatigue.

To lift an object off the ground, the following are manual lifting steps:

Make sure of good footing and set your feet about 10 to 15 inches apart. It may help to set one foot forward of the other.

Assume a knee-bend or squatting position, keeping your back straight and upright. Get a firm grip and lift the object by straightening your knees – not your back.

The steps for setting an object on the ground are the same as above, but in reverse.

### ***Mechanical Lifting***

Mechanical devices must be used for lifting and moving objects that are too heavy or bulky for safe manual handling by employees. Employees who have not been trained must not operate power-driven mechanical devices to lift or move objects of any weight. Heavy objects that require special handling or rigging must be moved only by riggers or under the guidance of employees specifically trained and certified to move heavy objects.

### ***Inspections***

Each mechanical lifting or moving device must be inspected periodically. Each lifting device must also be inspected before lifting a load near its rated capacity. Defective equipment must be repaired before it is used. The rated load capacity of lifting equipment must not be exceeded.

Material moving equipment must be driven forward going up a ramp and driven backward going down a ramp.

Traffic must not be allowed to pass under a raised load.

The floor-loading limit must be checked before mobile lifting equipment enters an area. Passengers must not be carried on lifting equipment unless it is specifically equipped to carry passengers.

### ***Load Path Safety***

Loads moved with any material handling equipment must not pass over any personnel. The load path must be selected and controlled to eliminate the possibility of injury to employees should the material handling equipment fail. Equipment worked on while supported by material handling equipment must have a redundant supporting system capable of supporting all loads that could be imposed by failure of the mechanical handling equipment. A suspended load must



never be left unattended but must be lowered to the working surface and the material handling equipment secured before leaving the load unattended.

### ***Truck Loading***

All objects loaded on trucks must be secured to the truck to prevent any shifting of the load in transit. The wheels of the trucks being loaded or unloaded at a loading dock must be chocked to prevent movement.

### ***Clean Work Areas***

All areas controlled by O,R&L must be kept in orderly and clean condition and used only for activities or operations for which they have been approved. The following specific rules must also be followed:

Keep stairs, corridors, and aisles clear. Traffic lanes and loading areas must be kept clear and marked appropriately.

Store materials in work rooms or designated storage areas only. Do not use hallways, fan lofts, or boiler and equipment rooms as storage areas.

Do not allow exits, passageways, or access to equipment to become obstructed by either stored materials or materials and equipment that is being used.

Arrange stored materials safely to prevent tipping, falling, collapsing, rolling or spreading - that is, any undesired and unsafe motion.

Do not exceed the rated floor capacity of stored material for the area. The load limit and the maximum height to which material may be stacked must be posted.

Place material such as cartons, boxes, drums, lumber, pipe, and bar stock in racks or in stable piles as appropriate for the type of material.

Store materials that are radioactive, fissile, flammable, explosive, oxidizing, corrosive, or pyrophoric only under conditions approved for the specific use by the Responsible Safety Officer.

Segregate and store incompatible materials in separate locations.

Remove items that will not be required for extended periods from work areas and put them in warehouse storage. Call for assistance.

Temporary equipment required for special projects or support activities must be installed so that it will not constitute a hazard. A minimum clearance of 36 inches must be maintained around electrical power panels. Wiring and cables must be installed in a safe and orderly manner, preferably in cable trays. Machinery and possible contact points with electrical power must have

appropriate guarding. The controls for temporary equipment must be located to prevent inadvertent actuation or awkward manipulation. When heat producing equipment must be installed, avoid accidental ignition of combustible materials or touching of surfaces above 60 degrees C (140F). Every work location must be provided with illumination that meets OSHA requirements. Evaluation of illumination quality and requirements is made by the Responsible Safety Officer, but the supervisor of an area is responsible for obtaining and maintaining suitable illumination.

Areas without natural lighting and areas where hazardous operations are conducted must be provided with enough automatically activated emergency lighting to permit exit or entry of personnel if the primary lighting fails.

## *Cranes*

Bridge cranes are classified as cab-operated or pendant operated. Mobile cranes consist of a boom and controls mounted on a truck chassis.

Bridge and mobile cranes must be operated only by trained operators designated by the supervisor in charge of the facility. The supervisor is also responsible for ensuring that operators are trained, carrying out the inspections and following the safe operating rules explained in the Operator/Rigger Training Program.

The Operator/Rigger Training Program is administered by the Responsible Safety Officer. The training staff consists of a qualified crane consultant, professional riggers, and the Responsible Safety Officer. There are two levels of required training and performance:

**Professional Operator/ Rigger:** Person whose principal assignment includes crane operation and rigging functions. The chief operator/ rigger must ensure that the professional operator/riggers under his/her supervision maintain the necessary qualifications.

**Incidental Operator/Rigger:** Person who performs operating/rigging functions as an incidental part of his/her normal work assignment. Persons in this category are restricted to lower load limits and rigging of specific types of hardware.

Incidental operators/riggers must be reexamined at least once every three years.

Designated operator/riggers must have Government identification cards (Federal Form 46), endorsed appropriately.

Before an employee may operate any of these cranes, the supervisor must arrange for the employee to receive incidental crane-operator training on the appropriate crane. Successful completion of the training must include an oral or written examination on the safety aspects of crane operation and a satisfactory demonstration of operational skills. The supervisor must determine that the applicant does not have any disqualifying medical or physical disabilities based on established requirements.

## ***Loading the Crane***

The crane must not be loaded beyond its rated load except for test purposes. Hoist chain or hoist rope must be free of kinks or twists and must not be wrapped around the load. Crane operators and floor persons must follow the OSHA requirements relating to moving the load.

## ***Crane Inspections Required***

All crane functional operating mechanisms for maladjustment interfering with proper operation and for excessive wear of components. On days used inspection is required by a crane operator.

Deterioration or leakage in lines, tanks, valves, drains pumps, and other parts of air or hydraulic systems. On days used inspection is required by a crane operator.

When using hooks, visual inspection by a crane operator is required. Annual inspections must have signed reports by the crane operator or an outside Engineer. Hooks with cracks or having deformation more than 15% in excess of normal throat opening or more than 10 degrees twist from the plane of the unbent hook must be discarded.

Wire-rope slings, including end connections, for excessive wear, broken wires, stretch, kinking, or twisting. Visual inspection by crane operator on days used. The Responsible Safety Officer, the primary user or the Building Manager must ensure that an annual inspection with a signed report is made.

Crane operators or an outside Engineer must inspect rope revving for noncompliance with manufacturer's recommendations before first use and annually thereafter.

## ***Crane Maintenance, Routine***

All crane hooks and lifting fixtures must be magnafluxed at least every four years. This will normally coincide with the certification load testing and inspection.

The person in charge of a crane may request testing of hooks and/or lifting fixtures more frequently than every four years. The person in charge must give the Responsible Safety Officer a schedule of the desired frequency for testing the hook so that disassembly of the hook block can be included in their schedule for preventative maintenance of a particular crane.

## ***Running Ropes Inspections***

Running ropes must be thoroughly inspected at least once a year during the structural inspection of the crane, and a full, written, dated, and signed report of the rope conditions must be kept on file.

## ***OSHA Crane Standards***

Routine maintenance, adjustments, and repairs must be performed by a qualified mechanic and reported to the Responsible Safety Officer according to each machine's established schedule and according to OSHA requirements.

## ***Forklift Operators***

The Responsible Safety Officer must be notified whenever it is desired to acquire a crane from excess sources.

## ***OSHA Standards for Forklifts***

Forklift users must familiarize themselves with and comply with OSHA Standard 29 CFR 1910.178 and ANSI B56.1.

Modifications and additions must not be performed by the customer or user without manufacturer's prior authorization or qualified engineering analysis. Where such authorization is granted, capacity, operation and maintenance instruction plates, tags, or decals must be changed accordingly.

If the forklift truck is equipped with front end attachments other than factory installed attachments, the user must ensure that the truck is marked with a card or a plate that identifies the current attachments, shows the approximate weight of the truck with current attachments and shows the lifting capacity of the truck with current attachments at maximum lift elevation with load laterally centered.

The user must see that all nameplates and caution and instruction markings are in place and legible.

The user must consider that changes in load dimension may affect truck capacities.

## ***Forklift Maintenance***

Because forklift trucks may become hazardous if maintenance is neglected or incomplete, procedures for maintenance must comply with ANSI B56.1 Section 7 and OSHA Standard 29 CFR 1919.178g.

## ***Forklift Extension***

Maximum efficiency, reliability, and safety require that the use of fork extensions be guided by principles of proper application, design, fabrication, use, inspection, and maintenance. The user must notify the Responsible Safety Officer before purchasing extensions or having them fabricated.

Fork extensions are only appropriate for occasional use. When longer forks are needed on a regular basis, the truck should be equipped with standard forks of a longer length.

Routine on-the-job inspections of the fork extension must be made by the fork lift operator before each use unless, in the judgment of the supervisor, less frequent inspections are reasonable because of his or her knowledge of its use since the last inspection. Extensions must be inspected for evidence of bending, overload, excess corrosion, cracks, and any other deterioration likely to affect their safe use.

All fork extensions must be proof load tested to establish or verify their rated capacities, whether they were supplied commercially or fabricated at O,R&L. A load equal to the rated capacity of the pair at a particular load center multiplied by 1.15, must be placed on each fork extension pair and fork assembly and supported for a period of five minutes without any significant deformation. Rated capacity must be determined at significant load centers, including the midpoint of the extension and at the tip. Once determined, the rated capacity and load center information must be shown by stamping or tagging the extensions in a protected location of low stress. The proof load test must be witnessed by a mechanical engineer or designer.

Whenever evidence of deterioration is detected or whenever the extensions have been overloaded, magnetic particle inspection must be performed.

### ***Safety Inspection, Responsibility***

Each operator is responsible for the safety and safety inspection of his or her lifting devices (such as screw pin shackles, hoist rings, commercial equipment, etc.) and for its lifting fixtures (such as spreader bars, special slings, O,R&L-designed equipment, etc.).

### ***Design Stress***

The Responsible Safety Officer is responsible for the design, fabrication, and testing of lifting fixtures.

The design stress for lifting fixtures must not exceed one fifth (1/5) the ultimate strength of the material at operating temperature. If welded fabrication is used, the design stress must take into consideration any weakening effects of welding, such as those that occur in aluminum alloys.

If practical, avoid welding in the fabrication of lifting fixtures; however, if welding is used, design and fabrication must conform to the latest standards of the American Welding Society (AWS). Careful, thoughtful design and follow up are required. The following rules apply when designing welded units:

There must be no possibility of subjecting welds to tearing loads. Stresses in welds must be substantially uniform.

Where possible, design lifting fixtures so that the main loads are carried only by structural members, plates, or shear pins rather than by welds. Examine this possibility carefully.

Welded fabrications must be proof tested to twice the maximum rated load followed by a magnetic particle inspection or other appropriate crack inspection method. Primary load carrying welds and welds in tension must be x-rated.

The screw thread engagement required for conservative development of the full strength of a screw fastener depends upon the screw fastener material and the material of the threaded member. If the fastener is made of the same material as the female threaded member, e.g., a low-carbon steel bolt and a hole threaded into low carbon steel, an engagement of at least 1-1/2 diameters is required. A hardened steel screw (Allen screw) in mild steel requires at least 2- diameters engagement. A low-carbon screw fastener, threaded into a tapped hole in aluminum alloy, copper, or cast iron must have a threaded engagement of 1-1/2 diameters. Other material combinations must be approved by the Responsible Safety Officer. Safety hoist rings may be used to make lifts up to their rated load when screwed 2 hoist ring bolt diameters into materials such as aluminum alloy, copper, or cast iron.

When special high strength bolts are required, consider the use of nonstandard pitch threads to avoid the possibility of using the wrong bolt in the lifting device. Any bolt used as part of O,R,&L-designed lifting fixtures or pick up devices must be tested to two (2) times its rated load. A crack detection inspection must be performed after the load test to ensure soundness. It is desirable to maintain a supply of tested bolts in the event that one is lost.

Once a lifting device or fixture is in the hands of the user, it is the user's responsibility to ensure that the proper bolt is inserted to the proper depth and correctly torqued.

### ***Crane Loads***

When equipment is designed to be crane lifted at a single point with a single-bolt pickup device, the vertical lifting load through the screw thread of bolt must be in line with the axis of the bolt so that the load will remain level when it is lifted. With this bolt alignment the lift will be through the center of gravity and will be safer since the load will not tilt or kick out when it is lifted. A single-bolt pick up device, such as a Safety Hoist Ring or equivalent carefully designed and maintained in-house device, must be used.

When a load is to be crane-lifted by slings from a crane hook through 2, 3, or 4 single-load pickup points located at the corners of the load, and without the use of a spreader bar, the forces at the lift points will be nonvertical. In this case a single bolt pickup device, such as safety hoist ring or equivalent carefully designed and maintained in-house device, must be used at each pickup point.

The use of eye bolts with shoulders is permitted for lifting light incidental loads after receiving approval from the crane certified operator or supervisor and when the following conditions are met:

The load is in line with the axis of the eye bolt and side loads are minimal (a spreader bar may be required). The average stress at the root area of the thread does not exceed 5000 psi. The thread engagement is at least two bolt diameters.

## Chapter 14 Noise

### *Introduction*

This chapter contains information on the effects, evaluation, and control of noise. For assistance in evaluating a noise problem, contact the Responsible Safety Officer.

### *Danger of Noise*

Exposing the ear to high levels of noise may cause hearing loss. This loss can be temporary or permanent. Temporary hearing loss or auditory fatigue occurs after a few minutes exposure to an intense noise but is recoverable following a period of time away from the noise. If the noise exposure is repeated, there may be only a partial hearing recovery and the loss becomes permanent. Typically, significant hearing losses occur first in the frequency range of 3,000 to 6,000 hertz (Hz). Losses in this frequency range are not critical to speech perception, and the individual usually is completely unaware of this initial symptom. With longer exposures, the hearing loss spreads to lower frequencies, which will affect speech perception. Workers' Compensation laws regard hearing losses in the speech frequency range of 500 to 3,000 Hz as being compensable.

The evaluation of hearing loss due to noise is complicated by the fact that the hearing acuity normally decreases with increasing age. Further, the losses associated with age are quite similar to those caused by excessive noise since the hearing for high frequency sounds is most affected in both instances. Hearing impairment may also result from infections, tumors, and degenerative diseases.

### *ACGIH Standards*

OSHA has prescribed the limits established by the American Conference of Governmental Industrial Hygienists as a standard for occupational noise exposure. Both the sound pressure level of the noise and the total duration of the noise exposure are considered to determine if these limits are exceeded. The sound pressure levels are expressed as dBA or decibels A-weighted. A-weighting filters are used when measuring sound levels to more accurately predict the response of the human ear to different frequencies.

When the daily noise exposure is composed of two or more periods of noise of different levels, their combined effect must be considered rather than the individual effect of each.

Exposure to continuous noise above 115 dBA is not permitted without ear protection.

Personnel must not be exposed to impact noises exceeding 140 dBA. Impact noises occur at intervals of greater than one per second. For example, the noise made by a metal shear.





## *Reducing Noise Exposure*

Noise exposure can be reduced by using engineering controls, administrative procedures, or personal protective devices.

### *Engineering Controls*

#### **Reduction of noise production at the source:**

Proper design of new machines

Modification of present machines

Proper repair and upkeep of equipment

Use of appropriate mufflers

Use of vibration dampeners on machines

#### **Reduction of noise transmission:**

Increase distance between noise and personnel exposed  
Construction of barriers between noise source and personnel  
Sound treatment of ceilings and walls

#### **Administrative procedures:**

Job schedule changes

Personnel rotation

#### **Personnel Protective Devices:**

Ear plugs

Earmuffs

Federal and state occupational safety and health regulations require that whenever employees are exposed to excessive noise levels, feasible engineering or administrative controls must be used to reduce these levels. When these control measures cannot be completely accomplished and/or while such controls are being initiated, personnel must be protected from the effects of excessive noise levels. Such protection can, in most cases, be provided by wearing suitable protective hearing devices.

The appropriate Medical Services provider and/or the supervisor of the Department will supply ear plugs for employees upon request or before going into a high noise area. There is a need for medical supervision when ear plugs are used because their effectiveness depends on proper fitting. Only



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approved plugs should be used. Ear plugs should be cleaned daily to prevent ear infections.

Protection greater than provided by a single device can be obtained by wearing ear plugs under an earmuff. While the reduction provided by wearing both devices simultaneously is considerably less than the sum of the individual attenuations, it is still greater than when either device is worn separately. \*Ref. OSHA 1926.101

## Chapter 15 Protective Equipment

### *Introduction*

O,R&L will provide suitable equipment to protect employees from hazards in the workplace. The Responsible Safety Officer will advise on what protective equipment is required for the task, but the supervisor of the operation must obtain this equipment and see that it is used. All employees will be held responsible for the proper use and care of the equipment they have been issued.

Protective clothing is not a substitute for adequate engineering controls.

### *Protection Issued*

Protective clothing will be issued to employees who work with hazardous material for the purpose protecting their health and safety.

The Responsible Safety Officer is available for consultation as needed.

### *Protective Shoes*

O,R&L encourages the wearing of safety shoes, and for certain types of work the wearing of safety shoes is required by Company policy or by federal regulations. Examples are when employees are exposed to foot injuries from hot, corrosive, or poisonous substances; in shops, in equipment handling, or in construction jobs where there is a danger of falling objects; or in abnormally wet locations.

### *Protective Gloves*

O,R&L provides proper hand protection to employees exposed to known hand hazards. The supervisor must obtain the suitable hand protection and ensure that it is used. The individual department must maintain a supply of special or infrequently used hand protection.

Assistance in selecting the proper hand protection may be obtained by consulting the Responsible Safety Officer.

### *Head Protection*

O,R&L provides appropriate head protection devices for employees to protect them from head or other injuries that could result from their working environment. Some head protection devices are available from stock. The supervisor must also maintain sufficient supply of head protection devices for visitors in the area.

### *Eye Protection*



O,R&L provides appropriate eye protection devices for employees assigned to tasks in which an eye-injury hazard exists. The supervisor of the operation is responsible for determining the need for suitable eye-protection devices and for ensuring that the employees use them. The Responsible Safety Officer and appropriate Medical Services agency will assist the supervisor in defining eye-hazard operations and in selecting appropriate eye protection. The standard sign:

**CAUTION, EYE HAZARD AREA, DO NOT ENTER WITHOUT EYE PROTECTION,** must be posted in every area where eye protection is mandatory. All employees who work in such an area must wear eye protection issued to them. Every visitor to the area must also be provided with suitable eye protection.

### *Respiratory Protection*

Any operation that generates harmful airborne levels of dust, fumes, sprays, mists, fogs, smokes, vapors, or gases or that may involve oxygen-deficient atmospheres requires the use of safety controls. This must be accomplished, as much as feasible, by accepted engineering control measures (for example, enclosure or confinement of the operation, general and local ventilation, and substitution of less toxic materials). When effective engineering controls are not feasible, or while they are being instituted, appropriate respiratory protection must be used in accordance with O,R&L requirements as prescribed by OSHA in ANSI 288.2-1980, Standard Practices for Respiratory Protection.

### *Responsibilities*

To ensure that the respiratory protection program is conducted in accordance with ANSI 288.2-1980, certain responsibilities are required of each employee, supervisor, Responsible Safety Officer, and the Medical Services Department. Employees are responsible for:

Maintaining and storing the respirator in good condition.

Returning the respirator at the end of the required use for overhaul, cleaning, and disinfection.

Supervisors are responsible for:

Identifying those employees who may need to use respiratory protection (Responsible Safety Officer will provide assistance upon request in this determination).

Ensuring that their employees have been properly trained and fitted. Ensuring that their employees use the respirators as required.

The Responsible Safety Officer is responsible for:

Providing respiratory equipment.

Maintaining the equipment in good condition.

Fitting employees with proper respirators and providing training for their use.

Evaluating employee exposures and work conditions, including inspection of respirator use.

The Medical Services Department is responsible for:

Granting medical approval for each respirator user.

### ***Respiratory Equipment***

The Responsible Safety Officer has selected the types of respiratory protective equipment to be used at O,R&L. Any changes to protective equipment, its application, or the substitution of alternative protective equipment must be approved by the Responsible Safety Officer before its use.

O,R&L has a wide variety of respiratory protective equipment available. Each respirator has certain capabilities and limitations that taken into account when issued.

The types of respiratory protective devices provided by O,R&L are described below.

Disposable dust masks are approved for protection against low (non hazardous) levels of nuisance dusts. They provide no protection against vapors or gases, and they cannot be used in oxygen-deficient areas. There are no applicable training or fitting restrictions.

Air-purifying, half and full-face masks are approved for protection against low concentration of toxic particulates, organic vapors, acid gases, and ammonia. Specific cartridges must be selected for protection against each material. They must never be used in atmospheres deficient in oxygen, when carbon monoxide or oxides of nitrogen are suspected, or when conditions prevent a good face seal. Such conditions may be a growth of beard, sideburns a skullcap that projects under the face piece or temple pieces on eyeglasses. Users must be trained, fitted, and medically approved before they can be issued a respirator.

Supplied-air, half- and full-face masks may be used in atmospheres unsuitable for air-purifying respirators but cannot be used in areas which are immediately dangerous to life or health.

Compressors are normally used to supply breathing air, but compressed air cylinders may also be used. The user must be medically approved, trained, and fitted before using this equipment.

Personnel will not be fitted or issued a respirator if there is any condition that may prevent a good face seal, such as a beard, sideburns, a skullcap, or temple pieces on eyeglasses.

Supplied air-hoods are approved for respiratory protection in any atmosphere not immediately dangerous to life or health, and from which the wearer can escape without the aid of a respirator. The user must be medically approved and trained in its proper use. The presence of a beard, sideburns, skullcap, or eyeglasses will not affect the performance of this type of respirator. Ref. OSHA 1926.95

## Chapter 16 Pressure Safety

### *Definitions*

The following definitions apply in this chapter:

**Low Pressure:** Gas Pressure less than 1 MPa gauge (150) psig) or liquid pressure less than 10 MPa (1500psig).

**Immediate Pressure:** Gas pressure from 1 to 20 MPa gauge (150 to 3000psig) and liquid pressure from 10 to 35 MPa gauge (1500 to 5000psig).

**High Pressure:** Gas pressure greater than 20 MPa gauge (3000psig) and liquid pressure greater than 35 MPa gauge (5000psig).

**Pressure Equipment:** Any equipment, e.g., vessels, manifolds, piping, or other components, that operates above or below (in the case of vacuum equipment) atmospheric pressure.

**Pressure System:** Any mechanical system comprising pressure equipment.

**Pressure Vessel:** A relatively high-volume pressure component (such as a spherical or cylindrical container) with a cross section larger than the associated piping.

**Ductile Vessel:** A pressure vessel fabricated from materials that yield extensively before failure when over stressed at any temperature within the vessel's operating range (generally, materials that exhibit greater than 5% plastic strain to rupture).

**Brittle Vessel:** A pressure vessel fabricated from materials that do not yield extensively before failure when over stressed an any temperature within the vessel's operating range (generally, materials that exhibit less than 5% plastic strain to rupture).

**Research Pressure Equipment:** Pressure equipment used for research, development, or for some other unique activity (such as special test equipment for shop use).

**Plant-Facility Pressure Equipment:** Pressure vessels and pressurized utility equipment that is part of O,R&L buildings or physical-plant facilities.

**Operational Safety Procedure:** The OSP is the document used to describe the controls necessary to ensure that the risks associated with a potentially hazardous research project or unique activity are at an acceptable level.

**Safety Note (SN):** A Safety Note is generally used to document engineering calculations or tests of specific equipment or activities when there is a safety concern but the potential hazard is not high enough to require an OSP.

**Maximum Allowable Working Pressure (MAWP):** The maximum differential pressure (at the specified operating temperature) at which equipment is designed to operate safely. The relief device must not be set higher than the MAWP.

**Operating Pressure (OP):** The pressure at which equipment is normally operated- always less than the MAWP (also called working pressure).

**Pressure Test:** A test to ensure that equipment will not fail or permanently deform –i.e., will operate reliably at the MAWP.

**Proof Test:** A test in which equipment prototypes are pressurized to determine the actual yield or failure (burst) pressure (used to calculate the MAWP).

**Safety Factor (SF):** The ratio of the ultimate (i.e., burst or failure) pressure (measured or calculated) to the MAWP. A SF related to something other than the failure pressure should be identified with an appropriate subscript, e.g., SF sub y (based on yield pressure) or SF sub u (based on ultimate strength).

**Leak Test:** A pressure or vacuum test to determine the existence, rate, and/or location of a leak

### ***Standard Operating Procedures***

Any O,R&L division involved in the construction and/or use of pressure equipment must ensure that such equipment is designed, installed, tested, and operated in accordance with the requirements of this chapter. The Responsible Safety Officer must make an evaluation to determine whether the potential hazard of the pressure of the equipment is high enough to require an OPS.

### ***Pressure Installer***

The Pressure Installer is a technician or mechanic certified to fabricate, assemble, install, and operate pressure equipment within a specified pressure range. Upon being assigned by his or her supervisor, the Pressure Installer is authorized to work directly for a supervisor or the Responsible Safety Officer.

### ***Low and High Hazards***

For convenience in describing the required controls, pressure equipment has been divided into two hazard categories:

Low-Hazard pressure equipment – equipment with a low hazard level involving routine risks that are accepted without question by most users or equipment that is covered by existing industrial standards.

High-Hazard pressure equipment - equipment for which operational risk is high enough to require a SN and may be high enough to require an OSP. Review and approval are required.

## ***Low Hazards***

The following systems are low hazard and do not normally require an SN or OSP. Air and inert-gas systems for working pressures up to 1 MPa gauge (150psig) and inert-liquid systems for working pressures up to 10 MPa gauge (1500psig), provided that the stored energy does not exceed 100kJ(75,000 ft-lb).

Utility systems for MAWPs up to 2.0 MPa gauge (300psig), including cold water, hot-water, low-conductivity-water, compressed-gas, natural-gas, butane and propane (LPG), and steam systems that strictly comply with applicable Engineering standards.

Compressed-gas-cylinder manifolds assembled with compound-thread fittings in compliance with the chapter on GASES of this Manual.

Manifolds on tubebanks or tubetrailers that consist of components rated at 20.7 MPa gauge(3000psig) or higher and that are periodically retested.

Unmodified pressure vessels designed in accordance with Refs. 1-3, ASME Boiler and Pressure Vessel Codes and ASME-code stamped.

Refrigeration systems that comply with the ASME Boiler and Pressure Vessel Codes (Refs. 1 and 2) and applicable Air- Conditioning and Refrigeration Institute (ARI) standards (Refs. 4).

Pressure Vessels, stamped with a Department of Transportation (DOT) rating, used to supply and transport fluids. These vessels are subject to the retesting requirements of Ref. 5, Code of Federal Regulations, CFR 49, Transportation, Parts 100-199 (current issue).

Air- pressure tanks, liquefied- petroleum-gas tanks, anhydrous-ammonia tanks, and fired-steam boilers inspected periodically in accordance with Ref. 6, “Unfired Pressure Vessel Safety Orders,” or Ref. 7, “Boiler and Fired Pressure Vessel Safety Orders” of the State of California or other similar state requirements. The Responsible Designer must notify the Technicians Supervisor whenever such a vessel is to be installed.

Unmodified, commercially manufactured hydraulic systems with a safety factor of 4 or higher for working pressures to 35 MPa (5075 psi) on hydraulic presses, motorized vehicles, and machine tools that are periodically inspected and maintained by the using organization.

## ***High Hazards***

The systems listed below are high-hazard (containing hazardous materials or employing pressures that involve high hazard) and must be evaluated by the Responsible Safety Officer to determine if an OSP is required. A Safety Note is required, and the vessel must be approved by a Certified Pressure Inspector or by outside safety engineer. Responsible Safety Officer approval is required for



systems containing flammable, irritant, toxic, infectious, and/or radioactive fluids. Fire Department approval is also required for systems containing oxygen or flammable and/or toxic fluids.

All vessels and systems that contain irritant, toxic, infectious, and/or radioactive fluids at any pressure.

All oxygen or flammable-fluid vessels and systems.

All pressurized equipment and ASME-coded vessels that have been structurally modified and that operate at gas pressures over 1 MPa gauge (150psig) or liquid pressures over 10 MPa gauge (1500psig) or that contain over 100kJ (75,000ft-lb) of stored energy.

### *Piping Standards*

The following requirements apply in addition to other sections of this manual on Pressurized Flammable –Fluid Piping, and Instruments.

Use flexible non-metallic hose only when it is impractical to use metal pipe or tubing. Any use of nonmetallic hose in pressure systems must be approved by the Responsible Safety Officer.

Keep hose lengths as short as possible, protect them from mechanical damage, and anchor the ends to prevent whipping in case of a hose or hose-fitting failure.

Avoid sharp hose bends, and do not bend hoses more sharply than recommended by the manufacturer.

Replace or repair any hose showing leaks, burns, wear, or other defects.

Do not use non metallic hose on flammable, toxic, and/or radioactive gas systems. (Gases tend to permeate nonmetallic hose).

On liquefied-gas systems, ensure that all terminal-block (liquid-withdrawal) valves are rated above the vapor pressure of the liquefied gas at 38 degrees C (100degrees F) or that a properly set relief valve is permanently installed on the outlet side of each terminal-block valve.

All work on pressure equipment requiring an SN must be performed by trained personnel under the direction of an engineer or the Responsibility Safety Officer.

All systems must be securely fastened to resist seismic forces as specified in the chapter on Seismic Safety.

For gas systems use gauges graduated to about twice the MAWP of the system; for liquid systems use gauges graduated to at least the test pressure.

Calibrate pressure gauges, switches, and other devices through 120% of their maximum operating

points. These devices must be capable of withstanding the operational, and emergency, temperatures of the system, and their material must be compatible with the system fluid.

Use safety-type gauges (with shatterproof faces, solid fronts, and blow-out backs) or protect operators with a tested, O,R&L approved gauge-safety shield. This applies to all gas pressure gauges over 100 mm in diameter graduated to over 1.4 MPa (200psi) and to all liquid-pressure gauges over 100mm in diameter graduated to over 140 MPa (20,000psi). Safety-type gauges may be required for other combinations of diameter and pressure.

Protect a gauge subject to pressure surges or cyclic pulses by installing a throttling device.

Ensure that there is no oil in gauges used on gas systems. This is important on oxygen systems since hydrocarbons and oxygen can combine explosively. Clean all gauges to be used on high- purity gas systems.

Equip every flammable-gas drop or regulator/hose connection with a flash arrester or a check valve, a pressure gauge, and a shut-off valve. If the flammable gas is to be (or could be) cross connected with oxygen or compressed air, a flash arrester must be installed in the flammable-gas line and a check valve in the oxygen or compressed air line.

Equip all oxygen drops with a check valve. This applies to all single- and multiple-station installations and portable equipment.

### *Signs*

All pressurized gas equipment operating at pressures greater than 500 psig must be painted yellow, must have the operating pressure clearly marked thereon, and must bear a sign, **DANGER, HIGH-PRESSURE EQUIPMENT**.

### *Operator Qualifications*

O,R&L will authorize only trained persons to operate pressure equipment. Use of personnel or equipment shields may be required when there is a probability of damage from blast and to protect personnel or equipment from blast.

The user must ensure that the following safety precautions are taken:

Flammable, radioactive, irritant, and/or toxic gases or liquids or oxygen must not be used in systems that are not specifically designed for their use.

Flammable gas must not be used in combination with oxygen or compressed air unless there is a flash arrester in the flammable-gas line and a check valve in the oxygen or air line. Oxygen and air, because of its oxygen content can combine explosively with organic materials and flammable gases.



Acetylene-gas pressure must not exceed 15 psig since acetylene is unstable and will explode spontaneously around 30 psig at room temperature.

Work may not be performed on pressurized components unless the method has been approved by means of an SN or is specifically authorized by the User or designee.

### *Depressurized Vessels*

Whenever practical, a system or vessel not in use must be depressurized. When a vessel or system is stored under pressure, the pressure, fluid, and date pressurized must be clearly indicated on the vessel. The Shutdown Procedures apply.

### *Safety Orders*

State and federal Safety Orders establish minimum standards for the following:

The design and construction of all unfired pressure vessels for Plant-Facility Pressure Systems

The installation, operation (including issuance of permits), inspection, and repair of air-pressure tanks and liquefied-petroleum-gas (LPG) tanks

The design, construction, repair, or alteration of storage tanks for liquefied-natural gas (LNG) at 15 psi or less

The installation, use, and repair of anhydrous ammonia tanks

The design and construction of pressure vessels for storing and dispensing natural gas for motor-fuel and of motor-fuel installed on vehicles not licensed to travel on highways

The installation, use, and repair of natural- gas vessels and systems that are not a part of hazardous research equipment

State Safety Orders are not applicable to the following:

Pressure vessels that are under the jurisdiction and inspection of the United States Government are that are specifically exempted by the State.

Pressure vessels, except for LNG tanks, subject to an internal or external pressure of not more than 15 psi, with no limitation on size, and vessels having an inside diameter less than 6 in., with no limitation on pressure. (However, such vessels must be designed and constructed in accordance with recognized standards, when applicable, or in accordance with good engineering practices concerning pressure-vessel design, with a factor of safety of at least 4, and must be fitted with controls and safety devices necessary for safe operation.)

Natural-gas vessels and installations subject to the jurisdiction and inspection of the State Public Utilities Commission, Department of Transportation, or Highway Patrol; air brake tanks installed on units of transportation, including trucks, buses, trains, and streetcars, that are operated by any person, firm, or corporation subject to the jurisdiction and inspection of the Public Utilities Commission, the Department of Transportation, or the Highway Patrol.

The following vessels must be constructed, inspected, and stamped in accordance with the appropriate ASME Boiler and Pressure Vessel Code:

Air Pressure tanks

LPG tanks

Anhydrous-ammonia tanks

All Plant-Facility pressure vessels

LNG tanks for low-temperature storage at 15 psi or less must be designed, constructed, inspected, and certified in accordance with API (American Petroleum Institute) Standard 620.

LPG vaporizers having a volume greater than one U.S. gallon must be constructed in accordance with the California State Boiler and Fired Pressure Vessel Safety Orders, Title 8, Subchapter 2.

Permits to Operate are required for LPG tanks and air tanks larger than 1.5 ft sup 3 with relief valves set to open above 150 psi.

### ***OSHA Standards***

State Safety Orders establish minimum standards for the design, construction, installation, inspection, operation, and repair of all (1) power boilers, including nuclear, (2) all low-pressure boilers and high-temperature-water boilers, and (3) any other fired pressure vessels used in household service, and (3) any other fired pressure vessels in California not specifically exempted from these Orders.

State Safety Orders are not applicable to (1) boilers and fired pressure vessels under the jurisdiction of, and inspected by, the United States Government, (2) boilers and fired pressured vessels used in household service, and (3) boilers used exclusively to operate highway vehicles, including automobiles.

### ***Power Boilers***

All new power boilers, high temperature water boilers, and low-pressure boilers must be constructed, inspected, and stamped in full compliance with the ASME.

Boiler and Pressure Vessel Codes (refs. 11 and 12) unless the design and construction of the boiler

are accepted by the O,R&L Engineering Division as equivalent to Code.

Vessels not included in the scope of the ASME Codes must be designed and constructed in accordance with good engineering practice regarding pressure-vessel design for the pressure and temperature to be expected in service, with a factor of safety of at least 4. Good engineering practice (as used in this Manual) must be construed to require details of design and construction at least as safe as required by the rules in the ASME Codes, including shop inspection.

State Permits to Operate are required on all boilers and fired pressure vessels except for:

Low-pressure boilers

Miniature boilers

High-temperature water boilers

Boilers, including forced-circulation boilers, in which none of the following is exceeded: 100 ft sup 2 of heating surface, 16-in. steam-drum diameter, 100-psi MAWP, 35-gal. normal water capacity, and 400,000-Btu/hr burner power input.

### ***Pressure Testing Standards***

Whenever practical, pressure vessels and systems should be sent to an Assembly Shop or the Plant Maintenance Technician Shops for pressure testing. When this is not practical, the vessel or system must be tested in accordance with the In-Place Pressure Testing procedures described in this manual. Pressure tests performed at O,R&L must be conducted by a Plant Maintenance Technician, a Physical Plant Mechanic, or an Assembly Shop Machinist and must be observed (or conducted) and certified by the Responsible Safety Officer (or designee) or an outside independent Pressure Inspector.

Pressure-test and pressure inspection records must be maintained for the life of the vessel by the organization that certifies the test or inspection.

### ***Pressure Testing***

Pressure vessels must be tested in accordance with the rules in this Section, using an inert fluid.

Pressure vessels for low-hazard inert systems for operation with nonflammable, nontoxic, and nonradioactive fluids must be hydrostatically tested to at least 1.5 times the MAWP or pneumatically tested to at least 1.25 times the MAWP (only when safety considerations or research requirements do not permit a hydrostatic test). Any special temperature conditions or temperature cycles to which the vessel will be subjected in use must be reproduced as closely as possible during the test.

Pressure vessels for high-hazard reactive systems for operation with oxygen or flammable, toxic, and/or radioactive fluids must be tested to at least 2.0 times the MAWP with an inert liquid

(preferred) or gas. Any special temperature conditions or temperature cycles to which the vessel will be subjected in use must be reproduced as closely as possible during the test. In addition, consider the need to inspect any vessel ultrasonically or to check the vessel surface for cracks using the magnetic-particle test or (for nonmagnetic vessels) the fluorescent-penetrant test.

During tests of pressure vessels in which the yield strengths of their construction materials is approached, strain-gauge measurements must be made at high-stress locations. Diameter measurements accurate to within plus or minus 0.025mm (0.001 in.) must also be taken both before and after testing to determine whether detectable plastic yielding has occurred during pressurization.

When the strength of the vessel is questionable (old or unknown design), strain-gauge measurements must be made during testing, and diameter measurements must be taken before and after testing. The MAWP for ASME Code pressure vessels made of the acceptable ductile materials listed in the code, must not exceed 0.4 times the test pressure and must comply with a Proof Test to establish MAWP.

### ***Pressure Testing Procedures***

Inert-substance (low-hazard) pressure systems that will operate with nonhazardous liquids, inert gases, or compressed air must be tested hydrostatically (preferred) at least 1.5 times the MAWP or pneumatically to at least 1.25 times the MAWP using an inert fluid.

Reactive-substance (high hazard) pressure systems that will operate with oxygen or with flammable, toxic and/or radioactive fluids must be tested to at least 2.0 times the MAWP using an inert liquid (preferred) or gas.

### ***Standards for Low Pressure Vessels***

Pressure vessels and systems must be leak tested at their MAWP after successful pressure testing:

Open flames must not be used for leak-testing

Leak testing of non pressure-tested or undocumented pressure vessels or systems must be limited to a maximum of 20% of test pressure (or proposed test pressure).

### ***Leak Testing Required***

If a leak is detected during pressure testing of a vessel or system, and it is decided to locate the leak before completing the test, the pressure must be reduced to not over one-half the immediately preceding test pressure while the leak is being located.

A system or vessel must not be repaired while it is pressurized unless this is specifically authorized.

## ***Leak Repairs***

Any modification to a pressure vessel or system, other than repair or replacement (with an exact duplicate) of existing components, must be approved by the Responsible Safety Officer and recorded in a revision to the applicable engineering drawing, to the SN, and to the OSP (if applicable). The initial pressure test must be repeated before any further use of the modified vessel or system.

If an ASME-Code vessel is modified, the Code stamping must be obliterated, and the Responsible Safety Officer must be so notified.

When pressure equipment has been modified for use at a pressure below the original design pressure, all modifications (e.g. use of fewer bolts in flanged joints) must be approved by the Responsible Designer. All safety requirements for the lower pressure must be met, and the reduced working pressure and the number of bolts or other supports required must be clearly marked on the equipment. If high-strength or other special bolts are required, this must also be clearly marked on the equipment near the bolt holes.

Instructions on the precautions to be taken when the modified equipment is operated must be sent to all personnel concerned, and one copy must be filed in the SN file.

## ***Inspections and Re-Testing***

All high-hazard equipment that is not a part of Plant Facilities and/or under the jurisdiction of the State must be re-inspected at least every three years and retested at the MAWP at least every six years, unless otherwise specified in the SN or OSP.

Low-hazard pressure equipment that is not a part of Plant Facilities and/or under the jurisdiction of the State need not be periodically re-inspected and retested, unless otherwise specified in an SN or OSP.

Pressure re-inspection is performed by a Pressure Inspector or by a Responsible Safety Officer and is recorded on a "Pressure Inspection Record" form. The completed form must be signed by the User and sent to Responsible Safety Officer to be kept for the life of the vessel.

The result of the retest must be certified and a label must be fixed on the vessel or system as described earlier.

## ***Inspections and Testing***

If it is impractical to pressure test a vessel or system at the Mechanical Shop or some other approved location, pressure test it in place, in accordance with the provisions of this Section.

The supervisor or user must ensure that in-place retesting of pressure equipment for which he or

she is responsible is performed. Although other individuals may be designated to observe and direct testing or retesting, responsibility for safe conduct of the test and safe functioning of tested pressure equipment cannot be delegated.

The user and Responsible Safety Officer must prepare the required test procedure, direct the test personnel, and witness in-place pressure testing of vessels and systems for which he or she is responsible.

### ***Pressure Testing On Site***

A written test procedure must be prepared for every high-hazard pressure test conducted in the field. When testing will be conducted in place, the test procedure must be included in (or appended to) the SN or OSP (if applicable).

Procedures for in-place testing of high-hazard vessels and systems must be approved.

The Building Manager or Area Supervisor must be advised of pressure tests planned to occur in his or her facility, and Responsible Safety Officer must be notified if toxic and/or radioactive material is involved.

All pressure tests must be conducted by a person designated by the Responsible Safety Officer or conducted by a Plant Maintenance Technician, a Physical Plant Mechanic, or a Machinist in the Assembly Shop and must be observed (or conducted) and certified by a member of the Responsible Safety Officer (or designee) or a Pressure Inspector.

### ***Pressure Testing With Liquids***

Pressure testing with a gas is more dangerous than testing with a liquid. Therefore, tests must be conducted with liquids, whenever practical.

Barricade the equipment being tested, shield the controls and operators, and evacuate all unauthorized personnel from the test area.

Signs reading “Danger- High Pressure Test in Progress- Keep Out” must be posted at all approaches to the test area.

For in-place testing with liquids, all air must be removed from both the testing system and the equipment to be tested. Compressed air will expand violently in case of vessel failure. Spongy action of pumping equipment usually indicates the presence of trapped air.

### ***Pressure Testing with Gas***

For correct standards, refer to the following:





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ASME Boiler and Pressure Vessel Code, Section VIII, “Pressure Vessels,” Division 1, American Society of Mechanical Engineers, New York (latest version).

ASME Boiler and Pressure Vessel Code, Section VIII, “Pressure Vessels,” Division 2, American Society of Mechanical Engineers, New York (latest version).

ASME Boiler and Pressure Vessel Code, Section X, “Fiberglass-Reinforced Plastic Pressure Vessels,” American Society of Mechanical Engineers, New York (latest version).

ARI Standards, Air Conditioning and Refrigeration Institute, Arlington, VA (latest version).

Code of Federal Regulations 49, Transportation, Parts 100-199, General Services Administration (latest version).

Unfired Pressure Vessel Safety Orders, State of California Administration Code, Title 8, Industrial Relations, Part 1, Department of Industrial Relations, Chapter 4, Division of Industrial Relations, Subchapter 1 (latest version).

Boiler and Fired Pressure Vessel Safety Orders, State of California Administration Code, Title 8, Industrial Relations, Part 1, Department of Industrial Relations, Chapter 4, Division of Industrial Relations, Subchapter 2 (latest version).

OSHA Order 6430.1, General Design Criteria (latest version).

American Petroleum Institute, Standard 620 (latest version).

ASME Boiler and Pressure Vessel Code, Section I, Power Boilers, American Society of Mechanical Engineers, New York (latest version).

ASME Boiler and Pressure Vessel Code, Section IV, Heating Boilers, American Society of Mechanical Engineers, New York (latest version).

American National Standard Code, ANSI-B31.1, Power Piping (latest version).

American National Standard Code, ANSI-B31.3, Chemical Plant and Refinery Piping (latest version).

## Chapter 17 Ladders and Scaffolds

### *Ladders*

Ladders must be in good condition, made of suitable material, of proper length, and of the correct type for the use intended. Damaged ladders must never be used; they should be repaired or destroyed. Ladders used near electrical equipment must be made of a non-conducting material. Stored ladders must be easily accessible for inspection and service, kept out of the weather and away from excessive heat, and well supported when stored horizontally.

A portable ladder must not be used in a horizontal position as a platform or runway or by more than one person at a time. A portable must not be placed in front of doors that open toward the ladder or on boxes, barrels, or other unstable bases. Ladders must not be used as guys, braces, or skids. The height of a stepladder should be sufficient to reach the work station without using the top or next to the top steps. Bracing on the back legs of stepladders must not be used for climbing.

The proper angle (75-1/2 degrees) for a portable straight ladder can be obtained by placing the base of the ladder a distance from the vertical wall equal to one quarter of the vertical distance from base to top of ladder's resting point. Ladders must be ascended or descended facing the ladder with both hands free to grasp the ladder. Tools must be carried in a tool belt or raised with a hand line attached to the top of the ladder. Extension ladders should be tied in place to prevent side slip.

### *Scaffolds*

All scaffolds, whether fabricated on site, purchased, or rented must conform with the specifications found in ANSI A10.8, Safety Requirements for Scaffolding. Rolling scaffolds must maintain a 3:1 height to base ratio (use smaller dimension of base).

The footing or anchorage for a scaffold must be sound, rigid, and capable of carrying the maximum intended load without settling or displacement. Unstable objects such as barrels, boxes, loose brick or concrete blocks must not be used to support scaffolds or planks. No scaffold may be erected, moved, dismantled, or altered unless supervised by competent persons. Scaffolds and their components must be capable of supporting at least four times the maximum intended load without failure.

Guard rails and toe boards must be installed on all sides and ends of scaffolds and platforms more than 10 ft above the ground or floor. Scaffolds 4 feet to 10 feet in height having a minimum horizontal dimension in either direction of less than 45 inches must have standard installed on all open sides and ends of the platform.

Wire, synthetic, or fiber rope used for suspended scaffolds must be capable of supporting at least 6 times the rate load. No riveting, welding, burning, or open flame work may be performed on



any staging suspended by means of fiber or synthetic rope. Treated fiber or approved synthetic ropes must be used for or near any work involving the use of corrosive substances. All scaffolds, bosun's chairs, and other work access platforms must conform with the requirements set forth in the Federal Occupational Safety and Health Regulations for Construction, 29 CFR 1926.451, except where the specifications in ANSI A10.8 are more rigorous.

## *Floors*

Workroom floors must be in a clean and, as much as possible, dry condition. Drainage mats, platforms, or false floors should be used where wet processes are performed. Floors must be free from protruding nails, splinters, holes, and loose boards or tiles. Permanent aisles or passageways must be marked. Floor holes must be protected by covers that leave no openings more than one inch wide. Floor openings into which persons can accidentally walk must be guarded by standard railings and toe boards. Open-sided floors, platforms, and runways higher than four feet must be guarded by standard railings. Toe boards must be used wherever people can pass below or hazardous equipment or materials are below.

\*Ref. OSHA 1926.45

## Chapter 18 Fall Protection (Part 1)

### *Definitions*

*Anchorage* means a secure point of attachment for lifelines, lanyards or deceleration devices.

*Body belt* (safety belt) means a strap with means both for securing it about the waist and for attaching it to a lanyard, lifeline, or deceleration device.

*Body harness* means straps which may be secured about the employee in a manner that will distribute the fall arrest forces over at least the thighs, pelvis, waist, chest and shoulders with means for attaching it to other components of a personal fall arrest system.

*Buckle* means any device for holding the body belt or body harness closed around the employee's body.

*Connector* means a device which is used to couple (connect) parts of the personal fall arrest system and positioning device systems together. It may be an independent component of the system, such as a carabiner, or it may be an integral component of part of the system (such as a buckle or dee-ring sewn into a body belt or body harness, or a snap-hook spliced or sewn to a lanyard or self-retracting lanyard).

*Controlled access zone* (CAZ) means an area in which certain work (e.g., overhand bricklaying) may take place without the use of guardrail systems, personal fall arrest systems, or safety net systems and access to the zone is controlled.

*Dangerous equipment* means equipment (such as pickling or galvanizing tanks, degreasing units, machinery, electrical equipment, and other units) which, as a result of form or function, may be hazardous to employees who fall onto or into such equipment.

*Deceleration device* means any mechanism, such as a rope grab, rip-stitch lanyard, specially-woven lanyard, tearing or deforming lanyards, automatic self retracting lifelines/lanyards, etc., which serves to dissipate a substantial amount of energy during a fall arrest, or otherwise limit the energy imposed on an employee during fall arrest.

*Deceleration distance* means the additional vertical distance a falling employee travels, excluding lifeline elongation and free fall distance, before stopping, from the point at which the deceleration device begins to operate. It is measured as the distance between the location of an employee's body belt or body harness attachment point at the moment of activation (at the onset of fall arrest forces) of the deceleration device during a fall, and the location of that attachment point after the employee comes to a full stop.

*Equivalent* means alternative designs, materials or methods to protect against a hazard which the

employer can demonstrate will provide an equal or greater degree of safety for employees than the methods, materials or designs specified in the standard.

*Failure* means load refusal, breakage, or separation of component parts. Load refusal is the point where the ultimate strength is exceeded.

*Free fall* means the act of falling before a personal fall arrest system begins to apply force to arrest the fall.

*Free fall distance* means the vertical displacement of the fall arrest attachment point on the employee's body belt or harness between onset of the fall and just (OSHR Page 31:3352) before the system begins to apply force to arrest the fall. This distance excludes deceleration distance, and lifeline/lanyard elongation, but includes any deceleration device slide distance or self-retracting lifeline/lanyard extension before they operate and fall arrest forces occur.

*Guardrail system* means a barrier erected to prevent employees from falling to lower levels. (OSHR Page 31:3353).

*Hole* means a gap or void 2 inches (5.1 cm) or more in its least dimension, in a floor, roof, or other walking/working surface.

*Infeasible* means that it is impossible to perform the construction work using a conventional fall protection system (i.e., guardrail system, safety net system, or personal fall arrest system) or that it is technologically impossible to use any of these systems to provide fall protection.

*Lanyard* means a flexible line of rope, wire rope, or strap which generally has a connector at each end for connecting the body belt or body harness to a deceleration device, lifeline, or anchorage.

*Leading edge* means the edge of a floor, roof, or formwork for a floor or other walking/working surface (such as the deck) which changes location as additional floor, roof, decking or formwork sections are placed, formed or constructed. A leading edge is considered to be an "unprotected side and edge" during periods when it is not actively and continuously under construction.

*Lifeline* means a component consisting of a flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline), or for connection to anchorages at both ends to stretch horizontally (horizontal lifeline), and which serves as a means for connecting other components of a personal fall arrest system to the anchorage.

*Low-slope roof* means a roof having a slope less than or equal to 4 in 12 (vertical to horizontal).

*Lower levels* means those areas or surfaces to which an employee can fall. Such areas or surfaces include, but are not limited to, ground levels, floors, platforms, ramps, runways, excavations, pits, tanks, material, water, equipment, structures, or portions thereof.

*Mechanical equipment* means all motor or human propelled wheeled equipment used for roofing

work, except wheelbarrows and mopcars.

*Opening* means a gap or void 30 inches (76 cm) or more high and 18 inches (48cm) or more wide, in a wall or partition, through which employees can fall to a lower level.

*Overhead bricklaying and related work* means the process of laying bricks and masonry units such that the surface of the wall to be jointed is on the opposite side of the wall from the mason, requiring the mason to lean over the wall to complete the work. Related work includes mason tending and electrical installation incorporated into the brick wall during the overhand bricklaying process.

*Personal fall arrest system* means a system used to arrest an employee in a fall from a working level. It consists of an anchorage, connectors, a body belt or body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these. As of January 1, 1998, the use of a body belt for fall arrest is prohibited.

*Positioning device system* means a body belt or body harness system rigged to allow an employee to be supported on an elevated vertical surface, such as a wall, and work with both hands free while leaning.

*Rope grab* means a deceleration device which travels on a lifeline and automatically, by friction, engages the lifeline and locks so as to arrest the fall of an employee. A rope grab usually employs the principle of inertial locking, cam/level locking, or both.

*Roof* means the exterior surface on the top of a building. This does not include floors or formwork which, because a building has not been completed, temporarily becomes the top surface of a building.

*Roofing work* means the hoisting, storage, application, and removal of roofing materials and equipment, including related insulation, sheet metal, and vapor barrier work, but not including the construction of the roof deck.

*Safety-monitoring system* means a safety system in which a competent person is responsible for recognizing and warning employees of fall hazards.

*Self-retracting lifeline/lanyard* means a deceleration device containing a drum-wound line which can be slowly extracted from, or retracted onto, the drum under slight tension during normal employee movement, and which, after onset of a fall, automatically locks the drum and arrests the fall.

*Snaphook* means a connector comprised of a hook-shaped member with a normally closed keeper, or similar arrangement, which may be opened to permit the hook to receive an object and, when released, automatically closes to retain the object. Snaphooks are generally one of two types:

*The locking type with a self-closing, self locking keeper which remains closed and locked until unlocked and pressed open for connection or disconnection; or*

*The non-locking type with a self-closing keeper which remains closed until pressed open for connection or disconnection. As of January 1, 1998 the use of a non-locking snaphook as part of personal fall arrest systems and positioning device systems is prohibited.*

*Steep roof means a roof having a slope greater than 4 in 12 (vertical to horizontal).*

*Toeboard means a low protective barrier that will prevent the fall of materials and equipment to lower levels and provide protection from falls for personnel.*

*Unprotected sides and edges means any side or edge (except at entrances to points of access) of a walking/working surface, e.g., floor, roof, or ramp, or runway where there is no wall or guardrail system at least 39 inches (1.0m) high.*

*Walking/working surface means any surface, whether horizontal or vertical on which an employee walks or works, including, but not limited to, floors, roofs, ramps, bridges, runways, formwork and concrete reinforcing steel but not including ladders, vehicles, or trailers, on which employees must be located in order to perform their job duties.*

*Warning line system means a barrier erected on a roof to warn employees that they are approaching an unprotected roof side or edge, and which designates an area in which roofing work may take place without the use of guardrail, body belt, or safety net systems to protect employees in the area.*

*Work area means that portion of a walking/working surface where job duties are being performed.*

## ***Policy***

The employer shall determine if the walking/working surfaces on which its employees are to work have the strength and structural integrity to support employees safely. Employees shall be allowed to work on those surfaces only when the surfaces have the requisite strength and structural integrity.

Unprotected sides and edges. Each employee on a walking/working surface (horizontal and vertical surface) with an unprotected side or edge which is 6 feet (1.8m) or more above a lower level shall be protected from falling by the use of guardrail systems, safety net systems, or personal fall arrest systems. Each employee who is constructing a leading edge 6 feet (1.8m) or more above lower levels shall be protected from falling by guardrail systems, safety net systems or personal fall arrest systems. Exception: When the employer can demonstrate that it is infeasible or creates a greater hazard to use these systems, the employer shall develop and implement a fall protection plan which meets the requirements of paragraph (k) of 1926.502.

**Note:** There is a presumption that it is feasible and will not create a greater hazard to implement at least one of the above listed fall protection systems. Accordingly, the employer has the burden of (OSHR Page 31:3354) establishing that it is appropriate to implement a fall protection plan which

complies with 1926.502(k) for a particular workplace situation, in lieu of implementing any of those systems.

Each employee on a walking/working surface 6 feet (1.8m) or more above a lower level where leading edges are under construction, but who is not engaged in the leading edge work, shall be protected from falling by a guardrail system, safety net system, or personal fall arrest system. If a guardrail system is chosen to provide the fall protection, and a controlled access zone has already been established for leading edge work, the control line may be used in lieu of a guardrail along the edge that parallels the leading edge.

O,R&L, through its Responsible Safety Officer will provide and install all fall protection systems required by this subpart for an employee, and shall comply with other pertinent requirements of this subpart before that employee begins the work that necessitates the fall protection.

### ***Hoist areas***

Each employee in a hoist area shall be protected from falling 6 feet (1.8m) or more to lower levels by guardrail systems or personal fall arrest systems. If guardrail systems, {or chain, gate or guardrail} or portions thereof, are removed to facilitate the hoisting operation (e.g. during landing of materials), and an employee must lean through the access opening or out over the edge of the access opening (to receive or guide equipment and materials, for example), that employee shall be protected from fall hazards by a personal fall arrest system.

### ***Holes***

Each employee on walking/working surfaces shall be protected from falling through holes (including skylights) more than 6 feet (1.8m) above lower levels, by personal fall arrest systems, covers, or guardrail systems erected around such holes.

Each employee on a walking/working surface shall be protected from tripping in or stepping into or through holes (including skylights) by covers.

Each employee on a walking/working surface shall be protected from objects falling through the holes (including skylights) by covers.

### ***Formwork and reinforcing steel***

Each employee on the face of formwork or reinforcing steel shall be protected from falling 6 feet (1.8m) or more to lower levels by personal fall arrest systems, safety net systems, or positioning device systems.

### ***Ramps, runways and other walkways***

Each employee on ramps, runways, and other walkways shall be protected from falling 6 feet (1.8m) or more to lower levels by guardrail systems.



## *Excavations*

Each employee at the edge of an excavation 6 feet (1.8m) or more in depth shall be protected from falling by guardrail systems, fences, or barricades when the excavations are not readily seen because of plant growth or other visual barrier;

Each employee at the edge of a well, pit, shaft, and similar excavation 6 feet (1.8m) or more in depth shall be protected from falling by guardrail systems, fences, barricades, or covers.

## *Dangerous equipment*

Each employee less than 6 feet (1.8m) above dangerous equipment shall be protected from falling into or onto the dangerous equipment by guardrail systems or by equipment guards.

Each employee 6 feet (1.8m) or more above dangerous equipment shall be protected from fall hazards by guardrail systems, personal fall arrest systems, or safety net systems.

## *Overhand bricklaying and related work*

Except as otherwise provided in paragraph (b) of this section, each employee performing overhand bricklaying and related work 6 feet (1.8m) or more above lower levels, shall be protected from falling by guardrail systems, safety net systems, personal fall arrest systems, or shall work in a controlled access zone.

(b) Each employee reaching more than 10 inches (25cm) below the level of walking/working surface on which they are working shall be protected from falling by a guardrail system, safety net system, or personal fall arrest system.

**Note:** Bricklaying operations performed on scaffolds are regulated by subpart L-Scaffolds (see the RSO)

## *Roofing work on Low-slope roofs*

Except as otherwise provided in paragraph (b) of this section, each employee engaged in roofing activities on low-slope roofs, with unprotected sides and edges 6 feet (1.8m) or more above lower levels shall be protected from falling by guardrail systems, safety net systems, personal fall arrest systems, or a combination of warning line system and guardrail system, warning line system and safety net system, or warning line system and personal fall arrest system, or warning line system and safety monitoring system. Or, on roofs 50-feet (15.25m) or less in width (see the RSO), the use of a safety monitoring system alone {i.e. without the warning line system} is permitted.

## *Steep roofs*

Each employee on a steep roof with unprotected sides and edges 6 feet (1.8m) or more above lower levels shall be protected from falling by guardrail systems with toeboards, safety net systems, or personal fall arrest systems.

## ***Precast concrete erection***

Each employee engaged in the erection of precast concrete members (including, but not limited to the erection of wall panels, columns, beams, and floor and roof “tees”) and related operations such as grouting of precast concrete members, who is 6 feet (1.8m) or more above lower levels shall be protected from falling by guardrail systems, safety net systems, or personal fall arrest systems, unless another provision in paragraph (b) of this section provides for an alternative fall protection measure. Exception: When the employer can demonstrate that it is infeasible or creates a greater hazard to use these systems, the employer shall develop and implement a fall protection plan which meets the requirements of paragraph (k) of 1926.502.

## ***Wall openings***

Each employee working on, at, above or near wall openings (including those with chutes attached) where the outside bottom edge of the wall opening is 6 feet (1.8m) or more above lower levels and the inside bottom edge of the wall opening is less than 39 inches (1.0) above the walking/working surface, shall be protected from falling by the use of a guardrail system, a safety net system, or a personal fall arrest system.

## ***Walking/working surfaces not otherwise addressed***

Except as provided in, each employee on a walking/working surface 6 feet (1.8m) or more above lower levels shall be protected from falling by a guardrail system, (OSHR Page 31:3355) safety net system, or personal fall arrest system.

## ***Protection from falling objects***

When an employee is exposed to falling objects, the employer shall have each employee wear a hard hat and shall implement one of the following measures:

- Erect toeboards, screens or guardrail systems to prevent objects from falling from higher levels; or,
- Erect a canopy structure and keep potential fall objects far enough from the edge of the higher level so that those objects would not go over the edge if they were accidentally displaced; or,
- Barricade the area to which objects could fall, prohibit employees from entering the barricaded area, and keep objects that may fall far enough away from the edge of a higher level so that those objects would not go over the edge if they were accidentally displaced.

## Chapter 18 Fall Protection (Part 2) Procedures

### *Guardrail systems*

Guardrail systems and their use shall comply with the following provisions:

Top edge height of top rails, or equivalent guardrail system members, shall be 42 inches (1.1m) plus or minus 3 inches (8 cm) above the walking/working level. When conditions warrant, the height of the top edge may exceed the 45-inch height, provided the guardrail system meets all other criteria of this paragraph ( ).

**Note:** When employees are using stilts, the top edge height of the top rail, or equivalent member, shall be increased an amount equal to the height of the stilts.

Midrails, screens, mesh, intermediate vertical members or equivalent intermediate structural members shall be installed between the top edge of the guardrail system and the walking/working surface when there is no wall or parapet wall at least 21 inches (53cm) high.

Midrails, when used, shall be installed at a height midway between the top edge of the guardrail system and the walking/working level.

Screens and mesh, when used, shall extend from the top rail to the walking/working level along the entire opening between top rail supports.

Intermediate members (such as balusters), when used between posts, shall be not more than 19 inches (48cm) apart.

Other structural members (such as additional midrails and architectural panels) shall be installed such that there are no openings in the guardrail system that are more than 19 inches (.5m) wide.

Guardrail systems shall be capable of withstanding, without failure, a force of at least 200 pounds (890N) applied within 2 inches (5.1cm) of the top edge, in any outward or downward direction, at any point along the top edge.

When the 200 pound (890N) test load specified in this section is applied in a downward direction, the top edge of the guardrail shall not deflect to a height less than 39 inches (1.0m) above the walking/working level. Guardrail system components selected and constructed in accordance with the Appendix B to subpart M (see the RSO) will be deemed to meet this requirement.

Midrails, screens, mesh, intermediate vertical members, solid panels, and equivalent structural members shall be capable of withstanding, without failure, a force of at least 150 pounds (666N) applied in any downward or outward direction at any point along the midrail or other member.

Guardrail systems shall be so surfaced as to prevent injury to an employee from punctures or lacerations, and to prevent snagging of clothing.



The ends of all top rails and midrails shall not overhang the terminal posts, except where such overhang does not constitute a projection hazard.

Steel banding and plastic banding shall not be used as top rails or midrails.

Top rails and midrails shall be at least one-quarter inch (0.6cm) nominal diameter or thickness to prevent cuts and lacerations. If wire rope is used for top rails, it shall be flagged at not more than 6-foot intervals with high visibility material.

When guardrail systems are used at hoisting areas, a chain, gate or removable guardrail section shall be placed across the access opening between guardrail sections when hoisting operations are not taking place.

When guardrail systems are used at holes, they shall be erected on all unprotected sides or edges of the hole.

When guardrail systems are used around holes use for the passage of materials, the hole shall have not more than two sides provided with removable guardrail sections to allow the passage of materials. When the hole is not in use, it shall be closed over with a cover, or guardrail system shall be provided along all unprotected sides or edges.

When guardrail systems are used around holes which are used as points of access (such as ladderways), they shall be provided with a gate, or be so offset that a person cannot walk directly into the hole.

Guardrail systems used on ramps and runways shall be erected along each unprotected side or edge.

Manila, plastic or synthetic rope being used for top rails or midrails shall be inspected as frequently as necessary to ensure that it continues to meet the strength requirements of this section.

### ***Safety net systems***

Safety net systems and their use shall comply with the following provisions:

Safety nets shall be installed as close as practicable under the walking/working surface on which employees are working, but in no case more than 30 feet (9.1m) below such level. When nets are used on bridges, the potential fall area from the walking/working surface to the net shall be unobstructed.

Safety nets shall extend outward from the outermost projection of the work surface as follows:

#### **Minimum required horizontal distance**

Vertical distance from working level to horizontal plane of net:	of outer edge of net from the edge of the working surface:
Up to 5 feet	8 feet



More than 5 feet up to 10 feet	10 feet
More than 10 feet	13 feet.

Safety nets shall be installed with sufficient clearance under them to prevent contact with the surface or structures below when subjected to an impact force equal to the drop test specified in this section.

Safety nets and their installations shall be capable of absorbing an impact force equal to that produced by the drop test specified in this section.

### ***Drop Testing***

Except as provided, safety nets and safety net installations shall be drop- tested at the jobsite after initial installation and before being used as a fall protection system, whenever relocated, after major repair, and at 6 month intervals if left in one place. The drop-test shall consist of a 400 pound (180kg) bag of sand  $30 \pm 2$  inches ( $76 \pm 5$  cm) in diameter dropped into the net from the highest walking/working surface at which employees are exposed to fall hazards, but not from less than 42 inches (1.1m) above that level.

When the employer can demonstrate that it is unreasonable to perform the drop-test required by this section, the employer (or a designated competent person) shall certify that the net and net installation is in (OSHR Page 31:3356) compliance with the provisions of this section by preparing a certification record prior to the net being used as a fall protection system. The certification record must include an identification of the net and net installation for which the certification record is being prepared; the date that it was determined that the identified net and net installation were in compliance with this section and the signature or the person making the determination and certification. The most recent certification record for each net and net installation shall be available at the jobsite for inspection.

### ***Defective nets shall not be used***

Safety nets shall be inspected at least once a week for wear, damage, and other deterioration. Defective components shall be removed from service. Safety nets shall also be inspected after any occurrence which could affect the integrity of the safety net system.

Materials, scrap pieces, equipment, and tools which have fallen into the safety net shall be removed as soon as possible from the net and at least before the next work shift.

The maximum size of each safety net mesh opening shall not exceed 36 square inches (230cm<sup>2</sup>) nor be longer than 6 inches (15cm) on any side, and the opening, measured center- to-center of mesh ropes or webbing, shall not be longer than 6 inches (15cm). All mesh crossings shall be secured to prevent enlargement of the mesh opening.

Each safety net (or section of it) shall have a border rope for webbing with a minimum breaking

strength of 5,000 pounds (22.2kN).

Connections between safety net panels shall be as strong as integral net components and shall be spaced not more than 6 inches (15cm) apart.

### *Personal fall arrest systems*

Personal fall arrest systems and their use shall comply with the provisions set forth below. Effective January 1, 1998, body belts are not acceptable as part of a personal fall arrest system.

**Note:** The use of a body belt in a positioning device system is acceptable and is regulated under of this section.

Connectors shall be drop forged, pressed or formed steel, or made of equivalent materials.

Connectors shall have a corrosion-resistant finish, and all surfaces and edges shall be smooth to prevent damage to interfacing parts of the system.

Dee-rings and snaphooks shall have a minimum tensile strength of 5,000 pounds (22.2kN).

Dee-rings and snaphooks shall be proof-tested to a minimum tensile load of 3,600 pounds (16 kN) without cracking, breaking, or taking permanent deformation.

Snaphooks shall be sized to be compatible with the member to which they are connected to prevent unintentional disengagement of the snaphook by depression of the snaphook keeper by the connected member, or shall be a locking type snaphook designed and used to prevent disengagement of the snaphook by the contact of the snaphook keeper by the connected member. Effective January 1, 1998, only locking type snaphooks shall be used.

Unless the snaphook is a locking type and designed for the following connections, snaphooks shall not be engaged:

directly to webbing, rope or wire rope;

to each other;

to a dee-ring to which another snaphook or other connector is attached;

to a horizontal lifeline; or

to any object which is incompatibly shaped or dimensioned in relation to the snaphook such that unintentional disengagement could occur by the connected object being able to depress the snaphook keeper and release itself.

On suspended scaffolds or similar work platforms with horizontal lifelines which may become vertical lifelines, the devices used to connect to a horizontal lifeline shall be capable of locking in both directions on the lifeline.

Horizontal lifelines shall be designated, installed, and used, under the supervision of a qualified

person, as part of a complete personal fall arrest system, which maintains a safety factor of at least two.

Lanyards and vertical lifelines shall have a minimum breaking strength of 5,000 pounds (22.2kN).

Except as provided in this section, when vertical lifelines are used, each employee shall be attached to a separate lifeline.

During the construction of elevator shafts, two employees may be attached to the same lifeline in the hoistway, provided both employees are working atop a false car that is equipped with guardrails; the strength of the lifeline is 10,000 pounds {5,000 pounds per employee attached} (44.4 kN); and all other criteria specified in this paragraph for lifelines have been met.

Lifelines shall be protected against being cut or abraded.

Self retracting lifelines and lanyards which automatically limit free fall distance to 2 feet (0.61m) or less shall be capable of sustaining a minimum tensile load of 3,000 pounds (13.3kN) applied to the device with the lifeline or lanyard in the fully extended position.

Self-retracting lifelines and lanyards which do not limit free fall distance to 2 feet (0.61m) or less, ripstitch lanyards, and tearing and deforming lanyards shall be capable of sustaining a minimum tensile load of 5,000 pounds (22.2kN) applied to the device with the lifeline or lanyard in the fully extended position.

Ropes and straps (webbing) used in lanyard, lifelines, and strength components of body belts and body harnesses shall be made from synthetic fibers.

Anchorage used for attachment of personal fall arrest equipment shall be independent of any anchorage being used to support or suspend platforms and capable of supporting at least 5,000 pounds (22.2kN) per employee attached, or shall be designed, installed, and used as follows:

- as part of a complete personal fall arrest system which maintains a safety factor of
- least two; and under the supervision of a qualified person.

**Personal fall arrest systems, when stopping a fall, shall:**

- limit maximum arresting force on an employee to 900 pounds (4kN) when used with a body belt
- limit maximum arresting force on an employee to 1,800 pounds (8kN) when used with a body harness
- be rigged such that a employee can neither free fall more than 6 feet( 1.8m), nor contact any lower level
- bring an employee to a complete stop and limit maximum deceleration distance an employee travels to 3.5 feet (1.07m)

- have sufficient strength to withstand twice the potential impact energy of an employee free falling a distance of 6 feet (1.8m), or the free fall distance permitted by the system, whichever is less

**Note:** If the personal fall arrest system meets the criteria and protocols contained in Appendix C to subpart M (see the RSO), and if the system is being used by an employee having a combined person and tool weight of less than 310 pounds (140kg), the system will be considered to be in compliance with the provisions of paragraph (d)(16) of this section. If the system is used by an employee having a combined tool and body weight of 310 pounds (140kg) or more, then the employer must appropriately modify the criteria and protocols of the Appendix to provide proper protection for such heavier weights, or the system will not be deemed to be in compliance with the requirements of this section.

The attachment point of the body belt shall be located in the center of the wearer's back. The attachment point of the body harness shall be located in the center of the wearer's back near shoulder level, or above the wearer's head.

Body belts, harnesses, and components shall be used only for employee (OSHR Page 31:3357) protection (as part of a personal fall arrest system or positioning device system) and not to hoist materials.

Personal fall arrest and components subjected to impact loading shall be immediately removed from service and shall not be used again for employee protection until inspected and determined by a competent person to be undamaged and suitable for reuse.

The employer shall provide for prompt rescue of employees in the event of a fall or shall assure that employees are able to rescue themselves.

Personal fall arrest systems shall be inspected prior to each use for wear, damage and other deterioration, and defective components shall be removed from service.

Body belts shall be at least one and five-eighths (1 5/8) inches (4.1cm) wide.

Personal fall arrest systems shall not be attached to guardrail systems, nor shall they be attached to hoists except as specified in other subparts of this Part.

When a personal fall arrest system is used at hoist areas, it shall be rigged to allow the movement of the employee as far as the edge of the walking/working surface.

### ***Positioning device systems***

**Positioning device systems and their use shall conform to the following provisions:**

Positioning devices shall be rigged such that an employee cannot free fall more than 2 feet (.9m).

Positioning devices shall be secured to an anchorage capable of supporting at least twice the



potential impact load of an employee's fall or 3,000 pounds (13.3kN), whichever is greater.

Connectors shall be drop forged, pressed or formed steel, or made of equivalent materials.

Connectors shall have a corrosion-resistant finish, and all surfaces and edges shall be smooth to prevent damage to interfacing parts of this system.

Connecting assemblies shall have a minimum tensile strength of 5,000 pounds (22.2kN).

Dee-rings and snaphooks shall be proof-tested to a minimum tensile load of 3,600 pounds (16kN) without cracking, breaking, or taking permanent deformation.

Snaphooks shall be sized to be compatible with the member to which they are connected to prevent unintentional disengagement of the snaphook by depression of the snaphook keeper by the connected member, or shall be a locking type snaphook designed and used to prevent disengagement of the snaphook by the contact of the snaphook keeper by the connected member. As of January 1, 1998, only locking type snaphooks shall be used.

Unless the snaphook is a locking type and designed for the following connections, snaphooks shall not be engaged:

- directly to webbing, rope or wire rope;
- to each other,
- to a dee-ring to which another snaphook or other connector is attached;
- to a horizontal lifeline; or
- to any object which is incompatibly shaped or dimensioned in relation to the snaphook such that unintentional disengagement could occur by the connected object being able to depress the snaphook keeper and release itself.

Positioning device systems shall be inspected prior to each use for wear, damage, and other deterioration, and defective components shall be removed from service.

Body belts, harnesses, and components shall be used only for employee protection (as part of a personal fall arrest system or positioning device system) and not to hoist materials.

### ***Warning line systems***

Warning line systems and their use shall comply with the following provisions:

The warning line shall be erected around all sides of the roof work area.

When mechanical equipment is not being used, the warning line shall be erected not less than 6 feet (1.8m) from the roof edge.

When mechanical equipment is being used, the warning line shall be erected not less than 6 feet

(1.8m) from the roof edge which is parallel to the direction of mechanical equipment operation, and not less than 10 feet (3.1m) from the roof edge which is perpendicular to the direction of mechanical equipment operation.

Points of access, materials handling areas, storage areas, and hoisting areas shall be connected to the work area by an access path formed by two warning lines.

When the path to a point of access is not in use, a rope, wire, chain, or other barricade, equivalent in strength and height to the warning line, shall be placed across the path at the point where the path intersects the warning line erected around the work area, or path shall be offset such that a person cannot walk directly into the work area.

Warning lines shall consist of ropes, wires, or chains, and supporting stanchions erected as follows:

The rope, wire, or chain shall be flagged at not more than 6-foot (1.8m) intervals with high visibility material;

The rope, wire, or chain shall be rigged and supported in such away that its lowest point (including sag) is no less than 34 inches (.9m) from the walking/working surface and its highest point is no more than 39 inches (1.0m) from the walking/working surface;

After being erected, with the rope, wire, or chain attached, stanchions shall be capable of resisting, without tipping over, a force of at least 16 pounds (71N) applied horizontally against the stanchion, 30 inches (.8m) above the walking/working surface, perpendicular to the warning line, and in the direction of the floor, roof, or platform edge;

The rope, wire or chain shall have a minimum tensile strength of 500 pounds (2.22kN), and after being attached to the stanchions, shall be capable of supporting, without breaking, the loads applied to the stanchions as prescribed in this section; and

The line shall be attached at each stanchion in such a way that pulling on one section of the line between stanchions will not result in slack being taken up in adjacent sections before the stanchions tip over.

No employee shall be allowed in the area between a roof edge and a warning line unless the employee is performing roofing work in that area.

Mechanical equipment on roofs shall be used or stored only in areas where employees are protected by a warning line system, guardrail system, or personal fall arrest system.

### ***Controlled access zones***

Controlled access zones and their use shall conform to the following provisions:

When used to control access to areas where leading edge and other operations are taking place the controlled access zone shall be defined by a control line or by any other means that restricts access.

When control lines are used, they shall be erected not less than 6 feet (1.8m) nor more than 25 feet (7.7m) from the unprotected or leading edge, except when erecting pre-cast concrete members.

When erecting pre-cast concrete members, the control line shall be erected not less than 6 feet (1.8m) nor more than 25 feet (7.7m) from the unprotected or leading edge, except when erecting pre-cast concrete members.

The control line shall extend along the entire length of the unprotected or leading edge and shall be approximately parallel to the unprotected or leading edge.

The control line shall be connected on each side to a guardrail system or wall.

When used to control access to areas where overhand bricklaying and related work are taking place:

The controlled access zone shall be defined by a control line erected not less than 10 feet (3.1m) nor more than 15 feet (4.5m) from the working edge. (OSHR Page 31:3358)

The control line shall extend for a distance sufficient for the controlled access zone to enclose all employees performing overhand bricklaying and related work at the working edge and shall be approximately parallel to the working edge.

Additional control lines shall be erected at each end to enclose the controlled access zone.

Only employees engaged in overhand bricklaying or related work shall be permitted in the controlled access zone.

Control lines shall consist of ropes, wires, tapes, or equivalent materials, and supporting stanchions as follows:

Each line shall be flagged or otherwise clearly marked at not more than 6-foot (1.8m) intervals with high-visibility material.

Each line shall be rigged and supported in such away that its lowest point (including sag) is not less than 39 inches (1m) from the walking/working surface and its highest point is not more than 45 inches (1.3m) {50 inches (1.3m) when overhand bricklaying operations are being performed} from the walking/working surface.

Each line shall have a minimum breaking strength of 200 pounds (.88kN).

On floors and roofs where guardrail systems are not in place prior to the beginning of overhand bricklaying operations, controlled access zones shall be enlarged, as necessary, to enclose all points of access, material handling areas, and storage areas.

On floors and roofs where guardrail systems are in place, but need to be removed to allow overhand bricklaying work or leading edge work to take place, only that portion of the guardrail necessary to accomplish that day's work shall be removed.

## *Safety monitoring systems*

Safety monitoring systems and their use shall comply with the following provisions:

The employer shall designate a competent person to monitor the safety of other employees and the employer shall ensure that the safety monitor complies with the following requirements:

The safety monitor shall be competent to recognize fall hazards;

The safety monitor shall warn the employee when it appears that the employee is unaware of a fall hazard or is acting in an unsafe manner;

The safety monitor shall be on the same walking/working surface and within visual sighting distance of the employee being monitored;

The safety monitor shall be close enough to communicate orally with the employee; and

The safety monitor shall not have other responsibilities which could take the monitor's attention from the monitoring function.

Mechanical equipment shall not be used or stored in areas where safety monitoring systems are being used to monitor employees engaged in roofing operations on low-slope roofs.

No employee, other than an employee engaged in roofing work {on low-sloped roofs} or an employee covered by a fall protection plan, shall be allowed in an area where an employee is being protected by a safety monitoring system.

Each employee working in a controlled access zone shall be directed to comply promptly with fall hazard warnings from safety monitors.

## *Covers*

Covers for holes in floors, roof, and other walking/working surfaces shall meet the following requirements:

Covers located in roadways and vehicular aisles shall be capable of supporting, without failure, at least twice the maximum axle load of the largest vehicle expected to cross over the cover.

All other covers shall be capable of supporting, without failure, at least twice the weight of employees, equipment, and materials that may be imposed on the cover at any one time.

All covers shall be secured when installed so as to prevent accidental displacement by the wind, equipment, or employees.

All covers shall be color coded or they shall be marked with the word "HOLE" or "COVER" to provide warning of the hazard.

**Note:** This provision does not apply to cast iron manhole covers or steel grates used on streets or roadways.

## *Protection from falling objects*

Falling object protection shall comply with the following provisions:

Toeboards, when used as falling object protection, shall be erected along the edge of the overhead walking/working surface for a distance sufficient to protect employees below.

Toeboards shall be capable of withstanding, without failure a force of at least 50 pounds (222N) applied in any downward or outward direction at any point along the toeboard.

Toeboards shall be a minimum of 3 ½ inches (9cm) in vertical height from their top edge to the level of the walking /working surface. They shall have not more than ¼ inch (0.6cm) clearance above the walking/working surface. They shall be solid or have openings not over 1 inch (2.5cm) in greatest dimension.

Where tools, equipment, or materials are piled higher than the top edge of a toeboard, paneling or screening shall be erected from the walking/working surface or toeboard to the top of a guardrail system's top rail or midrail, for a distance sufficient to protect employees below.

Guardrail systems, when used as falling object protection, shall have all openings small enough to prevent passage of potential falling objects.

During the performance of overhand bricklaying and related work:

- No materials or equipment except masonry and mortar shall be stored within 4 feet (1.2m) of the working edge.
- Excess mortar, broken or scattered masonry units, and all other materials and debris shall be kept clear from the work area by removal at regular intervals.

During the performance of roofing work:

- Materials and equipment shall not be stored within 6 feet (1.8m) of a roof edge unless guardrails are erected at the edge.
- Materials which are piled, grouped, or stacked near a roof edge shall be stable and self-supporting.

Canopies, when used as falling object protection, shall be strong enough to prevent collapse and to prevent penetration by any objects which may fall onto the canopy.

The Responsible Safety Officer will advise, on request, regarding usage and procedures, and has all of the documentation referenced above to use for reference.

It is the responsibility of the supervisor to plan the intended work sufficiently to ensure that job planning and proper precautions have been taken. The Responsible Safety Officer is available for consultation.



## *Personnel Platforms*

Work may be performed from a crane-suspended platform where another procedure is not possible because of structure design or work site conditions.

Personnel platforms must be designed by a qualified engineer and reviewed by the Responsible Safety Officer. The suspension system must minimize tipping. The platform must be designed with a minimum safety factor of 5 based on the ultimate strength of the members, and the design must conform to 29 CFR 1926.550(g).

Additionally, all of the above Fall Protection requirements must be met.

## Chapter 19 Tools

### *Company Provided Tools*

O,R&L provides hand and powered portable tools that meet accepted safety standards. A damaged or malfunctioning tool must not be used; it must be turned in for servicing and a tool in good condition obtained to complete the job. Employees must use the correct tool for the work to be performed; if they are unfamiliar with the operation of the tool, they must request instruction from their supervisor before starting the job. Supervisors are responsible for ensuring that their subordinates are properly trained in the operation of any tool that they are expected to operate. An employee is not permitted to use a powder-actuated tool unless instructed and licensed by the manufacturer.

### *Grounding*

Tools that are not double-insulated must be effectively grounded and tested. Testing must be accomplished before initial issue, after repairs, and after any incident that could cause damage, such as dropping or exposure to a wet environment.

Grounded tools must always be used with an effectively grounded circuit. Any extension cord used with a grounded tool must be a three-wire, grounded type.

Electric-powered hand tools used on construction sites, on temporary wired circuits, or in wet environments will be used in conjunction with an approved ground fault circuit interrupter (GFCI).

The responsibility for implementing and maintaining this program rests with the individual supervisors involved.

Tool testing equipment will be maintained by the Responsible Safety Officer.

Documentation of tool testing will be maintained by the group owning powered hand tools. Tools maintained in a tool crib and tested prior to issue are exempted from this requirement.

Repairs of defective tools will only be made by qualified electrical personnel.

### *Shop Rules*

Any O,R&L facility housing shop tools is defined by OSHA as a shop. It is the responsibility of the person in charge of each shop to ensure compliance with the following practices:

Shop machines and tools are to be used only by qualified personnel. It is the responsibility of the person in charge of the shop to render a judgment as to who is qualified.



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The person in charge will take whatever action is deemed necessary to prevent a personal injury or damage to equipment.

Equipment guards and protective devices must be used and must not be compromised.

Approved eye protection (visitor's glasses) must be worn by anyone entering and/or passing through shop areas.

Approved industrial safety eye protection must be worn by anyone working in a posted shop area.

Shoes or boots covering the whole foot must be worn in shop areas.

Persons using machine tools must not wear clothing, jewelry or long hair in such a way as to represent a safety hazard.





## Chapter 20 Traffic and Transportation

### *Official Vehicle Use*

O,R&L requires that an operator hold a valid driver's license for the class of vehicle that he/she is authorized to operate. Persons intending to operate forklifts are required to successfully complete the appropriate course as outlined in this manual.

### *Responsibility*

Each division Director and Department Head is responsible for restricting the use of Company-furnished vehicles to official Company business only. They are also responsible for limiting use of such vehicles to properly authorized personnel. Use of an official vehicle for an employee's personal convenience or benefit constitutes misuse and is prohibited. Employees who misuse Company vehicles are subject to disciplinary action and financial responsibility for any accident.

All drivers of Company vehicles are responsible for reporting any damage or deficiency to the office. Repairs, adjustments and maintenance can only be accomplished if the driver adequately documents and reports these items. Failure to report unsafe vehicle conditions can result in an accident.

### *Safety Belts*

Employees operating or riding in company-furnished vehicles, or personal vehicles on official company business are required to wear safety belts at all times. The driver should instruct the passengers to fasten their safety belts before operating the vehicle.

### *Cell Phone*

O,R&L employees driving company vehicles are strictly forbidden from speaking on cell phones while driving.

### *Accidents*

Any accident involving Company vehicles (including private, rented, or leased vehicles used on official company business) must be reported to the driver's supervisor. If the driver is unable to make a report, another employee who knows the details of the accident must make the report.

***It is O,R&L's policy that employees should not admit to responsibility for vehicle accidents occurring while on official business.*** It is important that such admissions, when appropriate, be reserved for the company and its insurance carrier. The law requires that each driver involved in a vehicle accident must show his/her license on request by the other party.



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Be sure to obtain adequate information on the drivers involved as well as on the owner of the vehicles. Names, addresses, driver's license numbers, vehicle descriptions, and registration information are essential. In addition, a description of damages is needed for completion of accident reports. If the accident is investigated by off site police agencies, request that a copy of the police report be sent to O,R&L, or to obtain the name and department of the investigating officer. A printed card titled "In Case of Accident" is kept in each official vehicle to assist in collecting required information. In case of collision with an unattended vehicle (or other property), the driver of the moving vehicle is required by law to notify the other party and to exchange information pertaining to the collision. If unable to locate the other party, leave a note in, or attached to, the vehicle (or other property) giving the driver's name, address, and vehicle license number.

The driver of any O,R&L vehicle involved in an accident must also complete a Company Motor Vehicle Accident Report and submit it to his/her supervisor within one workday of the accident.

The supervisor should interview the driver and complete the supervisor's portion of the report. Within two work days of the accident, the completed form and vehicle must be taken to the Administration Office so that damages may be estimated and repairs scheduled.

Forms for obtaining appropriate information about an accident are carried in the vehicle or may be obtained from Administration. The Responsible Safety Officer will receive copies of all accident reports and will prepare any required OSHA reports.

## Chapter 21 Hazard Warnings

### *Introduction*

Every reasonable method to warn employees of hazards and dangers and to inform them of the actions required must be utilized. Signs, characteristic lights, and audible alarms as additional safeguards for built-in mechanical and physical protection must be used. To ensure uniform response by personnel, the warning signs and devices must be of the same type for similar hazards. Obtaining and installing the warning systems is the responsibility of the group needing them.

### *Contents and Configuration*

Signs must conform to the colors, symbols, lettering size, and proportions as specified by O,R&L, except that radiation signs must conform to the requirements stated in 10 CFR 20. Every warning sign must include the following components:

An approved heading that indicates the relative hazard

A statement of the type of hazard

A statement of what to do or not to do in the area

### *Danger Signs*

Danger signs are used only where injury or damage is certain to occur if approved operating instructions and procedures are not followed. Personnel must be warned of the serious consequences of ignoring the message. The top of this sign says DANGER in white letters on a red oval that is edged by a rectangular black border. The body of the sign is white with the message printed in black.

### *Caution Signs*

Caution signs are used where injury or damage is possible and employees must be on their guard. The top of this sign says CAUTION in yellow letters on a black rectangle. The body of the sign is yellow with the message printed in black.

### *Informational Signs*

Informational signs are used where instructions are needed. The heading says NOTICE in white letters on a green rectangular when the message relates to safety and on a blue rectangle for the other messages. The body of the sign is white with the message printed in black.



## *Warning Devices*

Warning devices such as lights and audible alarms must be installed where they are needed to warn personnel against remaining in or entering hazardous areas.

Personnel must be instructed about the meaning and the response required when an alarm sounds.

An explanatory sign (describing hazard and action to take) must be posted near a warning light that when ON indicates danger, caution, high explosives, or radioactivity. In a highly illuminated area, the warning light should be surrounded by a disk or wide-angled cone of a contrasting color.



## Chapter 22 Off-Site Safety

### *Off-Site Operations*

Off-site operations are those performed away from the Company and for which O,R&L personnel have responsibility in one or more of the following fields: design, test, transportation, assembly, operation, maintenance, disassembly, and storage or removal of equipment.

All off-site operations must be reviewed to determine if an Operational Safety Procedure (OSP) is required. The OSP will be reviewed by the Responsible Safety Officer.

Personnel contemplating off-site operations must give written notification of the nature and scope of the project to the Responsible Safety Officer. This notification must be made as soon as possible after the project is approved. The OSP will be reviewed by the Responsible Safety Officer.

The Responsible Safety Officer may visit off-site operations in order to: Observe local conditions.

Inspect facilities prior to operation.

Evaluate periodically operating procedures and modifications.

Evaluate procedures for disassembly, transportation, and storage.

When O,R&L employees are injured or become ill during off-site operations, the following procedure should be used:

Employees should obtain appropriate treatment by a nearby physician or hospital staff.

Those rendering care should be informed that the injury is work related.

The Responsible Safety Officer should be informed so the proper injury report can be prepared.

## Chapter 23 Carcinogens

### *Introduction*

This section of the Safety Manual describes the recommendations and requirements established to govern the use of substances that pose a carcinogenic risk. All personnel using chemical carcinogens are expected to be familiar with these guidelines and conduct their operations accordingly.

### *Responsibilities*

The responsibilities of various groups involved with chemical safety at O,R&L are described below.

#### *Responsibility Safety Officer:*

Determines if the use of a carcinogen creates a significant potential for occupational exposure.

Evaluates operations for compliance with OSHA mandated standards.

Provides technical guidance to personnel regarding the selection of appropriate laboratory practices and engineering controls.

Investigates all reported incidents that result in exposure of personnel or the environment to chemical carcinogens and recommends corrective actions to reduce the potential for recurrence.

Supervises cleanup operations where incidents have resulted in significant contamination of laboratory areas or personnel.

Updates and transmits list of carcinogens to the Purchasing Department.

Authorizes issue of carcinogens stocked at the O,R&L Storeroom.

#### *Purchasing Department:*

Specifies special distribution procedures and purchase orders for carcinogens. Materials Management Department:

Obtains approval from the Responsible Safety Officer before issuing carcinogens.

#### *Receiving Department*

Notifies the Responsible Safety Officer of the receipt of carcinogens designated for special distribution (Distribution Category A).



## *Supervisor*

Employs and ensures the use of appropriate practices, engineering controls, and personal protective equipment that reduce the potential for exposure as low as reasonably achievable.

Informs employees under his/her supervision of the potential hazards associated with the use of carcinogens and provides proper training and instruction in the use of laboratory practices, engineering controls, and emergency procedures.

Reviews operating procedures with the Responsible Safety Officer before the initiation of an operation or when significant changes occur in an ongoing operation.

Reports to the Medical Services Department any incident that involves the exposure of personnel to carcinogens.

Reports to the Responsible Safety Officer any incident that results in danger of environmental contamination from carcinogens.

Provides any necessary assistance during accident investigations.

## *Other Company Personnel:*

Know and comply with safety practices required for the assigned task. Wear appropriate protective clothing.

Report all unsafe conditions to the laboratory supervisor.

Attend appropriate training in safety procedures for handling and using carcinogenic materials.

Report to the Responsible Safety Officer when pregnant to review safety conditions.

Report to the immediate supervisor and the Responsible Safety Officer all facts pertaining to incidents resulting in exposure to carcinogens or in environmental contamination.

## *Practices and Controls*

The practices and engineering controls included in this section provide general safeguards that are recommended for the use of chemical carcinogens. To select the appropriate safeguards, knowledge is required of the physical and chemical properties, the proposed use, the quantity needed, the carcinogenic and other toxic hazards, and the applicable health and safety standards. Careful judgment is therefore essential in planning any activity that involves chemical carcinogens. Personnel within the Responsible Safety Officer's Department are available to assist the laboratory supervisor in selecting the appropriate safeguards. Carcinogen Safety Data Sheets provide details of chemical and physical properties, hazards, and safe operational procedures for

specific carcinogens.

Wear gloves appropriate to the task. Discard after each use and immediately after any obvious contact.

Wear appropriate eye protection. The type of eyewear used will depend upon the hazard presented by the operation and chemical in use. Contact lenses should be removed.

Do not eat, drink, smoke, chew gum or tobacco, apply cosmetics carcinogens are used or stored.

Do not pipette by mouth- use mechanical aids.

Wash hands immediately after the completion of any procedure. Wash immediately after an exposure, or if appropriate, shower the affected area.

Provide respirators for emergency use. (Personnel who will use respirators must have medical approval and be properly trained before use.)

### ***Operational Practices:***

Label all primary and secondary containers and place warning signs on entrances to work or storage areas. To obtain appropriate labels and signs, call the Responsible Safety Officer.

Limit entry to only personnel authorized by the supervisor for entry to work or storage areas. Women who are pregnant must consult with the Medical Services Department before the start of any activity involving chemical carcinogens.

### ***Maintenance and Emergency Storage Areas:***

Cover work surfaces with stainless steel or plastic trays, absorbent paper with a moisture-proof lining, or other impervious material. Decontaminate or discard the protective covering materials after the procedure has been completed.

Conduct aerosol-generating procedures or procedures involving volatile carcinogens in a chemical fume hood, a glove box, or other suitable containment equipment. Examples of aerosol-producing operations opening of closed vessels; transfer operations; preparation of mixtures; blending; sonification; open vessel centrifugation.

Capture vapors or aerosols produced by analytical instruments with local exhaust ventilation into a chemical fume hood.

Decontaminate obviously contaminated equipment.

Transfer carcinogens in tightly closed containers placed within a durable outer container.





Maintain an inventory of all carcinogens including the quantities acquired, dates of acquisition, and disposition.

Keep working quantities to a minimum; do not exceed the amounts required for use in one week. This does not include amounts stored in a designated area or a central cabinet.

Dissolve finely divided powdered carcinogens, if possible, into a liquid. This reduces the possibility of generating an aerosol.

Use mixtures that are as dilute as possible.

Place contaminated materials in a closed plastic bag and sealed primary container. Place the primary container in a durable box before transporting.

Label each primary container with content, amount, physical state, and percentage breakdown when dealing with a mixture. Each box must have a complete list on contents or description written on an official Hazardous Material packing list. To obtain blank packing lists, contact the Responsible Safety Officer.

## **Chlorinated Hydrocarbons**

The chlorinated hydrocarbons as a whole have many industrial as well as laboratory uses. At O,R&L they are commonly used cleaners, degreasers, paint removers, solvents, and extractants.

### ***Hazards***

Most of these compounds have an anesthetic (narcotic) effect, causing workers to feel “drunk”, become unconscious, or even die if the amount of inhaled vapor is excessive. Individuals working around moving machinery can be subject to accidents when their judgment and coordination are impaired by the anesthetic effects of inhaled solvents. Usually it is the anesthetic effect that is responsible for the sudden unconsciousness of persons exposed to solvents in tanks, pits, and other confined spaces. Trichloroethylene, ethylene dichloride, and chloroform are examples of compounds that are powerful anesthetics.

Some, but not all, of the chlorinated hydrocarbons are strong poisons that damage the liver, kidneys, nervous system, and/or other parts of the body. This damage may be permanent or even cause death, although recovery from lesser exposures does occur. Single exposures to higher concentrations of vapors, as well as repeated exposure to small concentrations can produce symptoms of poisoning. These symptoms most often come on gradually, with nausea, loss of appetite, vomiting, headaches, weakness, and mental confusion most often noted. Carbon tetrachloride, tetrachloroethane, and 1, 1, 2-trichloroethane are examples of compounds that are strong poisons.

All chlorinated hydrocarbons on repeated contact with the skin can cause rashes (dermatitis)

because of their ability to remove protective fats and oils from the skin. A few of these solvents are known to be capable of entering the body through contact with the skin. In addition, many of these compounds are highly irritating to the membranes around the eyes and in the nose, throat, and lungs. Examples of chlorinated hydrocarbons that have irritant properties are ethylene dichloride and chloroform.

Some compounds are human suspect carcinogens, such as carbon tetrachloride and chloroform. In studies on laboratory animals, several chlorinated hydrocarbons have been linked to the production of cancer. These compounds are ethylene dichloride, perchloroethylene, and trichloroethylene. At present, there is no direct evidence associating these compounds with an increased risk of cancer in humans.

When heated, these compounds can decompose, forming highly toxic fumes of phosgene, hydrochloric acid, and chlorine.

Most of the chlorinated hydrocarbons are non-flammable; however, there are exceptions. The Table below lists important characteristics of some of the common chlorinated hydrocarbon solvents.

### *TLV Volatility\**

Common name Chemical name (ppm)\*\* (mmHg) Flammability

Acetylene dichloride 1, 2-dichloroethylene 200 200

Moderate Carbon tetrachloride\*\*\*

Tetrachloromethane 5 115 Nonflammable Chloroform\*\*\*

Trichloromethane 10 200 Nonflammable

Ethylene dichloride 1, 2-dichloroethane 10 80

Moderate Methyl chloroform 1, 1, 1-trichloroethane 350 132

Nonflammable Methylene chloride Dichloromethane 100 435

Nonflammable Perchloroethylene Tetrachloroethylene 50 18

Nonflammable Tetrachloroethane 1, 1, 2, 2-tetrachloroethane 1 8

Nonflammable Trichloroethane 1, 1, 2-trichloroethane 10 25

Nonflammable Trichloroethylene Trichloroethylene 50 76

\*The threshold limit value (TLV) is expressed as parts of pure solvent vapors per million parts

(PPM) of air.

\*\*The vapor pressure at 77F (25C).

\*\*\*Designated as a carcinogen by OSHA.

Because of their inherent properties, these compounds are harmful to varying degrees.

For questions concerning the hazards of a specific compound, contact the Responsible Safety Officer.

### ***Precautions***

The above table includes information on the TLV, the volatility, and the flammability of the compound listed. These three characteristics always must be taken into careful consideration in selecting a compound in order to minimize the health hazards connected with its use. 1, 1, 1-trichloroethane (ethyl chloroform) is recommended for degreasing operations.

If there is a possibility of skin or eye contact, wear the appropriate protection equipment. Gloves made of impervious material should be worn for hand protection. Barrier creams are in no instance as protective as impervious gloves. However, if finger dexterity is an absolute requirement, a solvent resistant ointment may be used in some instances.

For high vapor concentrations, control by local exhaust ventilation or chemical fume hoods is necessary.

Chlorinated hydrocarbons should be stored in cool, dry and well-ventilated areas. Containers should be checked for leaks because metal corrosion can occur from hydrochloric acid produced by the decomposition of the solvent. Decomposition may occur under conditions of high temperature, exposure to moisture, and exposure to ultraviolet.

### **Fiberglass**

Fiberglass is found in many materials (such as flexible duct, Nema G-10 and electrical wire insulation) used at the company.

### ***Hazards***

Irritation of the exposed skin, a common complaint among persons working with this material, is the result of the mechanical irritation from small glass fibers. The sensation varies from an itch to a prickling or burning sensation. Common locations involved are the arms, face, or neck.

Another cause of dermatitis is contact with fiberglass binders or coating materials.

Except for skin irritation, there is no other known health hazard associated with exposure to fiberglass particles. Results of medical research, including examinations of hundreds of persons who have worked in fiberglass plants for as long as 25 to 30 years, give evidence that fiberglass is inert and non-injurious to the person's overall health. It will not cause silicosis.

### ***Precautions***

Persons with skin problems should consult the Medical Services Department before working with the fiberglass.

Wear loose-fitting clothing and change daily.

Adherent fibers on the skin should be washed off with an ample amount of lukewarm or cool water.

Air hoses and brooms should not be used to clean off fibers from the body because these methods may drive the fibers deeper into the skin.

Showering at the end of a work shift is advisable.

Plastic binders should be fully cured before working on fiberglass laminates. Use vacuum pickup units when machining fiberglass parts.

Practice good housekeeping.

Some skin protective creams may be of benefit.

At home, clothing should be washed separately in a tub or basin. Washing machines should not be used. Ideally, rubber gloves should be worn. The tub or basin should then be fully rinsed.

### **Flammable Liquids**

Class B combustibles are flammable and combustible liquids (including oils, greases, tars, oil base paints, lacquers) and flammable gases. Flammable aerosols (spray cans) are also treated here.

Water should not be applied to fire in a Class B combustible. The use of water may float burning liquids, causing the fire to spread more rapidly. Class B fires are usually extinguished by excluding the air around the burning liquid. This is accomplished by one of several approved types of fire extinguishing agents, e.g., carbon dioxide, ABC multipurpose dry chemical, and Halon 1301 (a vaporizing liquid that breaks the flame front).

Technically, flammable and combustible liquids do not burn. However, under appropriate conditions, they generate sufficient quantities of vapors to form ignitable vapor-air mixtures. As a general rule, the lower the flash point of a liquid, the greater the fire and explosion hazard. (The

flash point of a liquid is the minimum temperature at which it gives off sufficient vapor to form an ignitable mixture with the air near its surface or within its containment vessel.)

Many flammable and combustible liquids also pose health hazards.

It is the responsibility of the user to ensure that all Class B combustibles are properly identified, labeled, handled, and stored. If assistance is required, contact the Responsible Safety Officer.

### *Classifications*

Flammable and combustible liquids are defined and divided into classes as shown below.

Flammable Liquids (Class I). Liquids having flash points below 100F (37.8C) and having vapor pressures not exceeding 40 pounds per square inch (absolute) at 100F (37.8C). Flammable Class I liquids are subdivided as follows:

Class IA. Liquids having flash points below 73F (22.8C) and boiling points below 100F (37.8C). Flammable aerosols (spray cans) are included in Class IA.

Class IB. Liquids having flash points below 73F (22.8C) and boiling points at or above 100F (37.8C).

Class IC. Liquids having flash points at or above 73F (37.8C) and below 100F (37.8C).

Combustible Liquids (Classes II and III). Liquids having flash points at or above 100F (37.8C). Combustible liquids in Class II and Class III are subdivided as follows:

Class II. Liquids have flash points at or above 100F (37.8C) and below 140F (60.0C).

Class IIIA. Liquids having flash points at or above 140F (60.0C) and below 200F (93.4C).

Class IIIB. Liquids having flash points at or above 200F (93.4C).

Unstable (Reactive) Liquids. These are liquids that in the pure state, or as commercially produced or transported, will vigorously polymerize, decompose, combine, or become self-reactive under conditions of shock, pressure, or temperature. Use of such materials must have prior approval from the Responsible Safety Officer on a case-by case basis.

### *Fire Hazards*

Fires involving Class B combustibles are especially dangerous because they release heat quickly, causing the fire to spread rapidly. The handling and use of these combustibles presents the most significant single source of fire hazard. Misuse or improper storage threatens not only the employee and the entire building, but all fellow employees.

Liquids with flash points below room temperature (Class IA and IB liquids) continually emit

sufficient quantities of vapors to be ignitable, except when chilled to temperatures below their flash points. Even when chilled, if spilled on a floor or work surface, they will heat rapidly and pose severe fire and explosion hazards.

Liquids with flash points above room temperature (Class IC, II, IIIA, and IIIB liquids) can be easily heated to the point at which they will create flammable vapor-air mixtures.

Flammable liquid vapors are heavier than air. They can travel for appreciative distances and accumulate in low places. Since it is the vapor of flammable liquids that burns, the fire hazard may not be confined to the immediate vicinity of actual use. Vapors can be ignited several hundred feet from the point of vapor generation. Flammable liquid vapors generally have low ignition-energy requirements and can often be ignited by small sparks from electrical motors, switches, relay contacts, etc.

### ***Precautions***

Recommended precautions are based on the properties of the liquid to be used and the intended application. The user cannot make a correct decision on necessary precautions unless the properties of the liquid are known and the intended use is reviewed from a safety standpoint.

There must be sufficient ventilation to preclude the accumulation of flammable vapors. Flammable liquids should be used in a fume hood or with local exhaust ventilation. Normal room ventilation may be sufficient to permit small scale use of flammable liquids (milliliter quantities). However, if larger quantities of liquid must be used in such facilities, it will be necessary to provide additional ventilation by opening doors and windows or providing some form of temporary exhaust ventilation.

Extreme care must be exercised when using flammable liquids in closed spaces with minimal ventilation (such as glove boxes and tanks). Even milliliter quantities of flammable liquids can cause the build-up of explosive mixtures in the confined space.

### **Fluorocarbon Solvents**

Fluorocarbon solvents are organic compounds containing fluorine. Common names for some members of this family are Freon-TF, Freon-MF, and Freon-BF.

### ***Hazards***

The vapors are four to five times heavier than air and tend to accumulate in tanks, pits, and low places. This displaces the oxygen, which can cause suffocation, or the vapors themselves may be toxic in high concentrations.

Fluorocarbon solvents will dissolve and extract the natural oils present in the skin. If contact is prolonged, the skin may become dry and perhaps cracked. The vapors have little or no effect on the eyes. If the liquid is splashed in the eyes, temporary redness may be produced.

Lower boiling liquids may cause freezing if splashed on the skin or in the eyes.

Fluorocarbon vapors decompose when exposed to high temperatures. Toxic fumes such as hydrofluoric acid, hydrochloric acid, and phosgene may be formed.

Fluorocarbon solvents are nonflammable.

### ***Precautions***

Contact the Responsible Safety Officer if fluorocarbon solvents are used in enclosed areas such as tanks and pits. Forced-air ventilation and air supplied respirators may be required.

Avoid contact with hot surfaces, electric heating elements, or open flames. If toxic fumes are formed, good ventilation will be required.

Wear gloves made of neoprene or equivalent when there is the possibility of prolonged or repeated skin contact with the liquid. Wear protective clothing and eye goggles if the liquid may be splashed.

### **Hazardous Gases**

The general precautions for compressed gas cylinders must be followed.

Large cylinders of hazardous gases should not be purchased if it is possible to use small cylinders.

The color coding must not be used on the cylinder to identify its contents. These colors have not been standardized by the suppliers. Read the label placed on the cylinder.

The Responsible Safety Officer must be notified of all hazardous gases ordered to ensure that adequate facilities are available (e.g., fume hoods, safety showers, alarms, fire extinguishers, respirators, etc.) and that the user is aware of the hazardous properties of the material.

When hazardous gases are received by O,R&L, the Responsible Safety Officer will pick up and deliver all cylinders of J-size and smaller. Larger cylinders will be released by the Responsible Safety Officer delivery by O,R&L or contractor employees.

Cylinders should be returned to the vendor as soon as possible after use. It is not uncommon for gas cylinders to develop leaks during storage. Arrangements for pick up of used cylinders are made by contacting the Responsible Safety Officer. Before pickup, the cylinder valve must be closed, the regulator or needle valve must be removed, and the valve cover put back on the cylinder.

Arrangements for pickup of cylinders that are leaking or have valves that are stuck open should be made by contacting the Responsible Safety Officer.



## ***Oxygen Pumping in Vacuum System***

Oxygen in concentrations 25% by volume should not be introduced into a mechanical vacuum pump charged with hydrocarbon oil, which is a combustible fluid. During compression in the pump, the pressure of the oxygen may reach as high as 2-3 atmospheres, and at this pressure it may cause an explosion if combined with a hydrocarbon oil.

### ***Required Solution***

Pump manufactures recommend the use of inert fluid in place of hydrocarbon oil. Various fluids are available, such as Fomblin or Halo Vac (Sargent-Welch Science Company). Modification of the pump may be required because these fluids have high molecular weights and high specific gravities and may be incompatible with seals. An inquiry to the pump manufacturer is recommended.

Pumps modified for oxygen service shall be permanently identified and used only with the specified fluid.

## **Peroxidizable Compounds**

Isopropyl, ether, ethyl ether, dioxane, tetrahydrofuran, and other alkyl ethers form peroxides on exposure to air and light. Because these chemicals are packaged in an air atmosphere, peroxides can form even though the containers have not been opened. The longer the storage period of these chemicals, the greater the amount of dangerous peroxides that may form. Experience has shown that isopropyl ether is by far the worst offender.

### ***Hazards***

These peroxides are highly unstable, explosive chemicals that may detonate if subjected to high temperature, shock, or friction. Concentration by evaporation or distillation of the ether increases the risk of detonation.

## **Polychlorinated Biphenyls (PCBs)**

PCBs are a broad class of nonflammable, synthetic, chlorinated hydrocarbon insulating fluids used mostly in capacitors and transformers at O,R&L. Synonyms include askarel, aroclor, inerteen, pyranol, therminol, and many others.

### ***Hazards***

Prolonged skin contact with PCB oils can cause skin irritation and occasionally the formation of temporary acne-like cysts. Eye contact can cause severe irritation and inflammation. Breathing the vapor or mist from heated oil can cause respiratory irritation. PCBs are listed as suspect carcinogens.

Because of their inert character and stability under extreme physical stresses, PCBs do not break down in the environment. PCBs are widely dispersed in the environment and can accumulate in foods found in the human diet.

### ***Precautions***

When working with PCB-contaminated equipment or on PCB spills, the appropriate personnel must wear protective equipment, including viton gloves, coveralls, and splash goggles.

Small spills can be absorbed in vermiculite or Sorb-all. Place waste material in plastic bags and call the Decontamination and Waste Disposal Unit. All equipment containing PCBs must be disposed of through the Responsible Safety Officer.

In case of large spills or explosion of a capacitor, evacuate all personnel from the area. Call the Fire Department, 911, for assistance. Provide or maintain ventilation in the affected area, if possible. If entry to the area is necessary, self-contained breathing apparatus must be worn.

All large capacitors containing PCBs and all PCB transformers must be labeled.

Banks of capacitors may be labeled as a unit. Capacitors and transformers within a confined area with limited access may be labeled at each point of entry. Labels may be obtained at the Central Storeroom or from the Responsible Safety Officer.

A record of the quantity, type, movement, and disposal of PCB items must be maintained by each superintendent. A yearly update of the record is made.

### ***Calibration of Gas Detection Systems:***

This policy covers the calibration of systems to detect flammable, toxic, or pyrophoric gases being used at O,R&L.

### ***Specifications of Calibration:***

The specifications of the calibration technique and the frequency of calibration must be described in the Operational Safety Procedure governing the operation of apparatus with which the gas-detecting system is associated. It is recommended that the calibrations of these systems be performed by an approved outside contractor or by Scientific and Technical Resources personnel. In all cases calibrations must be carried out by an independent party: calibration of these systems may not be carried out by the group operating the apparatus.

When changes are required in the Operational Safety Procedure, approval of the new procedure will be coordinated by the Responsible Safety Officer.



## Chapter 24 Sanitation

### *Potable Water*

Potable water shall be provided in all places of employment, for drinking, washing of the person, cooking, washing of cooking or eating utensils, washing of food preparation or processing premises, and personal service rooms.

Potable drinking water dispensers shall be designed, constructed, and serviced so that sanitary conditions are maintained, shall be capable of being closed, and shall be equipped with a tap.

Open containers such as barrels, pails, or tanks for drinking water from which the water must be dipped or poured, whether or not they are fitted with a cover, are prohibited.

A common drinking cup and other common utensils are prohibited.

### *Toilet Facilities*

Except as otherwise indicated in this section, toilet facilities, in toilet rooms separate for each sex, are provided in all places of employment. The number of facilities to be provided for each sex shall be based on the number of employees of that sex for whom the facilities are furnished. Where toilet rooms will be occupied by no more than one person at a time, can be locked from the inside, and contain at least one water closet, separate toilet rooms for each sex need not be provided.

20 or less	1
20 or more	1 toilet seat and a urinal per 40 workers
200 or more	1 toilet seat and 1 urinal per 50 workers

Where toilet facilities will not be used by women, urinals may be provided instead of water closets.

This requirement does not apply to mobile crews or to normally unattended work locations so long as employees working at these locations have transportation immediately available to nearby toilet facilities which meet the other requirements of this section.

The sewage disposal method shall not endanger the health of employees.

Toilet paper with holder shall be provided for every water closet.

The requirements of this subsection do not apply to mobile crews or to normally unattended work locations.



## *Food and Beverages on Premises*

This section shall apply only where employees are permitted to consume food or beverages, or both, on the premises.

Eating and drinking areas. No employee shall be allowed to consume food or beverages in a toilet room or in any area exposed to a toxic material.

Waste disposal containers. Receptacles, constructed of smooth, corrosion resistant, easily cleanable, or disposable materials, shall be provided and used for disposal of waste food. The number, size and location of such receptacles shall encourage their use and not result in overfilling. They shall be emptied not less frequently than one each working day, unless unused, and shall be maintained in a clean and sanitary condition. Receptacles shall be provided with a solid tight-fitting cover unless sanitary conditions can be maintained without use of a cover.

Sanitary storage. No food or beverages shall be stored in toilet rooms or in an area exposed to a toxic material.

Food handling. All employee food service facilities and operations shall be carried out in accordance with sound hygienic principles. In all places of employment where all or part of the food service is provided, the food is dispensed shall be wholesome, free from spoilage, and shall be processed, prepared, handled, and stored in such a manner as to be protected against contamination.

## Chapter 25 Blasting Operations

### *Application*

This standard applies to all operations where an abrasive is forcibly applied to a surface pneumatic or hydraulic pressure or by centrifugal force. It does not apply to steam blasting, steam cleaning or hydraulic cleaning methods where this work is done without the aid of abrasives.

### *Selection of Abrasives and Equipment*

Each type of abrasive and each type of equipment has its particular advantages in producing the quality of work desired, and the selection will depend on the specific requirements of the user. Therefore, no rule or suggestion can be given in this standard for the selection of a particular abrasive or of particular equipment. With properly designed equipment and proper operation and maintenance all types of abrasives and equipment can be used safely. However, abrasives which create the minimum hazard should be used wherever feasible.

### *Abrasive Blasting Operations*

**Abrasive.** A solid substance used in an abrasive blasting operation.

**Abrasive blasting.** The forcible application of an abrasive to a surface by pneumatic pressure, hydraulic pressure, or centrifugal force.

**Abrasive-blasting respirator.** A continuous flow airline respirator constructed so that it will cover the wearer's head, neck, and shoulders to protect him from rebounding abrasive.

**Air-line respirator.** A device consisting of a face-piece, helmet, or hood to which clean air is supplied to the wearer through a small-diameter hose from a source not on the wearer's body.

**Blast cleaning barrel.** A complete enclosure which rotates on an axis, or which has an internal moving tread to tumble the parts, in order to expose various surfaces of the parts to the action of an automatic blast spray.

**Blast cleaning room.** A complete enclosure in which blasting operations are performed and where the operator works inside of the room to operate the blasting nozzle and direct the flow of abrasive material.

**Blasting cabinet.** An enclosure where the operator stands outside and operates the blasting nozzle through an opening or openings in the enclosure.

**Clean air.** Air of such purity that it will not cause harm or discomfort to an individual if it is inhaled for extended periods of time.

**Dust collector.** A device or combination of devices for separating dust from the air handled by an exhaust ventilation system.

**Exhaust ventilation system.** A system for removing contaminated air from the air from a space, comprising two or more of the elements; enclosed or hood, duct work, dust collecting equipment, exhauster, and discharge stack.

***Dust hazards from abrasive blasting.***

**Dust sources.** Abrasives and the surface coatings on the materials blasted are shattered and pulverized during blasting operations and the dust formed will contain particles of respirable size. The composition and toxicity of the dust from these sources shall be considered in making an evaluation of the potential health hazards.

**Types of abrasives.** A very large variety of solid materials may be used as abrasives, with the qualities varying from hard deep-cutting to soft polishing. These include; mineral grains; either synthetic or natural, metallic shot or grit, generally of steel or chilled cast iron, and organic abrasives, such as ground corncobs or walnut shells.

Silica sand is the most hazardous mineral abrasive commonly used and its use should be limited wherever possible.

The potential hazard from steel or iron dust is considered to be minimal.

Readily combustible organic abrasives may be pulverized fine enough to be capable of forming explosive mixtures with air.

**Types of coatings.** A surface coating formed during the fabrication of a part, or a protective coating applied after fabrication, will be removed and dispersed as a dust by abrasive blasting. The type of coating should be known to make proper evaluation of the potential hazard.

Silica sand is frequently embedded in the surface of castings and may be pulverized by blast cleaning.

Coatings containing toxic metals will add to the potential seriousness of the dust exposures. Examples of such coatings are anti-fouling paints containing mercury, lead paints on structural steel, cadmium plating, and lead deposits on pistons of internal combustion engines.

Plastic or resin coatings may be decomposed by the action of the abrasives to form irritating by-products.



**Wet abrasive blasting.** Wet methods will tend to keep dust exposures minimal, but droplets dispersed and dried residues which become airborne may create potential exposures.

**Concentrations of contaminants.** The concentration of respirable dust or fumes in the breathing zone of the abrasive-blasting operator or any other worker shall be kept below the recommended levels.

**Use of combustible abrasives.** Organic abrasives which are combustible shall be used only in automatic systems because the fine dust produced presents a potential fire and explosion hazard.

Where flammable or explosive dust mixtures may be present, the construction of the equipment, including the exhaust system and all electrical wiring shall conform to the requirements of American National Standard Installation of Blower and Exhaust Systems for Dust, Stock, and Vapor Removal or Conveying, Z 33.1- 1961 (NFPA 91-1961; NBFU 91-1961), and chapter 296-24 part L. The blast nozzle shall be bonded and grounded to prevent the buildup of static charges.

Where flammable or explosive dust mixtures may be present, the abrasive blasting enclosure, the ducts, and the dust collector shall be constructed with loose panels or explosion venting areas, located on sides away from any occupied area, to provide for pressure relief in case of explosion, following the principles set forth in the National Fire Protection Association Explosion Venting Guide, NFPA 68-1954.

\*Ref. OSHA 1926.900

## Chapter 26 Possession and Handling of Explosives

### *Basic Legal Obligations*

It is unlawful for any person to manufacture, purchase, sell, use, or store any explosive without having a validity issued license.

Upon notice, any law enforcement agency having jurisdiction, a person manufacturing, purchasing, selling, using, or storing any explosives without a license shall immediately surrender any and all such explosives to the respective law enforcement agency.

### *Portable Storage Facilities*

A Class 2 storage facility shall be a box, a trailer, a semi-trailer or other mobile facility. It shall be bullet-resistant, fire-resistant, weather-resistant, theft-resistant, and well ventilated. Portable magazines shall be at least one cubic yard in size. They are to be supported to prevent direct contact with the ground. The ground around magazines shall slope away for drainage or other adequate drainage provided. When unattended, vehicular magazines shall have wheels removed or otherwise effectively immobilized by kingpin locking devices or other methods approved by the department.

The exterior and doors shall be constructed of not less than  $\frac{1}{4}$  inch steel and lined with at least two inches of hardwood. Magazines with top openings shall have lids with water-resistant seals or shall overlap the sides by at least one inch when in a closed position.

Hinges and hasps shall be attached to doors by welding, riveting, or bolting (nuts on inside of door). Hinges and hasps shall be installed so that they cannot be removed when the doors are closed and locked. Each door shall be equipped with two mortise locks; or with two padlocks fastened in separate hasps and staples; or with a combination of mortise lock and a padlock, or with a mortise lock that requires two keys to open; or a three-point lock. Padlocks shall have at least five tumblers and a case-hardened shackle of at least  $\frac{3}{8}$  inch diameter. Padlocks shall be protected with not less than  $\frac{1}{4}$  inch steel hoods constructed so as to prevent sawing or lever action on the locks, hasps, and staples. These requirements do not apply to magazine doors that are adequately secured on the inside by means of a bolt, lock, or bar that cannot be actuated from the outside.

Except at doorways, a 2-inch air space shall be left around ceilings and the perimeter of floors. Foundation ventilators shall be not less than 4 by 6 inches. Vents in the foundation, roof, or gables shall be screened and offset.

No sparking metal construction shall be exposed below the top of walls in the interior of storage facilities and all nails therein shall be blind-nailed, countersunk, or non sparking.

### *Construction of detonator (blasting cap) indoor storage facilities*



Class 3 storage facility for detonators (blasting caps) in quantities of 1,000 or less shall be fire-resistant and theft-resistant. They need not be bullet-resistant and weather-resistant if the locked uninhabited building in which they are stored provide protection from the weather and from bullet penetration. Sides, bottoms and covers shall be constructed of not less than number 12-gauge metal and lined with a non sparking material.

Hinges and hasps shall be attached so they cannot be removed from the outside. One steel padlock (which need not be protected by a steel hood) having at least 5 tumblers and a case-hardened shackle of at least 3/8 inch diameter is sufficient for locking purposes.

### ***Blasting Agent Storage***

A Class 4 storage facility may be a building, an igloo, or army type structure, a tunnel, a dugout, a box, a trailer, or a semi trailer or other mobile facility. They shall be fire resistant, weather resistant and theft resistant. The ground around such storage facilities shall slope away for drainage. When unattended, vehicular storage facilities shall have wheels removed or otherwise effectively immobilized by kingpin locking devices or other methods approved by the department.

As a result of tests with electric blasting caps, it has been determined that these blasting caps are not subject to sympathetic detonation. Therefore, a Class 4 storage facility meets the necessary requirements for storage of electric blasting caps. These magazines shall be constructed of masonry, metal covered wood, fabricated metal or a combination of these materials. Foundations are to be constructed of brick, concrete, cement block, stone, or metal or wood posts. If piers or posts are used, in lieu of a continuous foundation, the space under the building shall be enclosed with fire resistant material. The walls and floors are to be constructed of, or covered with, a non sparking material or lattice work. The doors shall be metal or solid wood covered with metal.

Hinges and hasps shall be attached to doors by welding, riveting, or bolting (nuts on inside of door). Hinges and hasps shall be installed so that they cannot be removed when doors are closed and locked. Each door shall be equipped with two mortise locks; or with two padlocks fastened in separate hasps and staples; or with a combination of mortise lock and a padlock, or with a mortise lock that requires two keys to open; or a three point lock. Padlocks shall have at least five tumblers and a case hardened shackle of at least 3/8 inch diameter. Padlocks shall be protected with not less than a 1/4 inch steel hoods constructed so as to prevent sawing or lever action on the locks, hasps and staples. These requirements do not apply to magazine doors that are adequately secured on the inside by means of a bolt, lock, or bar that cannot be actuated from the outside.

A Class 5 storage facility may be a building, igloo or army type structure, tunnel, dugout, bin,

box, trailer, or a semi-trailer or other mobile facility. They shall be weather resistant and theft resistant. The ground around such storage facilities shall slope away for drainage. When unattended, vehicular storage facilities shall have wheels removed or otherwise effectively immobilized by kingpin locking devices or other methods approved by the department.

The doors shall be constructed of solid wood or metal. Hinges and hasps shall be attached to doors by welding, riveting, or bolting (nuts on inside of door). Hinges and hasps shall be installed so that they cannot be removed when the doors are closed and locked. Each door shall be equipped with two mortise locks; or with two padlocks fastened in separate hasps and staples; or with a combination of mortise lock and a padlock, or with a mortise lock that requires two keys to open; or a three point lock. Padlocks shall have at least 5 tumblers and a case hardened shackle of at least 3/8 inch diameter. Padlocks shall be protected with not less than 1/4 inch steel hoods constructed so as to prevent sawing or lever action on the locks, hasps, and staples.

Trailers, semi-trailers and similar vehicular magazines may, for each door, be locked with one steel padlock (which need not be protected by a steel hood) having at least 3/8 inch diameter, if the door hinges and lock hasp are securely fastened to the magazine and to the door frame. These requirements do not apply to magazine doors that are adequately secured on the inside by means of a bolt, lock, or bar that cannot be actuated from the outside.

### ***Explosives Day Box Storage***

A temporary storage facility shall be a day box. It must be fire resistant, weather resistant and theft resistant. The ground around such storage facilities shall slope away for drainage. A day box shall be constructed of not less than number 12- gauge (.1046 inches) steel, lined with either 1/2 inch plywood or 1/2 inch Masonite-type hardboard. Doors shall overlap sides by at least one inch.

Hinges and hasps shall be attached thereto by welding, riveting or bolting (nuts on inside). One steel padlock (which need not be protected by a steel hood) having at least five tumblers and a case hardened shackle of at least 3/8 inch diameter is sufficient for locking purposes. No explosive materials shall be left in a day box if unattended. The explosive materials contained therein shall be removed to licensed storage facilities for unattended storage.

### ***Detonators Day Box Storage***

Temporary storage facilities for blasting caps in quantities of 100 or less shall be constructed as follows. Sides, bottoms, and covers shall be constructed of number 12 gauge metal and lined with a non sparking material. Hinges and hasps shall be attached thereto by welding. A single five-tumbler proof lock shall be sufficient for locking purposes. No explosive materials shall be left in such facilities if unattended. The explosive materials contained therein shall be removed to licensed storage facilities for unattended storage.

## *Magazine Heating Systems*

Magazines requiring heat shall be heated by either hot water radiant heating coils within the building; or air directed into the magazine building over either hot water or low pressure steam (15psig) coils located outside the magazine building.

The magazine heating systems shall meet the following requirements: the radiant heating coils within the building shall be installed in such a manner that the explosive materials or their containers cannot contact the coils and air is free to circulate between the coils and the explosive materials or their containers; and the heating ducts shall be installed in such a manner that the hot air discharge from the duct is not directed against the explosive materials or their containers. The heating device used in connection with a magazine shall have controls which prevent the ambient building temperature from exceeding 130 degrees F.

The electric fan or pump used in the heating system for a magazine shall be mounted outside and separate from the wall of the magazine and shall be grounded. The electric fan motor and the controls for electrical heating devices used in heating water or steam shall have overloads and disconnects, which comply with the National Electrical Code, (National Fire Protection Association, NFPA No. 70-1984). All electrical switch gear shall be located a minimum distance of 25 feet from the magazine.

The heating source for water or steam shall be separated from the magazine by a distance of not less than 25 feet when electrical and 50 feet when fuel-fired. The area between the heating unit and the magazine shall be cleared of all combustible materials. The storage of explosive materials and their containers in the magazine shall allow uniform air circulation so temperature uniformity can be maintained throughout the explosive materials.

## *Lighting*

Battery activated safety lights or battery activated safety lanterns may be used in explosives storage magazines. Electric lighting used in any explosives storage magazine shall meet the standards prescribed by the "National Electrical Code," (National Fire Protection Association, NFPA 70-84), for the conditions present in the magazine at any time. All electrical switches shall be located outside of the magazine and also meet the standards prescribed by the National Electrical Code.

## *Explosives Storage*

The storage of caps with other explosives is prohibited. No blasting caps, or other detonating or fulminating caps, or detonators or flame producing devices shall be kept or stored in any magazine in which other explosives are kept or stored.

All Class A, Class B, Class C, explosives, and special industrial explosives, and newly developed and unclassified explosives, shall be kept in proper magazines unless they are in process of

manufacture, being physically handled in the operating process, being used or being transported to a place of storage or use. No explosives and no detonators (blasting caps) in quantities of 1,001 or more shall be stored in any building or structure except a Class 1, permanent, magazine that has been approved and licensed.

There shall be separate storage of components capable of detonation when mixed. Any two components which, when mixed, become capable of detonation by a number 6 cap must be stored in separate locked containers or in a licensed, approved magazine. Blasting operations or storage of electrical detonators shall be prohibited in the vicinity of operating radio frequency transmitter stations except where the clearance can be observed.

Blasting caps, electric blasting caps, detonating primers and primed cartridges shall not be stored in the same magazine with other explosives.

### ***Quantity Restrictions***

Explosive materials in excess of 300,000 pounds or blasting caps in excess of 20,000,000 shall not be stored in one storage magazine. Magazines shall be in the charge of a competent person at all times who shall be at least 21 years of age, and who shall be held responsible for the enforcement of all safety precautions.

All explosives shall be accounted for at all times. Explosives not being used shall be kept in a locked magazine, unavailable to persons not authorized to handle them. The employer shall maintain an inventory and use record of all explosives. Appropriate authorities shall be notified of any loss, theft, or unauthorized entry into a magazine.

Firearms (except firearms carried by guards) shall not be permitted inside of or within 50 feet of magazines. The land surrounding a magazine shall be kept clear of all combustible materials, brush, dried grass, leaves and other materials for a distance of at least 25 feet.

Combustible materials shall not be stored within 50 feet of magazines. Smoking, matches, open flames, and spark-producing devices are not permitted in any magazine or within 50 feet of any outdoor magazine; or within any room containing an indoor magazine.

The premises on which a magazine is located shall be conspicuously marked with signs containing the words "EXPLOSIVES KEEP OFF" in letters at least three inches high. Such signs shall warn any person approaching the magazine of the presence of explosives, but shall be so located that a bullet passing directly through the face of the sign will not strike the magazine.

Temporary storage at a site for blasting operations shall be located away from neighboring inhabited buildings, railways, highways, and other magazines. A distance of at least one hundred and fifty feet shall be maintained between magazines and the work in progress when the quantity of explosives

kept therein is in excess of 25 pounds, and at least 50 feet when the quantity of explosives is 25 pounds or less.

Explosives recovered from blasting misfires shall be placed in a separate magazine until competent personnel have determined from the manufacturer the method of disposal. Caps recovered from blasting misfires shall not be reused. Such explosives and caps shall then be disposed of in a manner recommended by the manufacturer.

### *Storage Within Magazines*

Packages of explosives shall be laid flat with top side up. Black powder when stored in magazines with other explosives shall be stored separately. Black powder in kegs shall be stored on ends, bungs down, or on side, seams down. Corresponding grades and brands shall be stored together in such a manner that brands and grade marks show. All stocks shall be stored so as to be easily counted and checked. Packages of explosives shall be piled in a stable manner. When any kind of explosive is removed from a magazine for use, the oldest explosive of that particular kind shall always be taken first.

Packages of explosives shall not be unpacked or repacked in a magazine nor within 50 feet of a magazine or in close proximity to other explosives.

Tools used for opening packages of explosives shall be constructed of non-sparking materials, except that non-sparking metallic slitters may be used for opening fiberboard boxes. A wood wedge and a fiber, rubber, or wood mallet shall be used for opening or closing wood packages of explosives. Opened packages of explosives shall be securely closed before being returned to a magazine.

Magazines shall not be used for storage of any metal tools nor of any commodity except explosives, but this restriction shall not apply to the storage of blasting agents and blasting supplies.

Magazine floors shall be regularly swept, kept clean, dry, free of grit, paper, empty used packages, and rubbish. Brooms and other cleaning utensils shall not have any spark-producing metal parts. Sweepings from floors of magazines shall be properly disposed of. Magazine floors stained with nitroglycerin shall be cleaned according to instructions by the manufacturer.

When any explosive has deteriorated to an extent that it is in an unstable or dangerous condition, or if nitroglycerin leaks from any explosives, then the person in possession of such explosive shall immediately proceed to destroy such explosive in accordance with the instructions of the manufacturer. Only experienced persons shall be allowed to do the work of destroying explosives.

When magazines need inside repairs, all explosives shall be removed therefrom and the floors cleaned. In making outside repairs, if there is a possibility of causing sparks or fire the explosives

shall be removed from the magazine. Explosives removed from a magazine under repair shall either be placed in another magazine or placed a safe distance from the magazine where they shall be properly guarded and protected until repairs have been completed, when they shall be returned to the magazine.

## *Underground Storage*

Explosives and related materials shall be stored in approved facilities. No explosives or blasting agents shall be permanently stored in any underground operation until the operation has been developed to the point where at least two modes of exit have been developed.

Permanent underground storage magazines shall be at least 300 feet from any shaft, adit, or active underground working area. Permanent underground magazines containing detonators shall not be located closer than 50 feet to any magazine containing other explosives or blasting agents.

Upon the approach of an electrical storm, unless a greater hazard would be created thereby, explosives at the adit or the top of any shaft leading to where persons are working shall be moved away from such location a distance equal to that required for inhabited buildings, as listed in the American table of distances for storage of explosive materials.

All explosive manufacturing buildings and magazines in which explosives or blasting agents, except small arms ammunition and smokeless powder are had, kept, or stored, must be located at distances from inhabited buildings, railroads, highways, and public utility transmission systems in conformity with the following quantity and distance tables, and these tables shall be the basis on which applications for license for storage shall be made and license for storage issued. Blasting and electric blasting caps in strength through number 8 should be rated as one and one half pounds of explosives per one thousand caps. Blasting and electric blasting caps of strength higher than the number 8 should be computed on the combined weight of explosives.

## *Multiple Magazines*

When two or more storage magazines are located on the same property, each magazine must comply with the minimum distances specified from inhabited buildings, railways, and highways, and in addition, they should be separated from each other by not less than the distances shown for “separation of magazines”, except that the quantity of explosives contained in cap magazines shall govern in regard to the spacing of said cap magazines from magazines containing other explosives. If any two or more magazines are separated from each other by less than specified “separation of magazines” distances, then such two or more magazines, as a group, must be considered as one magazine, and the total quantity of explosives stored in such group must be considered as one magazine, and the total quantity of explosives stored in such group must be treated as if stored in a single magazine located on the site of any magazine of the group, and must comply with the minimum of distances specified from other magazines, inhabited buildings, railway and highways.

## ***Ammonium Nitrate Storage***

This subsection applies to the storage of ammonium nitrate in the form of crystals, flakes, grains, or prills including fertilizer grade, dynamite grade, nitrous oxide grade, technical grade, and other mixtures containing 60 percent or more ammonium nitrate by weight but does not apply to blasting agents.

This section does not apply to the transportation of ammonium nitrate. This section does not apply to storage under the jurisdiction of and in compliance with the regulations of the United States Coast Guard (see 46 CFR Parts 146-149).

The storage of ammonium nitrate and ammonium nitrate mixtures that are more sensitive than allowed by the “definition of test procedures for ammonium nitrate fertilizer” is prohibited.

## ***Bulk Ammonium Nitrate Storage***

Warehouses shall have adequate ventilation or be capable of adequate ventilation in case of fire. Unless constructed of non-combustible material or unless adequate facilities for fighting a roof fire are available, bulk storage structures shall not exceed a height of 40 feet. Bins shall be clean and free of materials which may contaminate ammonium nitrate.

Due to corrosive and reactive properties of ammonium nitrate, and to avoid contamination, galvanized iron, copper, lead, and zinc shall not be used in a bin construction unless suitably protected. Aluminum bins and wooden bins protected against impregnation by ammonium nitrate are permissible. The partitions dividing the ammonium nitrate storage from other products which would contaminate the ammonium nitrate shall be of tight construction.

The ammonium nitrate storage bins or piles shall be clearly identified by signs reading “ammonium nitrate” with letters at least 2 inches high. Piles or bins shall be so sized and arranged that all material in the pile is moved out periodically in order to minimize possible caking of the stored ammonium nitrate. Height or depth of piles shall be limited by the pressure-setting tendency of the product. However, in no case shall the ammonium nitrate be piled higher at any point than 36 inches below the roof or supporting and spreader beams overhead.

Ammonium nitrate shall not be accepted for storage when the temperature of the product exceeds 130 F. Dynamite, other explosives, and blasting agents shall not be used to break up or loosen caked ammonium nitrate.

## ***Contaminants***

Ammonium nitrate shall be in a separate building or shall be separated by approved type firewalls of not less than 1 hour fire-resistance rating from storage of organic chemicals, acids, or other corrosive

materials, materials that may require blasting during processing or handling, compressed flammable gases, flammable and combustible materials or other contaminating substances, including but not limited to animal fats, baled cotton, baled rags, baled scrap paper, bleaching powder, burlap or cotton bags, caustic soda, coal, coke, charcoal, cork, camphor, excelsior, fibers of any kind, fish oils, fish meal, foam rubber, hay, lubricating oil, linseed oil, or other oxidizable or drying oils, naphthalene, oakum, oiled clothing, oiled paper, oiled textiles, paint, straw, sawdust, wood shavings, or vegetable oils. Walls referred to in this subsection need extend only to the underside of the roof.

In lieu of separation walls, ammonium nitrate may be separated from the materials referred to above by a space of at least 30 feet. Flammable liquids such as gasoline, kerosene, solvents, and light fuel oils shall not be stored on the premises. LP-Gas shall not be stored on the premises.

Sulfur and finely divided metals shall not be stored in the same building with ammonium nitrate. Explosives and blasting agents shall not be stored in the same building with ammonium nitrate except on the premises of makers, distributors, and user-compounders of explosives or blasting agents. Where explosives or blasting agents are stored in separate buildings, other than on the premises of makers, distributors, and user-compounders of explosives or blasting agents, they shall be separated from the ammonium nitrate.

### ***Explosives Transportation***

The transportation of explosives by vehicle on public highways shall be administered by the United States Department of Transportation, CFR 49-1978, Parts 100 through 199, and any state regulations. The following sections cover the transportation of explosives on the job site.

No employee shall be allowed to smoke, carry matches or any other flame-producing device, or carry any firearms or loaded cartridges while in or near a motor vehicle transporting explosives; or drive, load, or unload such vehicle in a careless or reckless manner.

Explosives shall not be carried on any vehicle while vehicle is being used to transport workers other than driver and two persons.

Explosives shall be transferred from the disabled vehicle to another, only when proper and qualified supervision is provided.

Other materials or supplies shall not be placed on or in the cargo space of a conveyance containing explosives, detonation cord or detonators, except carrying safety fuse, and properly secured, non-sparking equipment used expressly in the handling of such explosives will be permissible. Vehicles used for transporting explosives shall be strong enough to carry the load without difficulty and be in good mechanical condition. If vehicles do not have a closed body, the body shall be covered with a flameproof and moisture proof tarpaulin or other effective protection against moisture and sparks. All vehicles used for the transportation of explosive shall have tight floors and



exposed spark-producing metal on the inside of the body shall be covered with wood or other non-sparking materials to prevent contact with packages of explosives. Packages of explosives shall not be loaded above the sides of an open-body vehicle.

Vehicles shall be placarded and displayed as specified by the United States Department of Transportation, CFR 49-1981. Parts 100 through 199.

Each motor vehicle used for transporting explosives shall be equipped with a minimum of two extinguishers, each having a rating of at least 10-BC.

Only extinguishers listed or approved by a nationally recognized testing laboratory shall be deemed suitable for use on explosive-carrying vehicles. Extinguishers shall be filled and ready for immediate use and readily available. Extinguishers shall be examined periodically by a competent person.

A motor vehicle used for transporting explosives shall be inspected to determine that it is in proper condition for safe transportation of explosives.

### *Use of Explosives*

While explosives are being handled or used, smoking, matches, or any other source of fire or flame shall not be allowed within 100 feet of the blast site.

No person shall be allowed to handle explosives while under the influence of intoxicating liquors, narcotics, or other dangerous drugs. This rule does not apply to persons taking prescription drugs and/or narcotics as directed by a physician providing such use shall not endanger the workers or others.

Original containers or day box magazines shall be used for taking detonators and other explosives from storage magazines to the blast site.

When blasting is done in congested areas or in close proximity to a structure, railway, or highway or any other installation that may be damaged, the blast shall be covered before firing with a mat or material that is capable of preventing fragments from being thrown.

Persons authorized to prepare explosive charges or conduct blasting operations shall use every reasonable precaution, including but not limited to warning signals, flags and barricades or woven wire mats to ensure the safety of the general public and workers.

Blasting operations shall be conducted during daylight hours whenever possible.

Whenever blasting is being conducted in the vicinity of gas, electric, water, fire alarm, telephone,

telegraph, and steam utilities, the user (blaster) shall notify the appropriate representatives of such utilities at least twenty-four hours in advance of blasting, specifying the location and the intended time of such blasting.

Verbal notice shall be confirmed with written notice.

Due precautions shall be taken to prevent accidental discharge of electric blasting caps from current induced by radar, radio transmitters, lighting, adjacent power lines, dust storms, or other sources of extraneous electricity.

These precautions shall include the suspension of all blasting operations and removal of persons from the blast site during the approach and progress of an electric storm and the posting of signs, warning against the use of mobile radio transmitters, on all roads shall be in accordance with the application provisions of the American National Standards Institute D6. 1-1971, Manual on Uniform Traffic Control Devices for Streets and Highways, as amended by Washington State Department of Highways Manual M24-01, (February 22, 1972).

Ensuring that mobile radio transmitters which are less than 100 feet away from electric blasting caps, when the caps are in other than original containers, shall be de-energized and effectively locked. Compliance with the recommendations of The Institute of the Makers of Explosives (IME) with regard to blasting in the vicinity of radio transmitters as stipulated in Radio Frequency Energy-A Potential Hazard in the Use of Electric Blasting Caps, IME Publication No. 20, September 1971.

When electric blasting caps are being used in blasting operations in the proximity of fixed radio transmitters, the following table of distances must be observed, unless it is determined by designated test procedures that there is not sufficient radio frequency energy present to create a hazard. The test procedure shall be to attach a No. 47 radio lamp in place of the cap in the blasting circuit progressively as the circuit is connected, starting with the initial hole.

In the event the lamp glows, the length of the wires connecting the circuit shall be altered by adding or cutting of wire until the lamp does not glow. A radio frequency field strength meter may be used in lieu of the test lamp.

Blasting operations or storage of electrical detonators shall be prohibited in the vicinity of operating radio frequency transmitter stations except where the clearances given below can be observed.



### *Transmitter Power Minimum*

<b>Except FM Mobile Distance</b>	
(Watts)	(Feet)
5 - 25	100
25 - 50	150
50 - 100	220
100 - 250	350
250 - 500	450
500 - 1,000	650
1,000 - 2,500	1,000
2,500 - 5,000	1,500
5,000 - 10,000	2,200
10,000 - 25,000	3,500
25,000 - 50,000	5,000
50,000 - 100,000	7,000
<b>Transmitter Power Minimum FM Mobile Distance</b>	
(Watts)	(Feet)
1 - 10	5
10 - 30	10
30 - 60	15
60 - 250	30

No fire shall be fought where the fire is in imminent danger of contact with explosives. All employees shall be removed to a safe area and the fire area guarded against intruders. Electric detonators shall be shunted until wired into the blasting circuit. Explosives shall not be handled near open flames, uncontrolled sparks or open electrical circuits. Delivery and issue of explosives shall only be made by and to authorized persons and into authorized magazines or approved temporary storage or handling area. All loading and firing shall be directed and supervised by licensed persons thoroughly experienced in this field.

### *Storage at Use Sites*

Empty boxes and paper and fiber packing materials which have previously contained high explosives shall not be used again for any purpose, but shall be destroyed by burning at an approved isolated location out of doors, and no person shall be nearer than 100 feet after the burning has started.

When opening kegs or wooden cases, no sparking metal tools shall be used; wooden wedges and either wood, fiber or rubber mallets shall be used. Non sparking metallic slitters may be used for opening fiberboard cases.

Should cartridges or packages of explosives show signs of discoloration or deterioration, the manufacturer or the department shall be notified. Such explosives must be carefully set aside and properly disposed of.

Loading of explosives or blasting agents in the blast holes.

Procedures that permit safe and efficient loading shall be established before loading is started. All drill holes shall be sufficiently large to admit freely the insertion of the cartridges of explosives. Tamping shall be done only with wood rods or with approved plastic tamping poles without exposed metal parts, but non sparking metal connectors may be used for jointed poles. Violent tamping shall be avoided. The primer shall never be tamped.

No holes shall be loaded except those to be fired in the next round of blasting. After loading, all remaining explosives and detonators shall be immediately returned to an authorized magazine.

Drilling may not be started until all remaining butts of old holes are examined for unexploded charges, and if any are found, they shall be re-fired before work proceeds.

When a charge of explosives has been exploded in a bore hole to enlarge or “spring” it, an interval of at least two hours must be allowed to pass before an additional charge of explosives can be loaded into the hole. There may be an exception made to this rule provided the sprung hole is thoroughly wet down with water before it is loaded.

No person shall be allowed to deepen drill holes which have contained explosives or blasting agents. No explosives or blasting agents shall be left unattended unless stored in a licensed magazine. User (blasters) shall not load, store or use explosives closer than the length of the steel being used for drilling and in no event nearer than fifty feet of drilling operations.

Machines and all tools not used for loading explosives into bore holes shall be removed from the immediate location of holes being loaded with explosives. Equipment shall not be operated within 50 feet of loaded holes except when equipment is need to add burden, mats or tracking of drills out of the loading area.

Power lines and portable electric cables for equipment being used shall be kept a safe distance from explosives or blasting agents being loaded into drill holes. Cables in the proximity of the blast area shall be de-energized and locked out by the blaster. Holes shall not be drilled where there is danger

of intersecting a charged or misfired hole. All blast holes in open work shall be stemmed to the collar or to a point which will confine the charge.

No explosives for underground operations other than those in Fume Class 1, as set forth by the Institute of Makers of Explosives, shall be used; however, explosives complying with the requirements of Fume Class 2 and Fume Class 3 may be used if adequate ventilation has been provided. Warning signs, indicating a blast area, shall be maintained at all approaches to the blast area. The warning sign lettering shall not be less than 4 inches in height on a contrasting background. All load stumps must be marked for identification on logging sites.

A bore hole shall never be sprung when it is adjacent to or near a hole which has been loaded. Flashlight batteries shall not be used for springing holes. No loaded holes shall be left unattended or unprotected. The user (blaster) shall keep an accurate record of explosives, blasting agents, and blasting supplies used in a blast and shall keep an accurate running inventory of all explosives and blasting agents stored on the operation.

When loading blasting agents pneumatically over electric blasting caps, semi conductive delivery hose shall be used and the equipment shall be bonded and grounded.

### ***Electric Blasting***

Only electric blasting caps shall be used for blasting operations in congested districts, or on highways, or adjacent to highways open to traffic, except where sources of extraneous electricity make such use dangerous. Blasting cap leg wires shall be kept short-circuited (shunted) until they are connected into the circuit for firing. Before adopting any system of electrical firing, the user (blaster) shall conduct a thorough survey for extraneous currents, and all dangerous currents shall be eliminated before any holes are loaded.

In any single blast using electric blasting caps, all caps shall be of the same style or function and be of the same manufacture. Electric blasting shall be carried out by using blasting circuits or power circuits in accordance with the electric blasting cap manufacturer's recommendations.

The firing line shall be checked with an approved testing device at the terminals before being connected to the blasting machine or other power source. The circuit including all caps shall be tested with an approved testing device before being connected to the firing line.

When firing a circuit of electric blasting caps, care shall be exercised to ensure that an adequate quantity of delivered current is available, in accordance with the manufacturer's recommendations. Connecting wires and lead wires shall be insulated single solid wires of sufficient current-carrying capacity, and shall not be less than twenty gauge (American wire gauge) solid core insulated wire. Firing line or leading wires shall be solid single wires of sufficient current-carrying capacity, and shall not be less than fourteen gauge (American wire gauge) solid core insulated wire. Bus wires –

depends on the size of the blast, fourteen gauge (American wire gauge) copper is recommended.

The ends of lead wires which are to be connected to a firing device shall be shorted by twisting them together or otherwise connecting them before they are connected to the leg wires or connecting wires, and they shall be kept in the possession of the person who is doing the loading until loading is completed and the leg wires attached. Lead wires shall not be attached to the firing device until the blaster is ready to fire the shot and must be attached by the user (blaster) themselves.

The ends of the leg wires on electric detonators shall be shorted in a similar manner and not separated until all holes are loaded and the loader is ready to connect the leg wires to the connecting wires or lead wires. When firing electrically, the insulation on all firing lines shall be adequate and in good condition. A power circuit used for firing electric blasting caps shall not be grounded.

In underground operations when firing from a power circuit, a safety switch shall be placed at intervals in the permanent firing line. This switch shall be made so it can be locked only in the “off” position and shall be provided with a short-circuiting arrangement of the firing lines to the cap circuit. In underground operations there shall be a “lightning” gap of at least 5 feet in the firing system ahead of the main firing switch; that is, between this switch and source of power. This gap shall be bridged by a flexible jumper cord just before firing the blast.

When firing from a power circuit, the firing switch shall be locked in the open or “off” position at all times, except when firing. It shall be so designed that the firing lines to the cap circuit are automatically short-circuited when the switch is in the “off” position. Keys to this switch shall be entrusted only to the user (blaster). Blasting machines shall be in good condition and the efficiency of the machine shall be tested periodically to make certain that it can deliver power at its rated capacity. When firing with blasting machines, the connections shall be made as recommended by the manufacturer of the electric blasting caps used.

The number of electric blasting caps connected to a blasting machine shall not be in excess of its rated capacity. Furthermore, in primary blasting, a series circuit shall contain no more caps than the limits recommended by the manufacturer of the electric blasting caps in use. The user (blaster) shall be in charge of the blasting machines, and no other person shall connect the leading wires to the machine. Users (blasters), when testing circuits to charged holes, shall use only blasting testers especially designed for this purpose.

Whenever the possibility exists that a leading line or blasting wire might be thrown over a live power line by the force of an explosion, care shall be taken to see that the total length of wires are kept too short to hit the lines, or that the wires are securely anchored to the ground. If neither of these requirements can be satisfied, a nonelectric system shall be used. In electrical firing, only the person making lead wire connections shall fire the shot. All connections shall be made from the bore hole back to the source of the firing current, and the leading wires shall remain shorted and not

connected to the blasting machine or other source of current until the charge is to be fired. After firing an electric blast from a blasting machine, the leading wires shall be immediately disconnected from the machine and short-circuited. When electric blasting caps have been used, workers shall not return to misfired holes for at least thirty minutes.

### *Use of Safety Fuse*

A fuse that is deteriorated or damaged in any way shall not be used. The hanging of fuse on nails or other projections which will cause a sharp bend to be formed in the fuse is prohibited. Before capping safety fuse, a short length shall be cut from the end of the supply reel so as to assure a fresh cut end in each blasting cap.

Only a cap crimper of approved design shall be used for attaching blasting caps to safety fuse. Cap Crimpers shall be kept in good repair and accessible for use. No unused cap or short capped fuse shall be placed in any hole to be blasted; such unused detonators shall be removed from the working place and disposed of or stored in the licensed magazine.

No fuse shall be capped, or primers made up, in any magazine or near any possible source of ignition. Capping of fuse and making of primers shall only be done in a place selected for this purpose and at least one hundred feet distant from any storage magazine. Fuse must be cut long enough to reach beyond the collar of the bore hole and in no case less than three feet. When shooting choker holes, not less than three feet of fuse shall be used.

At least two persons shall be present when multiple cap and fuse blasting is done by hand lighting methods. Not more than 12 fuses shall be lighted by each blaster when hand devices are used. However, when two or more safety fuses in a group are lighted as one by means of igniter cord, or other similar fuse-lighting devices, they may be considered as one fuse. The so-called “drop-fuse” method of dropping or pushing a primer or any explosive with a lighted fuse attached is prohibited.

Cap and fuse shall not be used for firing mud cap charges unless charges are separated sufficiently to prevent one charge from dislodging other shots in the blast. When blasting with safety fuses, consideration shall be given to the length and burning rate of the fuse. Sufficient time, with a margin of safety, shall always be provided by the blaster to reach a place of safety. The burning rate of the safety fuse in use at any time shall be measured, posted in conspicuous locations, and brought to the attention of all workers concerned with blasting. No fuse shall be used that burns faster than one foot in forty seconds or slower than one foot in fifty-five seconds.

For use in wet places the joint between the cap and fuse shall be waterproofed with a compound prepared for this purpose. In making up primers only non-sparking skewers shall be used for punching the hole in the cartridge to insert the capped fuse. No blasting cap shall be inserted in the explosives without first making a hole in the cartridge of proper size or using a standard cap crimper. Only sufficient primers for one day’s use shall be made up at one time. They shall be stored

in a box type magazine in which no other explosives are stored.

Any loose cartridges of explosives, detonators, primers and capped fuse unused at the end of the shift shall be returned to their respective magazines and locked up.

### ***Use of Detonating Cord***

Care shall be taken to select a detonating cord consistent with the type and physical condition of the bore hole and stemming and the type of explosives used. Detonating cord shall be handled and used with the same respect and care given other explosives. For quantity and distance purposes detonating fuse up to 60 grains per foot should be calculated as equivalent to 9 lbs. of high explosives per 1,000 feet. Heavier cord loads should be rated proportionately.

If using a detonating type cord for blasting the double trunk line or loop systems shall be used. Trunk lines in multiple row blasts shall make one or more complete loops, with cross ties between loops at intervals of not over two hundred feet.

All detonating cord knots shall be tight and all connections shall be kept at right angles to the trunk lines. The line of detonating cord extending out of a bore hole or from a charge shall be cut from the supply spool before loading the remainder of the bore hole or placing additional charges. Detonating cord shall be handled and used with care to avoid damaging or severing the cord during and after loading and hooking-up.

Detonating cord connections shall be competent and positive in accordance with approved and recommended methods. Knot-type or other cord connections shall be made only with detonating cord in which the explosive core is dry. All detonating cord trunk lines and branch lines shall be free of loops, sharp kinks, or angles that direct the cord back toward the oncoming line of detonation. All detonating cord connections shall be inspected before firing the blast.

When detonating cord millisecond-delay connectors or short-interval-delay electric blasting caps are used with detonating cord, the practice shall conform strictly to the manufacturer's recommendations. When connecting a blasting cap or an electric blasting cap to detonating cord, the cap shall be taped or otherwise attached securely along the side or the end of the detonating cord, with the end of the cap containing the explosive charge pointed in the direction in which the detonation is to proceed.

Detonators for firing the trunk line shall not be brought to the loading area nor attached to the detonating cord until everything else is in readiness for the blast.

### ***Firing the Blast***

A code of blasting signals equivalent to Table T-1 shall be posted on one or more conspicuous places at the operation, and all employees shall be required to familiarize themselves with the code



and conform to it. Danger signs shall be placed at suitable locations. All charges shall be covered with blasting mats before firing, where blasting may cause injury or damage by flying rock or debris. Before a blast is fired, a loud warning signal shall be given by the blaster in charge, who has made certain that all surplus explosives are in a safe place and all employees, vehicles, and equipment are at a safe distance, or under sufficient cover.

Flagmen shall be safely stationed on highways which pass through the danger zone so as to stop traffic during blasting operations. It shall be the duty of the blaster to fix the time of blasting. The blaster shall conduct all blasting operations and no shot shall be fired without the blaster's approval. Before firing an underground blast, warning shall be given, and all possible entries into the blasting area, and any entrances to any working place where a drift, raise, or other opening is about to hole through, shall be carefully guarded. The blaster shall make sure that all employees are out of the blast area before firing a blast.

**WARNING SIGNAL** – A 1-minute series of long blasts 5 minutes prior to blast signal.

**BLAST SIGNAL** – A series of short blasts 1 minute prior to the shot.

**ALL CLEAR SIGNAL** – A prolonged blast following the inspection of blast area. Inspection After Blasting

Immediately after the blast has been fired, the firing line shall be disconnected from the blasting machine, or where power switches are used, they shall be locked open or in the off position. Sufficient time shall be allowed, not less than fifteen minutes in tunnels, for the smoke and fumes to leave the blasted area before returning to the shot. An inspection of the area and the surrounding rubble shall be made by the user (blaster) to determine if all charges have been exploded before employees are allowed to return to the operation, and in tunnels, after the muck pile has been wetted down.

### *Misfires*

If a misfire is found, the user (blaster) shall provide proper safeguards for excluding all employees from the danger zone. No other work shall be done except that necessary to remove the hazard of the misfire and only those employees necessary to do the work shall remain in the danger zone.

No attempt shall be made to extract explosives from any charged or misfired hole; a new primer shall be put in and the hole re-blasted. If re-firing of the misfired hole presents a hazard, the explosives may be removed by washing out with water or, where the misfire is under water, blown out with air.

If there are any misfires while using cap and fuse, all employees shall remain away from the charge for at least one hour. Misfires shall be handled under the direction of the person in charge of

blasting. All wires shall be carefully traced and a search made for unexploded charges. When electric blasting caps have been used, workers shall not return to misfired holes for at least thirty minutes. All wires shall be carefully traced and a search made for unexploded charges. If explosives are suspected of burning in a hole, all persons in the endangered area shall move to a safe location and no one shall return to the hole until the danger has passed, but in no case within one hour.

No drilling, digging, or picking shall be permitted until all missed holes have been detonated or the authorized representative has approved that work can proceed.

### ***Underwater Blasting***

A user (blaster) shall conduct all blasting operations, and no shot shall be fired without the blaster's approval. Loading tubes and casings of dissimilar metals shall not be used because of possible electric transient currents from galvanic action of the metals and water. Only water-resistant blasting caps and detonating cords shall be used for all underwater blasting. Loading shall be done through a non-sparking metal loading tube when tube is necessary.

No blast shall be fired while any vessel under way is closer than 1,500 feet to the blasting area. Those on board vessels or craft moored or anchored within 1,500 feet shall be notified before a blast is fired. No blast shall be fired while any swimming or diving operations are in progress in the vicinity of the blasting area. If such operations are in progress, signals and arrangements shall be agreed upon to assure that no blast shall be fired while any persons are in the water.

### ***Display of Blasting Flags***

The storage and handling of explosives aboard vessels used in underwater blasting operations shall be according to provisions outlined herein on handling and storing explosives. When more than one charge is placed under water, a float device shall be attached to an element of each charge in such a manner that it will be released by the firing.

### ***Blasting in Excavation Work***

Detonators and explosives shall not be stored or kept in tunnels, shafts, or caissons. Detonators and explosives for each round shall be taken directly from the magazines to the blasting zone and immediately loaded. Detonators and explosives left over after loading a round shall be removed from the working chamber before the connecting wires are connected up. When detonators or explosives are brought into an air lock, no employee except the powder man, user (blaster), lock tender and the employees necessary for carrying, shall be permitted to enter the air lock. No material, supplies, or equipment shall be brought through with the explosives.

Primers, detonators and explosives shall be taken separately into pressure working chambers. The

user (blaster) or powder man shall be responsible for the receipt, unloading storage, and on-site transportation of explosives and detonators. All metal pipes, rails, air locks, and steel tunnel lining shall be electrically bonded together and grounded at or near the portal or shaft, and such pipes and rails shall be cross-bonded together at not less than 1,000-foot intervals throughout the length of the tunnel. In addition, each air supply pipe shall be grounded at its delivery end.

The explosives suitable for use in wet holes shall be water resistant and shall be Fume Class 1, or other approved explosives. When tunnel excavation in rock face is approaching mixed face, and when tunnel excavation is in mixed face, blasting shall be performed with light charges and with light burden on each hole. Advance drilling shall be performed as tunnel excavation in rock face approaches mixed face, to determine the general nature and extent of rock cover and the remaining distance ahead to soft ground as excavation advances.

### ***Vibration and Damage Control***

Blasting operations in or adjacent to coffer dams, piers, underwater structures, buildings, structures, or other facilities shall be carefully planned with full consideration for all forces and conditions involved. Black blasting powder shall not be used for blasting except when a desired result cannot be obtained with another type of explosive such as in quarrying certain types of dimension stone.

### ***In the use of black blasting powder:***

Containers shall not be opened in, or within fifty feet of any magazine; within any building in which fuel fired or exposed element electric heater is in operation; where electrical or incandescent particle sparks could result in powder ignition; or within fifty feet of any open flame.

Granular powder shall be transferred from containers only by pouring.

Spills of granular powder shall be cleaned up promptly with non sparking equipment, contaminated powder shall be put into a container of water and its content disposed of promptly after the granules have disintegrated, or the spill area shall be flushed with a copious amount of water to completely disintegrate the granules.

Containers of powder shall be kept securely closed at all times other than when the powder is being transferred from or into a container.

Containers of powder transported by vehicles shall be in a wholly enclosed cargo space.

Misfires shall be disposed of by washing the stemming and powder charge from the bore hole, and removal and disposal of the initiator as a damaged explosive. Bore holes of shots that fire but fail to break, or fail to break promptly, shall not be recharged for at least twelve hours.

No person shall store, handle, or transport explosives or blasting agents when such storage, handling, and transportation of explosives or blasting agents constitute an undue hazard to life. Do not abandon explosives or explosive substances.

## ***Fixed Location Mixing***

Buildings or other facilities used for mixing blasting agents shall be located appropriate distances away from inhabited buildings, passenger railroads, and public highways. In determining the distance separating highways, railroads, and inhabited buildings from potential explosions the sum of all masses which may propagate from either individual or combined donor masses are included. However, when the ammonium nitrate must be included, only fifty percent of its weight shall be used because of its reduced blast effects.

### ***Buildings used for the mixing of blasting agents shall conform to the requirements of this section.***

Buildings shall be of noncombustible construction or sheet metal on wood studs. Floors in a mixing plant shall be of concrete or of other nonabsorbent materials.

All fuel oil storage facilities shall be separated from the mixing plant and located in such a manner that in case of tank rupture, the oil will drain away from the mixing plant building. The building shall be well ventilated. Heating units which do not depend on combustion processes, when properly designed and located, may be used in the building. All direct sources of heat shall be located outside the mixing building.

All internal-combustion engines used for electric power generation shall be located outside the mixing plant building, or shall be properly ventilated and isolated by a firewall. The exhaust systems on all such engines shall be located so any spark emission cannot be a hazard to any materials in or adjacent to the plant. Equipment for mixing blasting agents shall conform to the requirements of this subsection.

The design of the mixer shall minimize the possibility of frictional heating, compaction, and especially confinement. All bearings and drive assemblies shall be mounted outside the mixer and protected against the accumulation of dust. All surfaces shall be accessible for cleaning.

Suitable means shall be provided to prevent the flow of fuel oil to the mixer in case of fire. In gravity flow systems an automatic spring-loaded shutoff valve with fusible link shall be installed.

The provisions of this subsection shall be considered when determining blasting agent compositions. The sensitivity of the blasting agent shall be determined by means of a No. 8 test blasting cap at regular intervals and after every change in formulation. Oxidizers of small particle size, such as crushed ammonium nitrate prills or fines, may be more sensitive than coarser products and shall, therefore, be handled with greater care.

No hydrocarbon liquid fuel with flash point lower than that of No. 2 diesel fuel oil 125 F. minimum shall be used. Crude oil and crankcase oil shall not be used. Metal powders such as aluminum shall be kept dry and shall be stored in containers or bins which are moisture-resistant or weather tight.

Solid fuels shall be used in such manner as to minimize dust explosion hazards. Peroxides and chlorates shall not be used.

All electrical switches, controls, motors, and lights located in the mixing room shall conform to the requirements in; otherwise they shall be located outside the mixing room. The frame of the mixer and all other equipment that may be used shall be electrically bonded and be provided with a continuous path to the ground. Safety precautions at mixing plants shall include the requirements of this subsection.

Floors shall be constructed so as to eliminate floor drains and piping into which molten materials could flow and be confined in case of fire. The floors and equipment of the mixing and packaging room shall be cleaned regularly and thoroughly to prevent accumulation of oxidizers or fuels and other sensitizers. The entire mixing and packaging plant shall be cleaned regularly and thoroughly to prevent excessive accumulation of dust.

Smoking, matches, open flames, spark-producing devices, and firearms (except firearms carried by guards) shall not be permitted inside of or within 50 feet of any building or facility used for the mixing of blasting agents. The land surrounding the mixing plant shall be kept clear of brush, dried grass, leaves, and other materials for a distance of at least 25 feet. Empty ammonium nitrate bags shall be disposed of daily in a safe manner.

No welding shall be permitted or open flames used in or around the mixing or storage area of the plant unless the equipment or area has been completely washed down and all oxidizer material removed. Before welding or repairs to hollow shafts, all oxidizer material shall be removed from the outside and inside of the shaft and the shaft vented with a minimum one-half inch diameter opening. Explosives shall not be permitted inside of or within 50 feet of any building or facility used for the mixing of blasting agents.

### ***Bulk Delivery and Mixing Vehicles***

The provisions of this subsection shall apply to off-highway private operations as well as to all public highway movements. A bulk vehicle body for delivering and mixing blasting agents shall conform with the requirements of this subsection. The body shall be constructed of noncombustible materials. Vehicles used to transport bulk premixed blasting agents on public highways shall have closed bodies. All moving parts of the mixing system shall be designed as to prevent a heat buildup. Shafts or axles which contact the product shall have outboard bearings with 1-inch minimum clearance between the bearings and the outside of the product container. Particular attention shall be given to the clearances on all moving parts.

A bulk delivery vehicle shall be strong enough to carry the load without difficulty and be in good mechanical condition. Operation of bulk delivery vehicles shall conform to the requirements of federal regulations for interstate transportation of dangerous substances. These include the

placarding requirements as specified by department of transportation.

The operator shall be trained in the safe operation of the vehicle together with its mixing, conveying, and related equipment. The employer shall assure that the operator is familiar with the commodities being delivered and the general procedure for handling emergency situations. The hauling of either blasting caps or other explosives but not both, shall be permitted on bulk trucks provided that a special wood or nonferrous-lined container is installed for the explosives. Such blasting caps or other explosives shall be in DOT-specified shipping containers.

No person shall smoke, carry matches or any flame-producing device, or carry any firearms while in or about bulk vehicles effecting the mixing transfer or down-the-hole loading of blasting agents at or near the blasting site. Caution shall be exercised in the movement of the vehicle in the blasting area to avoid driving the vehicle over or dragging hoses over firing lines, cap wires, or explosive materials. The employer shall assure that the driver, in moving the vehicle, has assistance of a second person to guide the driver's movements.

No in transit mixing of materials shall be performed. Pneumatic loading from bulk delivery vehicles into blast holes primed with electric blasting caps or other static-sensitive systems shall conform to the requirements of this subsection. A positive grounding device shall be used to prevent the accumulation of static electricity. A discharge hose shall be used that has a resistance range that will prevent conducting stray currents, but that is conductive enough to bleed off static buildup.

A qualified person shall evaluate all systems to determine if they will adequately dissipate static under potential field conditions. Repairs to bulk delivery vehicles shall conform to the requirements of this section. No welding or open flames shall be used on or around any part of the delivery equipment unless it has been completely washed down and all oxidizer material removed.

Before welding or making repairs to hollow shafts, the shafts shall be thoroughly cleaned inside and out and vented with a minimum one-half inch diameter opening.

### ***Bulk Storage Bins***

The bin, including supports, shall be constructed of compatible materials, waterproof, and adequately supported and braced to withstand the combination of all loads including impact forces arising from product movement within the bin and accidental vehicle contact with leg supports. The bin discharge gate shall be designed to provide a closure tight enough to prevent leakage of the stored product. Provision shall also be made so that the gate can be locked.

Bin loading manways or access hatches shall be hinged or otherwise attached to the bin and be designed to permit locking. Any electrically driven conveyors for loading or unloading bins shall conform to the requirements of through. They shall be designed to minimize damage from corrosion. Bins containing blasting agents shall be located, with respect to inhabited buildings, passenger railroads, and public highways and separated from other blasting agent storage and explosives

storage. Bins containing ammonium nitrate shall be separated from blasting agent storage and explosive storage.

### ***Transporting Packaged Blasting Agents***

Vehicles transporting blasting agents shall only be driven by and in charge of a driver at least twenty one years of age who is capable, careful, reliable, and in possession of a valid motor vehicle operator's license. Such a person shall also be familiar with the states vehicle and traffic laws. No matches, firearms, acids, or other corrosive liquids shall be carried in the bed or body of any vehicle containing blasting agents.

No person shall be permitted to ride upon, drive, load, or unload a vehicle containing blasting agents while smoking or under the influence of intoxicants, narcotics, or other dangerous drugs. It is prohibited for any person to transport or carry any blasting agents upon any public vehicle carrying passengers for hire. Vehicles transporting blasting agents shall be in safe operating condition at all times.

When offering blasting agents for transportation on public highways the packaging, marking, and labeling of containers of blasting agents shall comply with the requirements of DOT. Vehicles used for transporting blasting agents on public highways shall be placarded in accordance with DOT regulations. Use of blasting agents.

### ***Water Gel Explosives and Agents***

Unless otherwise set forth in this section, water gels shall be transported, stored and used in the same manner as explosives or blasting agents in accordance with the classification of the product. Water gels containing a substance in itself classified as an explosive shall be classified as an explosive and manufactured, transported, stored, and used as specified for "explosives" in this manual.

Water gels containing no substance in itself classified as an explosive and which are cap-sensitive as defined in under blasting agent shall be classified as an explosive and manufactured, transported, stored and used as specified for "explosives" in this section. Water gels containing no substance in itself classified as an explosive and which are not cap-sensitive as defined in under blasting agent shall be classified as blasting agents and manufactured, transported, stored, and used as specified for "blasting agents" in this section.

When tests on specific formulations of water gels result in department of transportation classification as a Class B explosive, bullet-resistant magazines are not required.

### ***Fixed Location Mixing***

Buildings or other facilities used for mixing water gels shall be located with respect to inhabited

buildings, passenger railroads and public highways. In determining the distances separating highways, railroads, and inhabited buildings from potential explosions, the sum of all masses that may propagate from either individual or combined donor masses are included. However, when the ammonium nitrate must be included, only fifty percent of its weight shall be used because of its reduced blast effects.

Buildings used for the mixing of water gels shall conform to the requirements of this subsection. Buildings shall be of non-combustible construction or sheet metal on wood studs. Floors in a mixing plant shall be of concrete or of other nonabsorbent materials.

Where fuel oil is used all fuel oil storage facilities shall be separated from the mixing plant and located in such a manner that in case of tank rupture, the oil will drain away from the mixing plant building. The building shall be well ventilated. Heating units that do not depend on combustion processes, when properly designed and located, may be used in the building. All direct sources of heat shall be provided exclusively from units located outside of the mixing building.

All internal-combustion engines used for electric power generation shall be located outside the mixing plant building, or shall be properly ventilated and isolated by a firewall. The exhaust systems on all such engines shall be located so any spark emission cannot be a hazard to any materials in or adjacent to the plant.

### ***Construction of Magazines***

Construction of all explosive storage magazines must comply with state Bureau of Alcohol, Tobacco, and Firearms regulations.

A Class I storage facility shall be a permanent structure; a building, an igloo or any army-type structure, a tunnel, or a dugout. It shall be bullet-resistant, fire-resistant, weather-resistant, theft-resistant, and well ventilated.

All building type storage facilities shall be constructed of masonry, wood, metal, or a combination of these materials and shall have no openings except for entrances and ventilation. Ground around such storage facilities shall slope away for drainage. Masonry wall construction shall consist of brick, concrete, tile, cement, tile, cement block, or cinder block and shall be not less than 6 inches in thickness. Hollow masonry units used in construction shall have all hollow spaces filled with well tamped coarse dry sand or weak concrete (a mixture of one part cement and eight parts of sand with enough water to dampen the mixture while tamping in place). Interior wall shall be covered with a non-sparking material. Metal wall construction shall consist of sectional sheets of steel or aluminum not less than number 14 gauge, securely fastened to a metal framework. Such metal wall construction shall either be lined inside with brick, solid cement blocks, hardwood not less than 4 inches in thickness or a material of equivalent strength, or shall have at least 6 inch sand fill between interior and exterior walls. Interior walls shall be constructed of or covered with a non-sparking material.



Wood frame wall construction. The exterior of outer wood walls shall be covered with iron or aluminum not less than number 26 gauge. An inner wall of non sparking materials shall be constructed so as to provide a space of not less than 6 inches between the outer and inner walls, which space shall be filled with coarse dry sand or weak concrete. Floors shall be constructed of a non-sparking material and shall be strong enough to bear the weight of the maximum quantity to be stored.

Foundations shall be constructed of brick, concrete, cement block, stone, or wood posts. If piers or posts are used, in lieu of a continuous foundation, the space under the buildings shall be enclosed with metal.

Except for buildings with fabricated metal roofs, the outer roof shall be covered with no less than the number 26-gauge iron or aluminum fastened to a 7/8- inch sheathing. Where it is possible for a bullet to be fired directly through the roof and into the storage facility at such an angle that the bullet would strike a point below the top of inner walls, storage facilities shall be protected by one of the following methods a sand tray shall be located at the top of inner walls covering the entire ceiling area, except that necessary for ventilation, lined with a layer of building paper, and filled with not less than 4 inches of course dry sand. A fabricated metal roof shall be constructed of 3/16-inch plate steel lined with 4 inches of hardwood or material of equivalent strength (for each additional 1/16-inch of plate steel, the hardwood or material of equivalent strength lining may be decreased one inch).

All doors shall be constructed of ¼ inch plate steel and lined with 2 inches of hardwood or material of equivalent strength. Hinges and hasps shall be attached to the doors by welding, riveting or bolting (nuts on inside of door). They shall be installed in such a manner that the hinges and hasps cannot be removed when the doors are closed and locked. Each door shall be equipped with two mortise locks; or with two padlocks fastened in separate hasps and staples; or with a combination of mortise lock and a padlock, or with two padlocks fastened in separate hasps and staples; or with a combination of mortise lock and a padlock, or with two padlocks fastened in separate hasps and staples; or with a combination of mortise lock and a padlock, or with a mortise lock that requires two keys to open; or a three-point lock. Padlocks shall have at least five tumblers and a case hardened shackle of at least 3/8-inch diameter. Padlocks shall be protected with not less than ¼-inch steel hoods constructed so as to prevent sawing or lever action on the locks, hasps, and staples. These requirements do not apply to magazine doors that are adequately secured on the inside by means of a bolt, lock, or bar that cannot be actuated from the outside.

Except at doorways, a 2-inch air space shall be left around ceilings and the perimeter of floors. Foundation ventilators shall not be less than 4 by 6 inches. Vents in the foundation, roof, or gables shall be screened and offset.



# health & safety manual

c o n s t r u c t i n g   a   s a f e   &   s u s t a i n a b l e   f u t u r e

No sparking metal construction shall be exposed below the top of walls in the interior storage facilities, and all nails therein shall be blind-nailed, countersunk or non-sparking. Storage facilities shall be constructed of reinforced concrete, masonry, metal or a combination of these materials. They shall have an earth mound covering of not less than 24 inches on the top, sides and rear. Interior walls and floors shall be covered with a non-sparking material.

Ref. OSHA 1926-900

## Chapter 27 Bloodborne Pathogens

### *A. Purpose*

- B. The purpose of this Bloodborne Pathogens Exposure Control Plan is to protect the health and safety of all O,R&L employees who can be reasonably expected, as the result of performing their job duties, to be exposed to blood or potentially infectious materials and comply with the COMM/OSHA Standard 29 CFR 1910.1030 Bloodborne Pathogens Exposure Control. Definitions of terms relating to this exposure control plan are found in Appendix A.

### *C. Authority and Reference*

Occupational Safety and Health Administration (OSHA) CFR 29 1910.1030 Dept. of Commerce (Chapter 32)

### *D. Application*

This plan applies to all employees who are engaged in activities that involve exposures to blood or other body fluids.

### *E. Responsibility for Compliance*

The development and administration of this Bloodborne Pathogens Exposure Control Plan will be the responsibility of the Safety Officer. These responsibilities will include:

1. Establishing a written exposure control plan and developing a schedule for implementing other provisions of the standard.
2. Developing written procedures for cleaning and handling contaminated materials and for disposing of hazardous waste generated within all buildings and facilities.
3. Providing appropriate personal protective equipment that is readily accessible to identified employees.
4. Providing hepatitis B vaccines under specific circumstances as defined by an exposure determination and/or medical follow-up for exposure incidents.
5. Providing warning labels or color-coded containers for use with hazardous waste.
6. Providing training to current employees within 90 days of the effective date, of the plan and initially to new employees and thereafter, annually.
7. Developing written procedures for meeting the requirements for medical record keeping.
8. Providing for retention of medical records for the duration of employment, plus 30 years.



9. Conducting an annual review of the effectiveness of this exposure control plan and updating the plan as needed.

## ***F. Exposure Determinations***

O,R&L will determine which employees can be reasonably be expected to be exposed to blood or other body fluids containing blood in the course of their work. These employees, for the purposes of compliance with this standard, may include 1) designated first aid providers, i.e. those employees whose primary job assignment would include rendering first aid; and 2) those employees who might render first aid only as a collateral duty. **Note:** These exposure determinations may be performed by a qualified person (i.e. occupational, public health or infection control nurse, industrial hygienist or safety professional) or a committee consisting of qualified persons with appropriate education, experience and/or training.

All decisions relating to Bloodborne exposure by job classification will be documented using the form found in Appendix B.

### **A. Job Classifications**

The safety officer has identified the following job classifications as those in which employees could be exposed to Bloodborne pathogens in the course of fulfilling their job requirements:

Job Classifications:

1. Jobsite Superintendents
2. Any O,R&L employee first aid trained

### **B. Tasks and Procedures**

O,R&L will determine will develop a list of specific tasks performed by employees in the above job classifications in which exposure to Bloodborne pathogens may occur (without regard to the use of personal protective equipment) and the safety precautions and personal protective equipment that must be observed and used to prevent contact with Bloodborne pathogens.

**Note:** These tasks/procedures may include, but not be limited to, the following examples:

1. Care of minor injuries, i.e., scrape, minor lacerations;
2. Care of injured person during a construction activity;
3. Cleaning tasks associated with body fluid spills.

## *F. Method Of Compliance*

The following methods of compliance, as mandated by the COMM/OSHA standard, will be incorporated into this exposure control plan. O,R&L will determine appropriate specific guidelines for cleaning, decontamination and waste disposal procedures. **Note:** Once these guidelines are written, they will be distributed to the affected employees and/or posted in appropriate locations and the contents included in the training program.

### **1. Universal Precautions**

Universal precautions will be used in order to prevent contact with blood or other potentially infectious materials (OPIM). All blood or other potentially contaminated body fluids will be considered to be infectious. Under circumstances in which differentiation among body fluid types is difficult or impossible, all body fluids will be considered potentially infectious materials.

### **2. Engineering and Work Practice Controls**

Engineering and work practice controls are designed to eliminate or minimize employee exposure. Where occupational exposure remains after institution of these controls, personal protective equipment shall also be used.

### **3. Exposure Incident Investigation**

An exposure incident is defined as contact with blood or other potentially infectious materials on an employee's non-intact skin, eye, mouth, other mucous membrane or by piercing the skin or mucous membrane through such events as needle sticks.

An exposure incident investigation form will be completed each time an exposure incident occurs.

### **4. Handwashing**

- a. O,R&L will provide hand washing facilities which are readily accessible to employees, or when provision for hand washing facilities is not feasible, they will provide either an appropriate antiseptic hand cleanser in conjunction with clean cloth/paper towels or antiseptic towelettes.
- b. Employees will wash hands or any other skin with soap and water, or flush mucous membranes with water immediately or as soon as feasible following contact of such body areas with blood or other potentially infectious materials.
- c. Employees will wash their hands immediately or as soon as feasible after removal of gloves or other personal protective equipment. When antiseptic hand cleaners or towelettes are used, hands will be washed with soap and running water as soon as feasible. Do not reuse gloves.

## 5. Housekeeping and Waste Procedures

- a. O,R&L will ensure that the worksite is maintained in a clean and sanitary condition. O,R&L will also determine and implement an appropriate written schedule for cleaning and method of decontamination based upon the location within the facility, type of surface to be cleaned, type of soil present and the tasks or procedures being performed.
- b. All equipment, materials, environmental and working surfaces will be cleaned and decontaminated after contact with blood or other potentially infectious materials.
  - Contaminated work surfaces will be decontaminated with an appropriate disinfectant immediately after completion of procedures/task/therapy, or as soon as feasible, when surfaces are overtly contaminated or after any spill of blood or other potentially infectious materials, and at the end of the work day if the surface may have become contaminated since the last cleaning.
  - Protective coverings, such as plastic wrap, aluminum foil, or imperiously-backed absorbent paper used to cover equipment and environmental surfaces, will be removed and replaced as soon as feasible when they become contaminated with blood or OPIM, or at the end of the school day if they have become contaminated since the last cleaning.
- c. All bins, pails, cans, and similar receptacles intended for reuse which have a reasonable likelihood for becoming contaminated with blood or other potentially infectious materials will be inspected and decontaminated on a regularly scheduled basis and cleaned and decontaminated immediately or as soon as feasible upon visible contamination.
- d. Materials, such as paper towels, gauze squares or clothing, used in the treatment of blood or OPIM spills that are blood-soaked or caked with blood will be bagged, tied and designated as a biohazard. The bag will then be removed from the site as soon as feasible and replaced with a clean bag. Bags designated as biohazard (containing blood or OPIM contaminated materials) bags will be red in color or affixed with a biohazard label.
- e. A custodian will respond immediately to any major blood or OPIM incident so that the area can be cleaned, decontaminated, and the material removed immediately.

**Note:** A major blood or OPIM incident is one in which there will be biohazardous material for disposal.
- f. A marked biohazard container will be available in the (custodial ) area for the containment of biohazard designated bags.
- g. In the event that regulated waste leaks from a bag or container, the waste will be placed in a second container and the area will be cleaned and decontaminated.

- h. Broken glass contaminated with blood or OPIM will not be picked up directly with the hands. The glass will be cleaned up using mechanical means, such as a brush and dustpan, tongs, or forceps. All broken glass will be containerized.
- i. Contaminated sharps, broken glass, plastic or other sharp objects will be placed into appropriate sharps containers. The sharps containers will be closeable, puncture resistant, labeled with a biohazard label, and leak proof. Containers will be maintained in an upright position. Containers will be easily accessible to staff and located as close as feasible to the immediate area where sharps are used or can be reasonably anticipated to be found. If an incident occurs where there is contaminated material that is too large for a sharps container, the custodian will be contacted immediately to obtain an appropriate biohazard container for this material.

Reusable sharps that are contaminated with blood or other potentially infectious materials will not be stored or processed in a manner that requires employees to reach by hand into the containers where these sharps have been placed. Employees will notify when sharp containers become 3/4 full so that the containers can be disposed of properly. **Note:** The local hospital or county health department may provide assistance in determining appropriate disposal procedures.

Contaminated needles will not be bent, recapped, removed, sheared or purposely broken.

- j. Disposal of all regulated waste will be in accordance with applicable regulations of the United States, the Department of Commerce and the Department of Natural Resources.
- k. Food and drink will not be kept in refrigerators, freezers, cabinets, or on shelves, counter-tops or bench tops where blood or other potentially infectious materials are present.
- l. All procedures involving blood or other potentially infectious materials will be performed in such a manner as to minimize splashing, spraying, splattering, and generating droplets of these substances. Mouth pipetting/suctioning of blood or OPIM is prohibited; e.g., sucking out snakebites.
- m. Specimens of blood or other potentially infectious materials will be placed in containers which prevent leaking during collection, handling, processing, storage, transport, or shipping. These containers will be labeled with a biohazard symbol or be colored red.
- n. Equipment which may become contaminated with blood or other potentially infectious material is to be examined prior to servicing and shipping and is to be decontaminated, if feasible. If not feasible, a readily observable biohazard label stating which portions are contaminated is to be affixed to the equipment. This information is to be conveyed to all affected employees, the service representative,

and/or manufacturer, as appropriate, prior to handling, servicing or shipping. Equipment to consider may include communication devices, and vocational equipment needing repair after an exposure incident.

- o. Contaminated laundry will be handled as little as possible. Gloves must be worn when handling contaminated laundry. Contaminated laundry will be bagged or containerized at the location where it was used and will not be sorted or rinsed in the location of use. Containers must be leak-proof if there is reasonable likelihood of soak-through or leakage. All contaminated laundry will be placed and transported in bags or containers that are biohazard-labeled or colored red.
- p. Equipment which may become contaminated with blood or other potentially infectious materials shall be examined prior to servicing or shipping and shall be decontaminated as necessary, unless the employer can demonstrate that decontamination of such equipment or portions of such equipment is not feasible.
- q. The employer shall ensure that this information is conveyed to all affected employees, the servicing representative, and/or the manufacturer, as appropriate, prior to handling, servicing, or shipping so that appropriate precautions will be taken.

## ***G. Personal Protective Equipment***

1. Where the potential of occupational exposure remains after institution of engineering and work controls, personal protective equipment will be used. Personal protective equipment will be considered “appropriate” only if it does not permit blood or other potentially infectious materials to pass through to or reach the employee’s work clothes, street clothes, undergarments, skin, eyes, mouth, or other mucous membranes under normal conditions of use and for the duration of time which the protective equipment will be used. The employer shall clean, launder, repair and replace, and dispose of personal protective equipment at no cost to the employee. The types of personal protection equipment (PPE) available employees include:

### **Types of Personal Protective Equipment**

#### **a. Gloves**

#### **b. Eye/face protection**

#### **c. Masks**

- Gloves will be worn when it can be reasonably anticipated that the employee may have hand contact with blood, other potentially infectious materials, mucous membranes, and non-intact skin; and when handling or touching contaminated items or surfaces.
- Disposable gloves will be replaced as soon as practical when contaminated or as soon as feasible if they are torn, punctured, or when the ability to function as a barrier is compromised. Disposable gloves will not be washed or decontaminated



for re-use (contaminated disposable gloves do not meet the DNR definition of infectious waste and do not need to be disposed of in red or specially labeled bags).

- Hypoallergenic gloves, glove liners, powderless gloves, or other similar alternatives will be readily accessible to those employees who are allergic to the gloves nominally provided.
  - Masks, in combination with eye protection devices, such as goggles or glasses with solid side shields, or chin-length face shields, will be worn whenever splashes, spray, spatter, or droplets of blood or other potentially infectious materials may be generated and eye, nose, or mouth contamination can be reasonably anticipated, i.e., custodian cleaning a clogged toilet, nurses or aides who are performing suctioning.
  - Appropriate protective clothing will be worn in occupational exposure situations. The type and characteristics will depend upon the task, location, and degree of exposure anticipated.
2. O,R&L will ensure that appropriate personal protective equipment is readily accessible at the worksite.
    - a. O,R&L will clean, launder and dispose of personal protective equipment, at no cost to the employee.
    - b. O,R&L will repair or replace personal protective equipment as needed to maintain its effectiveness, at no cost to the employee.
  3. All personal protective equipment will be removed prior to leaving the work area. When personal protective equipment/supplies are removed, the equipment will be placed in an appropriately designated area or container for storage, washing, decontamination or disposal.
  4. If a garment(s) is penetrated by blood or other potentially infectious materials, the garment(s) will be removed immediately, or as soon as feasible.
  5. Supervisors will ensure that their employees use the appropriate personal protective equipment. If an employee temporarily and/or briefly declines to use personal protective equipment because the equipment is in his/her judgment that in that particular instance it would have posed an increased hazard to the employee or others, in that particular instance, O,R&L will investigate and document the circumstances in order to determine whether changes can be instituted to prevent such occurrences in the future.

## ***H. Hepatitis B Vaccination***

1. The hepatitis B vaccine will be available for employees whose designated job assignment includes the rendering of first aid treatment, or who have occupational exposure to blood or OPIM.
  - a. O,R&L will make the hepatitis B vaccination series available to all employees who have occupational exposure after the employee(s) have been given information on the

- hepatitis B vaccine, including information on its efficacy, safety, method of administration and the benefits of being vaccinated. The vaccinations will be offered at not cost to the employee and at reasonable times.
- b. The Safety Officer will make the hepatitis B vaccination series available after the training and within 10 working days of initial assignment to all employees who have occupational exposure.
  - c. The hepatitis B vaccination series will be made available to the employee at a reasonable time and place, and performed by or under the supervision of a licensed physician according to the most current recommendations of the U.S. Public Health Service. O,R&L will assure that the laboratory tests are then conducted by an accredited laboratory.
  - e. O,R&L will not make participation in a pre-employment screening program a prerequisite for receiving the hepatitis B vaccine.
  - f. If an employee initially declines the hepatitis B vaccination series, but at a later date while still covered under the standard decides to accept the vaccination, O,R&L will make available the hepatitis B vaccine at that time.
  - g. The safety officer will assure that employees who decline to accept the hepatitis B vaccine offered by O,R&L will sign the declination statement established under the standard. (Appendix E).
  - h. If a routine booster dose(s) of hepatitis B vaccine is recommended by the U.S. Public Health Service or other health care provided at a future date, the booster dose(s) will be made available at no charge to the employee.
  - i. Records regarding HBV vaccinations or declinations will be maintained by the safety officer.
  - j. The O,R&L safety officer will ensure that the health care professional responsible for employee's hepatitis B vaccination is provided with a copy of this regulation.
2. Hepatitis B vaccines will be available for employees who render first aid only as a collateral duty responding solely to injuries resulting from workplace incidents, generally at the location where the incident occurred.
- a. The O,R&L safety officer will provide the hepatitis B vaccine or vaccination series to those unvaccinated employees whose primary job assignment is not the rendering of first aid only in the event that they render assistance in any situation involving the presence of blood or OPIM as identified in Appendix B.
  - b. All first aid incidents involving the presence of blood or OPIM will be reported to the O,R&L safety officer by the end of the work day on which the incident occurred.
  - c. The O,R&L exposure incident investigation form will be used to report first aid incidents involving blood or OPIM. The incident description must include a determination of whether or not, in addition to the presence of blood or other potentially infected materials, an "exposure incident," as defined by the standard, occurred.

- d. This determination is necessary in order to ensure that the proper post-exposure evaluation, prophylaxis and follow-up procedures are made available immediately if there has been an exposure incident as defined by the standard.
- e. The full hepatitis B vaccination series will be made available as soon as possible, but in no event later than 24 hours, to all unvaccinated first aid providers who have rendered assistance in any situation involving the presence of blood or other potentially infectious materials regardless of whether or not a specific “exposure incident,” as defined by the standard, has occurred.
- f. The hepatitis B vaccination record or declination statement will be completed for each exposed employee. All other pertinent conditions will also be followed for those persons who receive the pre-exposure hepatitis B vaccine.
- g. This incident investigation form will be recorded on a list of recorded first aid incidents and will be readily available to employees.
- h. This reporting procedure will be included in the training program.

## ***I. Post Exposure Evaluation and Follow-up***

1. Following a report of an exposure incident, O,R&L will make immediately available to the exposed employee a confidential medical examination and follow-up, including at least the following elements:
  - a. Documentation of the route(s) of exposure, and the circumstances under which the exposure incident occurred;
  - b. Identification and documentation of the source individual, if possible, or unless this O,R&L can establish that identification is infeasible or prohibited by state or local law;
    - The source individual’s blood will be tested as soon as feasible and after consent is obtained in order to determine HBV and HIV infectivity, if consent is not obtained O,R&L will establish that legally required consent cannot be obtained. When the source individual’s consent is not required by law, the source individual’s blood, if available, shall be tested and the results documented.
    - Results of the source individual’s testing will be made available to the exposed employee only after consent is obtained, and the employee will be informed of applicable laws and regulations concerning disclosure of the identity and infectious status of the source individual.
  - c. The exposed employee’s blood will be collected as soon as feasible and tested after consent is obtained. If the employee consents to baseline blood collection, but does not consent at that time for HIV serological testing, the sample will be preserved for at least 90 days. If, within 90 days of the exposure incident, the employee elects to have the baseline sample tested, such testing will be done as soon as feasible.
  - d. For post-exposure prophylaxis, O,R&L will follow recommendations established by the U.S. Public Health Service

- e. Counseling will be made available at no cost to employees and their families on the implications of testing and post-exposure prophylaxis;
  - f. An evaluation of any reported illnesses will be conducted..
2. O,R&L will ensure that all medical evaluations and procedures, including prophylaxis, are made available at no cost and at a reasonable time and place to the employee. All medical evaluations and procedures will be conducted by or under the supervision of a licensed physician and laboratory tests will be conducted in accredited laboratories.
  3. Information provided to the health care professional who evaluates the employee will include:
    - A description of the employee's duties as they relate to the exposure incident;
    - Documentation of the route of exposure and the circumstances under which the exposure occurred;
    - Results of the source individual's blood testing, if consent was given and the results are available;
    - All medical records relevant to the appropriate treatment of the employee, including vaccination status which are O,R&L's responsibility to maintain.
    - O,R&L will obtain and provide the employee with a copy of the evaluating health care professional's written opinion within 15 days of the completion of the evaluation.
    - The health care professional's written opinion for hepatitis B vaccination will be limited to whether hepatitis B vaccination is indicated for an employee, and if the employee has received such vaccination.
    - The health care professional's written opinion for post-exposure evaluation and follow-up shall be limited to the following information:
      - This employee has been informed of the results of the evaluation; and
      - This employee has been told about any medical conditions resulting from exposure to blood or other potentially infectious materials which require further evaluation and or treatment.
    - All other findings or diagnoses will remain confidential and will not be included in the written report.

## ***J. Communication About Hazards To Employees***

1. Warning labels will be affixed to containers of regulated waste, refrigerators, and freezers containing blood or other potentially infectious material; and other containers used to store, transport or ship blood or other potentially infectious materials. Exception: Red bags or red containers may be substituted for labels.
  - a. These labels will be fluorescent orange or orange-red or predominantly so, with

lettering or symbols in a contrasting color.

- b. These labels will be an integral part of the container or will be affixed as close as feasible to the container by string, wire, adhesive, or other methods that prevent their loss or unintentional removal.
- c. Labels for contaminated equipment must follow the same labeling requirements. In addition, the labels will also state which portions of the equipment remain contaminated.

## 2. Information and Training

- a. O,R&L will ensure that all current and new employees with potential for occupational exposure participate in an initial and annual training program at no cost to employees.
- b. Training will be provided at the time of initial assignment to tasks when occupational exposure may take place and at least annually thereafter.

**Note:** For employees who have received training on Bloodborne in pathogens that preceded the effective date of this standard, only training with respect to the provisions of the standard which were not included need to be provided.

3. O,R&L will provide additional training when changes, such as modifications of tasks or procedures, affect employee potential for occupational exposure. The additional training may be limited to addressing the new exposures created.
4. Only material appropriate in content and vocabulary to the educational level, literacy and language of employees will be used in the training. Appendix H contains the required content for training.
5. The person conducting the training will be knowledgeable in the subject matter covered by the elements contained in the training program, as it relates to O,R&L workplace.

## ***K. Recordkeeping***

### 1. Medical Records:

- a. O,R&L will establish and maintain an accurate medical record for each employee with an occupational exposure. This record will include:
  - The name and social security number of employee;
  - A copy of employee's hepatitis B vaccination record or declination form and any additional medical records relative to hepatitis B;
  - If exposure incident(s) have occurred, a copy of all results of examinations, medical testing and follow-up procedures;
  - If exposure incident(s) have occurred, a copy of the health care professional's written opinion;
  - If exposure incident(s) have occurred, a copy of the information provided to the

health care professional: i.e., exposure incident investigation form and the results of the source individual's blood testing, if available and if consent has been obtained for release.

- b. O,R&L will insure that the employee's medical records are kept confidential and are not disclosed or reported without the employee's expressed written consent to any person within or outside of this Institution/University Campus/Center, except as required by law. These medical records will be kept separate from other personnel records.
- c. These medical records will be maintained for the duration of employment plus 30 years.

## 2. Training Records

- a. Training records will include:
  - The date(s) of the training session
  - The contents or a summary of the training sessions
  - The name(s) and qualifications of person(s) conducting the training
  - The name and job titles of all persons attending the training session
- b. Training records will be maintained for 5 years from the date the training occurred.

## 3. Availability of Records

O,R&L will insure:

- All records required to be maintained by this standard will be made available upon request to the Department of Commerce upon request for examination and copying.
- Employee training records required by this standard will be provided upon request for examination and copying to employees, to employee representatives, and to the Department of Commerce.
- Employee medical records required by this standard will be provided upon request for examination and copying to the subject employee and to anyone having written consent of the affected employee and to the Department Commerce.
- O,R&L will comply with the requirements involving the transfer of records set forth in this standard.

### *L. Evaluation and Review*

1. The safety officer will conduct an annual evaluation and review of the effectiveness of this exposure control plan and will coordinate corrective action and update the plan as needed.



## Chapter 28 Hazard Communication Plan

### *General*

The management of O,R&L Construction is committed to preventing accidents and ensuring the safety and health of our employees. We will comply with all applicable federal and state health and safety rules and provide a safe, healthful environment for all of our employees.

The written hazard communication plan is available at the following location for review by all employees:

O,R&L Construction  
2 Summit Place  
Branford, CT 06405

### *Container Labeling*

All hazardous chemical containers used at our construction sites will clearly identify the chemical on the label and include on appropriate hazard warning and the manufacturers name and address.

No container shall be allowed for use until this information is verified by the Site Superintendent. The Site Superintendent will ensure that all containers are labeled with a copy of the original manufacturers label or a label that has the appropriate identification and hazard warning.

### *Safety Data Sheets*

Safety data sheets (SDS) are readily available to all employees. Employees can review safety data sheets for all hazardous chemicals used at the respective construction site. Safety data sheets are stored by the respective Site Superintendent at the site trailer or office and may be requested for review by the employee at any time.

Conversely, duplicate safety data sheets are retained at O,R&L Construction's corporate office located at:

O,R&L Construction  
2 Summit Place  
Branford, CT 06405

## *Training*

Before they start their job, new employees will attend a hazard communication class that covers the following topics:

- An overview of the requirements in OSHA's hazard communication rules.
- Hazardous chemicals present in their workplace
- The written hazard communication plan and where it may be reviewed.
- Physical and health effects of the hazardous chemicals
- Methods used to determine the presence or release of hazardous chemicals in the work area.
- How to reduce or prevent exposure to these hazardous chemicals through use of control/work practices and personal protective equipment.
- Steps O,R&L Construction has taken to reduce or prevent exposure to these chemicals.
- Emergency procedures to follow if an employee is exposed to these chemicals.
- How to read labels and review safety data sheets.

## *Hazardous Chemical List*

Because of the nature of construction, a master list identifying all chemicals used in the workplace is not applicable. Individual project lists will be created using the specifications and drawings supplied by the owner and/or architect and supplied to each site superintendent. In cases where drawings do not specify materials to be used, the list will be generated through the submittal process and generated at that time.

## *Hazardous Non-routine Tasks*

Before employees perform non-routine tasks that may expose them to hazardous chemicals, they will be informed by their supervisors about the chemicals' hazards. Their supervisor also will inform them about the safe work practices necessary to control exposure and what to do in an emergency.

Examples of non-routine tasks that may expose employees to hazardous chemicals include the following: carpenter laying floor tile; superintendent applying insulation etc.

## *Chemicals in Pipes*

Before working in areas where hazardous chemicals are transferred through pipes or where pipes are insulated with asbestos containing material, employees will contact the respective site superintendent, who in turn will contact the mitigation sub-contractor for the following information





(if not already in their possession):

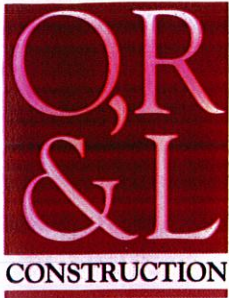
- The chemicals in the pipes.
- The physical or health effects of the chemicals or the asbestos insulation.
- The safe work practices to prevent exposure.

### *Informing Contractors*

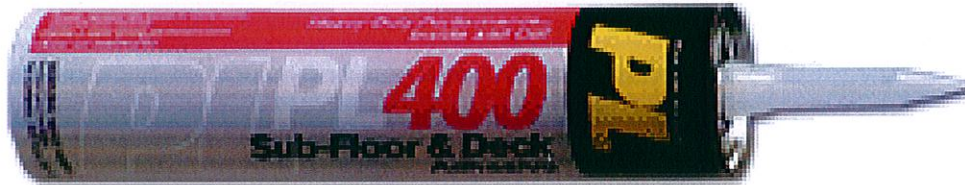
It is the responsibility of the respective site superintendent to provide contractors and their employees with the following information if they may be exposed to hazardous chemicals in our workplace:

- The identity of the chemicals, how to review safety data sheets and an explanation of the container and pipe labeling system.
- Safe work practices to prevent exposures.

This person will also obtain a safety data sheet for any hazardous chemical a contractor brings into the workplace.



## **Hazard Communication/GHS Program**



**Safety Director: Mark O'Connell**

**Director Administration/Safety: Jeri Hayes**

**Telephone Number: (203) 643-1035 Cell (203) 246-8831**

**Revised to the new GHS Standard in 2013**

### **The Hazard Communications Plan**

#### **Purpose:**

*The purpose of this written Hazard Communication program is to ensure that:*

- 1. Hazardous substances in the workplace are properly identified and labeled*
- 2. Employees have access to information on the hazards with these substances*
- 3. Employees are provided with information on how to prevent injuries and illnesses due to exposure to these substances*
- 4. Identify by job title who has the responsibility for maintaining the program the SDS sheets, conduct training, etc.*

**Note: This program is computer available in electronic format to all jobsites and on file in the OR&Loffice**

## **Hazard Determination**

The intent of this written program is to describe how OR&L is complying with 29 CFR 1926.59 Hazard Communication. The program covers labeling of hazardous materials, hazardous materials inventory, maintenance and availability of SDS's, employee training, outside subcontractors in the workplace, and designation of program responsibilities.

OR&L is committed to maintaining a safe work environment for its employees. Employees will be informed of hazards they may encounter in the workplace and provided with training and necessary personal protective equipment to perform tasks safely.

### **Table of Contents:**

- Labels
- Inventories
- Safety Data Sheets (SDS)
- Employee Information and Training
- Outside Subcontractors
- Responsibilities
- Appendix A

## **LABELS**

1. All incoming containers of hazardous chemicals must be labeled, tagged or marked with the following information:
  - Identity of the hazardous chemical
  - Appropriate hazard warning
  - Name and address of the chemical manufacturer, importer or other responsible party

Although site superintendents are ultimately responsible for ensuring that incoming containers are properly labeled, all employees are expected to check containers brought into the workplace and bring deficiencies to the attention of the area supervisor. Samples of proper labels are indicated below.



2. *All portable containers within the work area will be labeled, tagged or marked with the following information:*
  - *Identity of the hazardous material*
  - *Appropriate hazard warning*

*Note: A portable container is considered any container into which a substance has been transferred (typically from the original container) and then moved around the work area. The employee who transfers the substance is responsible for immediately labeling the portable container.*

3. *Additional labeling requirements:*
  - *All labels will be written in English*
  - *Chemical formulas are not acceptable in identifying a substance - the name must be written out in English*
  - *No employee shall deface an existing label unless the container is immediately marked with required information.*

## **INVENTORIES**

1. *Site Superintendents will maintain an inventory of hazardous substances in the work area. At a minimum this inventory should meet the following criteria:*
  - *Match inventory listing of product/chemical with names used on SDSs so that employees can readily access SDS information for a product/chemical.*
2. *Inventory will be updated as project progresses.*

## **SAFETY DATA SHEETS (SDS)**

1. *The Site Superintendent shall maintain a SDS for each substance in the hazardous chemical inventory. SDS shall be in English.*
2. *The SDS file shall be kept in a location that meets the following criteria:*
  - *Readily accessible to all employees on all working shifts*
  - *Location known to all employees in the work area*
3. *Site Superintendents are responsible for maintaining an accurate and comprehensive SDS file.*
4. *A copy of each new SDS received should be sent to the Project Engineer who maintains a central project SDS file.*
5. *See Appendix A for information on accessing a partial SDS Database.*
6. *SDS will be kept indefinitely for a product, even when the product is no longer used in the work area. Areas may dispose of old SDS when updated versions are received. The central SDS file will maintain all copies of SDS, both updated and old versions.*

## **EMPLOYEE INFORMATION AND TRAINING**

1. All new employees will receive Hazard Communication training either through a video presentation or through a live presentation. Supervisors are responsible for ensuring employees receive this training.
2. Content of this general training will include the following:
  - Hazard Communication - regulatory background/authority and details of the program
  - Labeling requirements
  - Safety Data Sheets - content and availability
  - O R & L policy on maintaining hazardous chemical inventory
  - Hazards associated with
    - flammable/combustible materials
    - corrosive materials
    - toxic materials
  - Appropriate Personal Protective Equipment (PPE) for working with
    - flammable/combustible materials
    - corrosive materials
    - toxic materials
  - O R & L emergency procedures
  - Bloodborne Pathogen awareness training if required
3. In addition to this general introductory training, superintendents are responsible for training employees on specific routine and non-routine hazards that may be found in the work area. This training will include specific area work procedures and required PPE.
4. Employees will receive additional training when new hazards are introduced into the work area. At a minimum this will include:
  - a review of the product label and SDS
  - discussion of appropriate work procedures and PPE requirements

## **OUTSIDE SUBCONTRACTORS**

1. When outside subcontractors perform work on O R & L projects, we need assurance that the outside subcontractor has a Hazard Communication Program meeting minimum requirements for the Standard in place. We also want to ensure that outside contractors have access to information on hazards they may encounter in our workplace, SDS availability and our labeling system. To meet these goals the following language should be included in all contracts where outside contractors will be doing work on our projects:

*If the subcontractor will use hazardous materials on site they agree to the following:*

- Ensure all contractor employees comply with all applicable health and safety standards.
- Notify supervisors in advance if any employee/ owner could be potentially exposed to a hazardous material used by the subcontractor.

- Have SDSs for materials used by contractor on the project readily available for reference by contractor employees and employees and supervisors if they have questions regarding effects of substance being used.
2. To ensure compliance with this policy, O R& L's Safety Director will conduct random audits of outside contractor work.

## **RESPONSIBILITIES**

### 1. Administration:

- require employee involvement in program at all levels
- consider Hazard Communication and safety responsibilities when conducting performance reviews

### 2. O R& L Safety Director:

- update written Hazard Communication/ GHS Program as needed
- provide support for the training component of this Program as requested
- maintain central O R& L inventory (P.E.)
- maintain central SDS file (P.E.)
- conduct random audits to ensure outside subcontractor compliance with Hazard Communication requirements stipulated in contracts
- provide support to area supervisors in implementing Program components
- ensure all new employees receive introductory Hazard Communication training either via video presentation or live presentation

### 3. Project Superintendents:

- exemplify Standard compliance by their own practices
- ensure proper labeling of substances in work area
- maintain and update annually an inventory of hazardous chemicals in the work area
- maintain a SDS file for all hazardous substances in the work area
- provide orientation to all new employees on specific hazards in work area
- train all employees on new hazards introduced into work area
- identify non-routine employee tasks and ensure employees receive training in performing tasks safely

### 4. Employees:

- ensure proper labeling of substances in work area
- review SDSs as requested by supervisor
- attend training as requested by supervisor
- follow established work procedures and wear PPE as required
- keep all personal protective equipment in good operating condition
- report any Program deficiencies noted (for example: missing SDS, improper labeling or unsafe conditions) to supervisors for correction
- be certain to understand the hazards associated with materials and tasks before beginning the work, if in doubt ask their supervisor
- suspend operations or deactivate equipment in the event of immediate danger to life, health, or the environment; report such actions immediately to supervisor

APPENDIX A  
HAZARD COMMUNICATION STANDARD  
29 CFR 1910.1200  
Inventory of Chemicals onsite

Adhesives

- [DAP Weldwood Products](#)
- [Elmer's Carpenters Products](#)
- [PL Products](#)
- [http://www.liquidnails.com/products/info.jsp?type=SDS Sheets](http://www.liquidnails.com/products/info.jsp?type=SDS%20Sheets)
- [Ramset Products](#)
- [Gorilla Glue - Safety Data Sheets](#)

Asphalt

- [Asphalt SDS](#)

Caulks

- [Phenoseal Products](#)

Paints

- [Benjamin Moore products \(English\)](#)
- [Benjamin Moore Products \(Spanish\)](#)

Gasoline and Diesel Fuels

- [Gasoline All grades](#)
- [Diesel Fuel #2 Fuel Oil](#)

Owens Corning Products

- [Owens Corning Products](#)

GE Specialty products

- [GE SilliconeII Specialty](#)

US Gypsum products

- [U S Gypsum Products](#)

Plumbing Chemicals

- [Oatey Plumbing Supplies](#)
- [Hercules Plumbing Products](#)

Powder Acuated Tools supplies

- [Ramset Powder acuated](#)

Hilti

- [Safety Data Sheet - Repair Mortar - Hilti USA](#)
- [Safety Data Sheet - Repair Mortar - Hilti USA](#)
- [Safety Data Sheet - Maintenance Chemicals - Hilti USA](#)
- [Safety Data Sheet - Lubricants - Hilti USA](#)
- [Safety Data Sheet - Lubricants - Hilti USA](#)
- [Safety Data Sheet - Foam, Foam Cleaner - Hilti USA](#)
- [Safety Data Sheet - Firestop - Hilti USA](#)
- [Safety Data Sheet - Crack Injection - Hilti USA](#)
- [Safety Data Sheet - Construction Grouting - Hilti USA](#)
- [Safety Data Sheet - Coatings - Hilti USA](#)
- [Safety Data Sheet - Chemical Anchors - Hilti USA](#)
- [Safety Data Sheet - Direct Fastening - Hilti USA](#)
- [Safety Data Sheet - Bits, Blades, Brushes - Hilti USA](#)

- [Safety Data Sheet - Batteries - Hilti USA](#)
- [Safety Data Sheet - Adhesives - Hilti USA](#)

*Bond Fill*

[SAFETY DATA SHEETS BOND FILL PRODUCTS](#)

*FORMICA*

- [SAFETY DATA SHEET FORMICA](#)
- [SAFETY DATA SHEET FORMICA ADHESIVES](#)

*Roofing*

- [Versico Safety Data Sheets](#)
- [Kemper roofing products SDS](#)

*Spray Foam insulation*

- [Safety Data Sheet Great Stuff](#)
- [Spray foam Insulation ICYNENE](#)

*Water additives*

[SDS Sheets | Summit Brands](#)

*CRC Duster*

1. [CRC Duster](#)



# Crystalline Silica

## Exposure Control Policy, Program & Procedure

O,R& L

Construction Corp.

# Part 1

## Silica Exposure Prevention & Control: Introduction

Silica is the second most common mineral on earth, found in the common form as "sand" and "rock". Silica is the compound formed from the elements silicon (Si) and oxygen (O) and has a molecular form of SiO<sub>2</sub>. The three main forms or 'polymorphs' of silica are alpha quartz, cristobalite and tridymite. The polymer most abundant and most hazardous to human health is alpha quartz, and is commonly referred to as crystalline silica.

## Health Hazards Associated with Silica Exposure

The health hazards of silica come from breathing in the dust. If crystalline silica becomes airborne through industrial activities, exposures to fine crystalline silica dust (*specifically exposure to the size fraction that is considered to be respirable*) can lead to a disabling, sometimes fatal disease called silicosis. The fine particles are deposited in the lungs, causing thickening and scarring of the lung tissue. The scar tissue restricts the lungs' ability to extract oxygen from the air. This damage is permanent, but the symptoms of the diseases may not appear for many years. As noted in the following Figure, (respirable) silica dust is very small, and is not visible to the human eye.

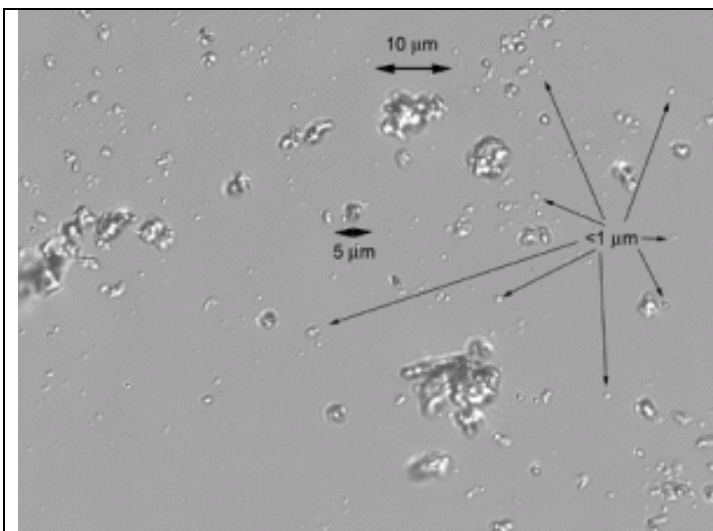


Figure 1: Crystalline silica up close. 1000 times magnification of sand dust. These particles are small enough to be trapped in lung tissue.

A worker may develop any of three types of silicosis, depending on the concentration of silica dust and the duration of the exposure:

- Chronic Silicosis: Develops after 10 or more years of exposure to crystalline silica and relatively low concentrations.
- Accelerated Silicosis: Develops 5 to 10 years after initial exposure to crystalline silica at high concentrations.
- Acute Silicosis: Develops within weeks, or 4 to 5 years, after exposure to very high concentrations of crystalline silica.

Initially, workers with silicosis may have no symptoms; however, as the disease progresses, workers may experience:

- Shortness of Breath.
- Severe Cough.
- Weakness.

These symptoms can worsen over time and lead to death. Exposure to silica has also been linked to other diseases, including bronchitis, tuberculosis, and lung cancer.

### **Silica Exposures at O,R& L Construction Corp.**

Many of the activities performed on O,R&L Construction Corp. projects result in the creation/release of silica dust, thus exposing our employees. These activities include, but are not necessarily limited to:

Examples include:

- *Sweeping*
- *Jack-hammering*
- *Saw-cutting*
- *Drilling (of concrete)*
- *Excavating and Truck Loading activities.*

# Part 2

## Silica Exposure Prevention & Control: Statement of Purpose

O,R&L Construction Corp. is committed to providing a safe and healthy workplace to our employees, recognizing the right of workers to work in a safe and healthy work environment and ensuring that O,R&L Construction Corp.'s activities do not adversely affect the health and safety of any other persons.

This commitment includes ensuring every reasonable precaution is taken to protect our employees (and others) from the adverse health effects associated with exposure to silica.

# Part 3

## Silica Exposure Prevention & Control: Responsibilities

Due to the risk posed by respirable silica, it is critical that all personnel involved in activities that could potentially create silica dust take specific actions to ensure that, as much as practicable, a hazard is not created. In recognition of this, the following (Silica related) responsibilities have been established and must be adhered to:

**Senior Management is responsible for:**

- Regularly evaluating new equipment and technologies that become available, as able/appropriate, purchasing the “best available” equipment/technologies (*within* O,R&L Construction Corp.’s *capabilities*). Equipment/technologies with (silica) dust suppression and/or capture technologies will generally be given preference over equipment/technologies that lack such.
- Implementing a suitable respirable silica exposure monitoring program, or otherwise ensuring representative exposure monitoring results are available. The purpose of the program will ensure that (*over time*) O,R&L Construction Corp. has quantifiable silica exposure data available for all regularly occurring, as well as reasonably foreseeable, work activities.
- Ensuring project and/or task specific Exposure Control Plans (ECPs) are developed communicated and effectively implemented as appropriate.
- Ensuring that all employees (*i.e. Managers, Supervisors and Workers*) receive the necessary education and training related to this Policy, as well as project/task specific ECPs.
- Maintaining applicable records (*i.e. exposure sampling, inspections, respirator fit tests, training records, etc.*) in accordance with O,R&L Construction Corp.’s record retention procedures/practices.
- O,R&L will conduct a review of this Policy, as well as: (1) project/task specific ECP’s, (2) available exposure monitoring data, (3) Industry/Regulatory information, and (4) new/emerging equipment/technologies on a regular (*i.e. annual*) basis.

**Supervisors (i.e. Superintendents/Foreman) are responsible for:**

- Obtaining a copy of the project/task specific ECPs (*and/or other similar such information*), and ensuring such are made available at each work site.
- Ensuring that all the tools, equipment, PPE and materials (*including water*) necessary to implement the ECP is available (*and in good working order*) prior to allowing work activities to commence.
- Ensuring that all workers (*under the supervisor’s direction and control*) have received the necessary education and training. As appropriate, each supervisor must ensure that workers are available to “demonstrate competency” for identified tasks.
- Ensuring that workers adhere to the project/task specific ECP, including PPE and personal hygiene (*i.e. including be clean shaven where the respirator seals to the user’s face*) requirements.



- Coordinating work activities with the Owner/Prime Contractor as required, and/or otherwise implementing the controls necessary to protect others (*i.e. erecting of barricades and signage*) who could be adversely effected by O,R&L Construction Corp. 's acts (*or omissions*).

**Employees (and subcontracted employees) are responsible for:**

- Knowing the hazards of silica dust exposure.
- Using the assigned protective equipment in an effective and safe manner.
- Working in accordance with the project/task specific ECP.
- Reporting (*immediately*) to their supervisor, any hazards (*i.e. unsafe conditions, unsafe acts, improperly operating equipment, etc.*).

# Part 4

## Silica Exposure Prevention & Control: Exposure Limits

**Exposure Limits/Considerations:** The Occupational Health & Safety Regulation (OHSR) lists an occupational exposure limit (OEL) for respirable crystalline silica (including quartz) of 0.025 milligrams per cubic metre (mg/m<sup>3</sup>). This is a concentration to which nearly all workers could be exposed for eight hours a day, five days a week, without adverse health effects. However, as a suspected carcinogen, crystalline silica is also an ALARA substance, and exposures must be reduced to levels **As Low As Reasonably Achievable** below the OEL.

# Part 5

## Silica Exposure Prevention & Control: Risk Identification

The health hazards of silica come from breathing in the dust. In addition to identifying the specific activities/areas where personnel could be exposed to silica dust, the "amount" of exposure and "duration" of exposure must also be considered. With consideration to these three factors, activities performed by O,R&L Construction Corp. *(or that are otherwise occurring in proximity to O,R&L Construction Corp.'s activities)* that expose our employees *(as well as members of the public and other workers)* to the dust include, but are not necessarily limited to:

- Surface preparation activities such as: (1) the use of Blow-Packs, (2) the use of Bobcats with "sweeper" attachments, (3) the use of Sweeper trucks and (4) hand sweeping.
- Jack-hammering *(of both asphalt and concrete)*.
- Saw-cutting *(of both asphalt and concrete)*.
- Drilling *(of concrete)*.
- Granular Surface Preparation activities *(i.e. grading and rolling)*, and
- Operation and use of milling equipment/machinery *(i.e. milling and conveyance/discharge of milled materials on conveyor)*.

# Part 6

## Silica Exposure Prevention & Control: Risk Assessment

**Risk Assessment:** O,R&L Construction Corp. will use a variety of methods to assist with the "assessment" of (*possible and actual*) silica exposures. These methods will include, but may not necessarily be limited to:

- Reviewing data/reports available in the public domain (*i.e. Information available through regulatory agencies (including WorkSafeBC) and industry associations (including the BC Construction Safety Alliance)*).
- Regularly consulting with the Safety Resources/Safety Managers from firms who perform similar work (*i.e. through ATAC (Asphalt Technical Advisory Committee)*).
- Implementing a suitable respirable silica exposure monitoring program. This program will ensure that (*over time*) O,R&L Construction Corp. has quantifiable silica exposure data available that is representative of all regularly occurring, as well as reasonably foreseeable work activities. Exposure monitoring will generally be conducted "in-house", although assistance (*i.e. actual monitoring and/or interpretation of results*) may be obtained through outside consultants/hygienists.

# Part 7

## Silica Exposure Prevention & Control: Risk Control



**Control Methods:** When determining measures to reduce or eliminate worker exposure to silica dust, O,R&L Construction Corp. will generally select a combination of controls, listed in order of preference:

- Elimination and Substitution.
- Engineering.
- Administrative.
- Personnel Protection Equipment (PPE).

**Substitution and Elimination:** Whenever possible, O,R&L Construction Corp. will substitute products containing silica with products that do not contain *(or contain a lower percentage of)* crystalline silica. While there have historically been few “substitution” options available, O,R&L Construction Corp. recognizes the importance of planning work in order to minimize the amount of silica dust generated. During the planning phases of a project, O,R&L Construction Corp. will advocate for the use of methods that reduce the need for cutting, grinding, or drilling of concrete surfaces.

**Engineering Controls:** Engineering controls are those controls which aim to control or otherwise minimize the release of crystalline silica. Two “common” engineering control options are available to O,R&L Construction Corp. in many circumstances. These include the Local Exhaust Ventilation (LEV) and Wet Dust Suppression (WDS) systems.

**LEV Systems:** Tools/appliance specific LEV systems are available on some tools/appliances. Such LEV systems are generally comprised of a shroud assembly, a hose attachment, and a vacuum system. Dust-laden air is collected within the shroud, drawn into the hose attachment, and conveyed to the vacuum, where it is filtered and discharged. “Large scale” LEV systems, such those available on some Vacuum Trucks and Mobile Sweepers, may also be employed (at times) on O,R&L Construction Corp. projects.

When/if LEV systems are used, O,R&L Construction Corp. will employ the following systems and safe work practices:

- Vacuum attachment systems that capture and control dust at its source whenever possible.
- Dust control systems will be maintained in optimal working condition.
- Grinding wheels will be operated at the manufacturer’s recommended RPM *(operating in excess of this can generate significantly higher airborne dust levels)*.
- HEPA or good quality, multi-stage vacuum units *(approved for use with silica dust)* will be used in accordance with the manufacturer’s instructions.
- Whenever possible, concrete grinding will be completed when the concrete is wet *(thus dust release will be significantly reduced)*.

**WDS Systems:** Unlike LEV systems, many tools/appliances at O,R&L Construction Corp. are equipped with WDS systems *(i.e. on the Milling equipment, sweeper equipped Bobcats, as well as attachments on various hand held/portable, abrasive/cutting equipment)*. When WDS Systems are not available, *(as a standard or retrofitted part of a tool/appliance)*, similar effects can also be achieved by manually wetting the surface *(i.e. with a mister or with a hose)*.

When WDS systems are used, O,R&L Construction Corp. will employ the following systems and safe work practices:

- If water is not readily available on the specific O,R&L Construction Corp. project, the project supervisor will arrange to have a water tank delivered to the site for use.
- Pneumatic or fuel (*i.e. gasoline*) powered equipment will generally be used instead of electrically powered equipment if water is the method of dust control, unless the electrical equipment is specifically designed to be used in such circumstances.
- Pressure and flow rate will be controlled in accordance with the tool manufacturer's specifications.
- When sawing concrete, tools that provide water directly to the blade will be used if possible.
- Wet slurry will be cleaned from work surfaces when the work is complete, if/when necessary.

**Administrative Controls:** Administrative controls are those that aim to control or otherwise minimize the release of silica through the use of work procedure and work methods, rather than by affecting the actual physical work. Common examples of administrative controls include, but are not limited to:

- Posting of warning signs.
- Rescheduling of work as to avoid the activities of others.
- Relocating unprotected workers away from dusty areas.

When administrative controls are used, O,R&L Construction Corp. will employ the following systems and safe work practices:

- In conjunction with the Owner/Prime Contractor, suitable exposure control strategies (*both within and outside* O,R&L Construction Corp. 's capabilities/responsibilities) will be discussed and determined. As necessary/appropriate, supplemental (to this policy/procedure) project and task specific Exposure Control Plans will be developed.
- Suitable housekeeping, restricted work area, hygiene practices, training and supervision procedures/standards will be determined and implemented on O,R&L Construction Corp. projects.
- As appropriate, barriers will be erected around known silica dust generating activities, and/or warning signs will be posted.
- As able, work activities will be scheduled to minimize the silica related effect on, and from, others.

**Personal Protective Equipment Controls:** When used in conjunction with the other (*i.e. Engineering and Administrative*) controls elsewhere identified, personal protective equipment and clothing can help further reduce our employee's exposure to silica dust.

An air purifying respirator fitted with HEPA cartridges is the most common piece of PPE that would be used by O,R&L Construction Corp. to minimize exposure to silica dust. Dependent on the effectiveness of the other (*i.e. engineering*) control measures employed, either a "full face piece" or "1/2 face piece" respirator would be used by personnel (*In the majority of situations a 1/2 face respirator will be used. When working indoors or in other areas with poor ventilation, a full face respirator may be required*). Both of these respirators are "seal dependent", and thus the users must be "fit tested" and clean shaven where the respirator seals to the face.

In addition to respiratory PPE, protective clothing (*i.e. disposable/washable coveralls*) may be used and/or required to help prevent the contamination of the worker's personnel clothing.

# Part 8

## Silica Exposure Prevention & Control: Education and Training

**Education and Training:** Prior to performing activities, or working on project sites where personnel could be exposed to silica dust, O,R&L Construction Corp. will ensure that personnel receive suitable education and training. As necessary, personnel will be trained to a level of "demonstrated competency". While not necessarily an exhaustive list, education and training may include:

- The hazards and risks associated with exposure to silica dust.
- The signs and symptoms of silica related diseases.
- General and specific silica exposure reduction methods/strategies (*i.e. as detailed in the general/specific exposure control plans*).
- The use of specific pieces of equipment and control systems (*i.e. LEV and WDS systems*).
- The use and care of respiratory (and other) personal protective equipment.
- How to seek first aid (*i.e. for respiratory related concerns, including those that may be caused/associated with silica dust exposure*), and
- How to report items of the concern (*i.e. those related to silica dust*).

The education and training detailed will be delivered to O,R&L Construction Corp. employees through a variety of forums, including but not necessarily limited to:

- New Employee Orientations.
- Project/Site Orientations.
- Equipment/task specific training (*in accordance with O,R&L Construction Corp.'s Policy, all personnel must be trained to a level of "demonstrated competency" prior to using required tools, equipment and appliances*).
- Start of shift "tool box talks".
- Regularly scheduled crew "Tailgate Meetings".
- Notifications and Bulletins (*those developed in house and those acquired from other reputable sources*).

# Part 9

## Silica Exposure Prevention & Control: Safe Work Procedures

O,R&L Construction Corp. will ensure that suitable written procedures for controlling the risk of silica exposure are developed. This document/table summarizes the silica control options generally available on O,R&L Construction Corp. sites/projects, and will be complimented with project/tasks specific Exposure Control Plans as necessary. This document and any supplemental work procedures/ECPs will be made readily available for review by all affected workers.

**SAMPLE**

Division/Task		Control Methods	Personal Protection Equipment	Comments
"Company Operations"	1. Use of flusher truck	No specific engineering/administrative controls required.	No specific PPE controls required	<p>The use of a flusher truck to remove debris/sediment from a surface to prepare it for driving in operations desirable/preferred, as the activity will generally generate little/no silica dust, and will improve drive aisles within the operations.</p> <p>The use of a flusher truck is not always practical/possible for reasons including: (1) increased costs and (2) the availability of such equipment, scheduling of staff at exact moments when the flusher truck required. The service will be included in general operator daily duties. Use of recycled water, availability is preferred.</p>

# Part 10

## Silica Exposure Prevention & Control: Documentation

In accordance with Record/Statistics Procedures detailed in the latest revision of O,R&L Construction Corp.'s "Health & Safety Manual", records associated with Crystalline Silica Program will be maintained in accordance with the following:

<b>Record Type</b>	<b>Location(s)</b>	<b>Retention Requirement</b>
Silica Policy, Program and Procedure	<ul style="list-style-type: none"> <li>• (i.e. Head Office)</li> </ul>	<ul style="list-style-type: none"> <li>• Current Revision</li> <li>•</li> </ul>
Project/Task Specific Silica ECPs	<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• LOP</li> <li>•</li> </ul>
Exposure Monitoring Results	<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• LOP</li> <li>• LOP + ___ years</li> </ul>
Workplace Inspections	<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>•</li> </ul>
First Aid Records/Reports of Exposure	<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>•</li> </ul>
Incident Investigation Reports	<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>•</li> </ul>
WorkSafeBC/Regulator Reports and Correspondence	<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>•</li> </ul>
Respirator Fit Tests	<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• LOE + ___ years</li> </ul>
Equipment Maintenance and Repair Logs	<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• LOS + ___ years</li> </ul>
New Employee Orientation Records	<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• LOE + ___ years</li> </ul>
Site/Project Orientation Records	<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• LOE + ___ years</li> </ul>
Tool Box Talk Records	<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>•</li> </ul>
Crew Safety Meeting Records	<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>•</li> </ul>
Job/Task Specific Training Records	<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• LOE + ___ years</li> </ul>

\*LOP – Length of Project

\*LOE – Length of Employment

\*LOS – Length of Service



**APPENDIX A**  
**Project/Task Specific Exposure Control Plan**

**APPENDIX B**  
**Silica Related Bulletins/Toolbox Talks**

**APPENDIX C**  
**Applicable Safety Data Sheets**

## Chapter 29 Water Intrusion Management Plan

### Policy

This program addresses the prevention, management, and response to water intrusion events and potential mold growth. It is important to note that this is a basic outline to respond to water intrusion events. Each water intrusion event has different characteristics. Although this guidance document can be used as a tool, each event needs to be assessed on an individual basis. To effectively implement this program, the following components are considered within each section of the plan:

- **Purpose** Why these steps are taken
- **Process** The actions that will be taken and how they will be implemented
- **Payoff** The value to the organization for taking these steps

Mold is a significant concern in North America as its presence in structures has the potential to result in both property damage and personal injury. It is the policy of O,R&L Construction to take reasonable steps to prevent water intrusion events, to respond to water intrusion events in a timely and effective manner and thus to minimize the potential for mold growth. This plan outlines the procedures that are followed during new construction, renovation and maintenance services to minimize the potential for water intrusion and to respond to water intrusion and/or mold growth when it occurs. By training employees, putting controls in place, and reporting and documenting incidents, project exposures associated with water intrusion are reduced.

### Responsibilities

O,R&L Construction is accountable for the enforcement of the plan. While senior management is ultimately responsible, all personnel involved in company operations have a responsibility to be familiar with and comply with the provisions of this plan. Compliance with the provisions shall be enforced by the project site manager and the O,R&L Construction management chain-of-command. It is the responsibility of all site personnel to report observed water intrusion and mold growth to the project site's supervisory personnel and owner upon discovery. Site personnel will also report site or design issues that have the potential to cause water intrusion if left uncorrected. The site personnel will inform O,R&L management both verbally and in writing, to be submitted to the project site manager.

### Training

Project personnel are trained on these responsibilities and how field operations impact the prevention, management and response to water intrusion events. All forms of training will be confirmed and documented with a sign-in sheet at each session for all construction employees.

## Water Intrusion Control During Project Life Cycle

Control of water intrusion begins at the project pre-construction phase, during subcontractor selection and in the use of protective contract language. It continues during field operations and is completed during project close-out and the warranty period.

### Pre-Construction Phase

O,R&L Construction verifies that the following elements, which are part of our bid package and scope of work, are evaluated upon review of the construction specifications prior to commencing site operations. This is the responsibility of the O,R&L Construction project managers or their designees and is performed as part of the pre-assessment constructability review.

- Pre-site analysis
- Discovery during renovations
- Drainage away from foundations
- Roofing intersection details
- Window and door flashing
- Roof and wall penetrations
- Building envelope drainage systems
- Vapor barriers and wall cavity drainage provisions
- Ventilation of enclosed spaces that may contain moisture
- Exterior waterproofing and foundation drainage
- HVAC systems, including condensate collection and drainage
- Mechanical systems
- Exterior venting of moisture producing areas and equipment (i.e., bathrooms, kitchens, indoor pools, locker rooms, laundries)
- Vapor barriers
- Sump pump installation (primary and optional battery back-up)
- Rain gutters and downspouts
- Utility and site drainage systems
- Septic systems
- Landscaping and irrigation systems
- Monitoring systems for relative humidity and temperature at selected locations throughout the building
- Potential for third party impact
- Ensure any discrepancies or concerns with the design are brought to the attention of the appropriate external and internal team members function for discussion and possible corrective action. These communications with the designated team, especially if a valid concern is not addressed, are documented. This documentation is retained in the project file.

## **Subcontractors**

When O,R&L Construction hires subcontractors, their activities may result in a water intrusion event. Prior to the start of field operations, O,R&L Construction instructs their subcontractors that they are responsible to identify and report to the project superintendent any water intrusion event they become aware of during the course of operations regardless of fault. The procedure is to inform the project site manager both verbally and in writing.

## **Contractual Provisions**

A review of each contract is performed by O,R&L Construction senior management to address overall project liabilities and responsibilities. As part of this review, terms and conditions that relate to the handling and/or discovery of a water intrusion event or mold at a project site are evaluated. O,R&L Construction accepts responsibility for remedying site conditions which were under O,R&L Construction control that may have led to the generation of mold. It is O,R&L Construction intent to enter into contracts that limit their responsibility for conditions beyond their control. Identified water intrusion or mold concerns or conditions must be addressed prior to contract approval. In the event that pre-existing mold is discovered at a project site, O,R&L Construction is responsible to notify the owner and/or the Construction Manager. Appropriate documentation of this communication, as well as the determined course of action, is retained in the project file.

## **Construction Phase**

O,R&L Construction ensures that site operations are performed in a way that minimizes the potential for water damaged materials to be utilized for the project. The following are steps that are taken to minimize the potential for water intrusion:

- Deliveries are sequenced to avoid the storage of large amounts of moisture sensitive material at the site for an extended time period
- Building materials are inspected upon delivery and significantly mold impacted materials are rejected
- Moisture sensitive materials are protected from weather elements during delivery and offloading activities
- Stored building materials are elevated and covered to protect them from weather elements
- Interior partitions are inspected for moisture and mold prior to being permanently enclosed
- Building penetrations are sealed at the end of the work day to avoid moisture infiltration
- Roof and building envelopes are substantially completed before any porous materials are stored in the building
- Wet porous building materials are dried and inspected for mold growth prior to installation
- Moisture limiting design features, such as roofing, flashing, windows, doors, exterior

waterproofing and building envelope components are properly installed according to manufacturer's specifications

- Site workers practice good housekeeping
- Site workers are responsible for reporting any unwanted accumulation of water to site management
- Sub-floors are cleaned and dried prior to carpet installation
- Construction debris is removed from within HVAC systems and associated ductwork
- Existing duct work that is to remain in place during renovation activities is sealed with polyethylene sheeting and tape to prevent dust and debris from entering
- HVAC condensate collection and drainage systems are checked to ensure that they are functioning properly
- Regular inspections are performed and documented during construction to identify leaks, ponded water and/or sources of water entry
- Moisture/water leaks are responded to within 24 to 48 hours of discovery
- Good communication is maintained between general contractor and other site contractors to remind them of this program and to discuss any water intrusion/mold issues
- HVAC, plumbing and mechanical systems are tested before enclosure
- O,R&L Construction conducts site inspections to ensure that the water intrusion minimization steps are implemented in a complete, consistent, and comprehensive manner. O,R&L Construction maintains copies of their documentation in the project file.

## **Project Close Out & Warranty Period**

At project conclusion O,R&L Construction performs a final inspection with the client. As part of this walk-through, O,R&L Construction will document that their site activities have not resulted in a moisture/water intrusion event. If a moisture/water intrusion event has occurred, O,R&L Construction provides the client with documentation of the corrective action which was taken, including photographs.

Maintenance and operations by others at the site may affect the potential for future mold growth. At the conclusion of site operations, O,R&L Construction provides the building owner(s) an information packet that includes all manufacturer warranties, equipment manuals and appropriate operation and maintenance instructions.

As part of the turn-over process, O,R&L Construction requests that the owner sign an acknowledgement form indicating the receipt of the materials provided to them. A copy of the signed form is maintained in the project file. A sample acknowledgement form is provided as Appendix 2.

A tip sheet titled "Tips for Mold Prevention in Structures" is provided as Appendix 3. Many projects include a year-long warranty program. O,R&L Construction will ensure that during this period, if issues of water intrusion or mold growth are repeated by the owner/tenant, that the concerns are addressed immediately.

## Procedure for Responding to Water Intrusion

These procedures are designed to respond to water intrusion generated as a result of clean water and not contaminated water (i.e. sewage). In the event moisture/water enters the structure during the construction phase (e.g. roof leak, pipe leak, weather-related flooding), the emphasis must shift to removing the moisture/water, halting the source of the moisture/water, and drying any impacted materials. In some instances, impacted porous materials may need to be removed and replaced. Response activities must commence immediately (within 24 to 48 hours) following the moisture/water event or upon discovery of the moisture/water damage. Field personnel should notify internal management of the moisture/water intrusion event as soon as possible.

**In the event that a moisture/water intrusion event is suspected to involve contaminated water, an appropriate specialty contractor should be contacted.**

If moisture/water intrusion response is not conducted promptly, mold growth may develop. The following actions shall be taken within 24 to 48 hours for handling objects and construction materials that have come into contact with clean moisture/water:

1. Identify and eliminate the moisture/water source.

2. **Wet Vacuum**

Wet vacuums are designed to collect water. They can be used to remove accumulated water from floors, carpets, and other hard surfaces. They are less effective for removing water from dense porous materials such as gypsum board. Wet vacuums may spread spores if sufficient liquid is not present. The tanks, hoses and attachments of these vacuums should be thoroughly cleaned and dried after use because mold and mold spores may stick to the equipment surfaces.

3. **Drying and Ventilation**

Materials that come into contact with water must be dried prior to being installed or covered with additional material. There are several methods used to assist in drying wet materials. Large blowers with directional controls or heaters assist in the drying process. Forced ventilation should be vented directly outside. Avoid combustion type heaters for drying purposes as oxygen levels are decreased, the exhaust requires outside ventilation and moisture is generated as a by-product of incomplete combustion. Ensure impacted area is dry before proceeding with repairs.

4. **Material Disposal**

Damaged materials that are not salvageable must be disposed. These materials are doubled-bagged using 6-mil polyethylene bags and discarded as construction waste. It is important to package mold-contaminated materials in sealed bags before removal from the contaminated area to minimize the dispersion of mold spores. Large items that have heavy mold growth should be covered with polyethylene sheeting and sealed with duct tape before they are removed from the containment area.





## **Procedure for Responding to Mold Growth**

O,R&L Construction's response to mold growth is based upon the US EPA, OSHA and/or CT's guidance documents addressing water intrusion and mold,

([www.OSHA.gov](http://www.OSHA.gov); [www.epa.gov/iag/molds](http://www.epa.gov/iag/molds)) ([www.ct.gov](http://www.ct.gov))

Both during construction and post-construction, O,R&L Construction will respond to complaints of water intrusion or mold growth in a timely manner and notify the owner and recommend a subcontractor to consult and establish the remediation plan. O,R&L will then, with the owner's approval, hire a licensed sub-contractor for mold and mildew abatement.

## **Communication & Documentation Procedures**

Throughout the phases of a project it is essential that communication with internal and external personnel are implemented and documented. O,R&L Construction must determine and ensure that the appropriate levels of communication and documentation are maintained throughout the project to ensure that all parties involved understand the risk. The owner understands that they need to subcontract an Industrial Hygienist and Environmental Subcontractor. O,R&L will write a letter to the owner defining that any mold or mildew is their responsibility, O,R&L will put the subcontractor on notice, with a copy to the owner. The subcontractor will be bound to the terms written in our subcontract agreement.

In the event that O,R&L operations have somehow caused mold and mildew growth we will investigate the problem, subcontract an Industrial Hygienist and Environmental Subcontractor; we will also involve any subcontractor who may be found to have caused the problem.

## Appendix I

### Guideline for Water Intrusion Event Documentation

Below is an outline of actions that should be taken when responding to a water intrusion or discovery of mold event. The key is to appropriately determine the significance of the event and ultimately the appropriate response, notification, and documentation required. This approach should include the following steps:

- Identification of a water or mold concern on a project; examples include unwanted water accumulation, water-impacted materials, visible mold growth, material staining, and musty odors
- Notification of site project manager by field personnel to communicate concern
- Direction from corporate management such as, but not limited to:
  - the continuation of work
  - the stoppage of work
  - notification of project owner and construction manager
  - completion of appropriate documentation
  - formal letter to project owner and architect

In order to document a water intrusion or mold growth event the following list of items is to be included in the documentation:

- Job site
- Site address
- Client contact
- Today's date
- Location of incident (description and/or description with diagram)
- Owner/client verification of location (i.e., how you may reference an area may not be how the owner/client does)
- Description of moisture event
- Date and time of observation of occurrence
- Date and time action initiated
- Describe materials affected
- Square footage affected
- HVAC evaluation
- Owner, construction manager, building occupant notification
- Actions taken (water source controlled, owner notification only, self-performed cleanup, remediation, retain CIH, remediation firm, etc.)



# health & safety manual

constructing a safe & sustainable future

- Equipment used
- Photographs; should include date and location description
- Follow-up actions
- Re-inspection (date, results, methods of verification)
- Comments

When appropriate, a copy of the completed form should be provided to owner/client and when possible have the owner/client sign the document. The original document is retained in the project records.

**The client/owner herein acknowledges that they are responsible for the proper operation and maintenance of the structure and the internal systems that have been constructed, installed, upgraded, designed, serviced, cleaned, modified, altered, and/or repaired by O,R&L pursuant to written agreement with the client/owner. Client/owner will indemnify O,R&L for any claims, including but not limited to mold or fungi claims, arising from or related to the owner's client's maintenance, operation, modification, alteration and/or changes made to the structure and internal system without the involvement of O,R&L.**



Appendix II

Building/Project Turn Over Notification Form

It is O,R&L Construction’s goal to fabricate high quality structures for our customers. During construction, we take a variety of precautions to reduce the likelihood that mold growth will occur in the structure. Since molds and their reproductive bodies, called spores, are all around us as a normal component of the environment, it is virtually impossible to completely exclude these organisms from the structure.

While the presence of low concentrations of these organisms does not represent a concern in most cases, increased mold growth can occur following the wetting of building materials such as lumber, carpet, drywall, and ceiling tiles. Some sources of moisture that could feed problematic mold growth include high humidity (such as in bathrooms or kitchen facilities), poor housekeeping, open windows when it is raining, flooding, sewer back-Ups, and leaking roofs/plumbing. Elevated concentrations of mold and their spores inside structures can potentially cause damage to building materials and adversely affect the health of occupants.

As the building owner, you have a responsibility to take reasonable actions to prevent mold from becoming a problem in your property. Failure to control moisture leading to excessive mold growth could affect or invalidate any warranties or insurance coverage you may have on the property. To assist you with this responsibility, O,R&L Construction is providing guidelines for preventing mold growth in occupied structures.

**The client/owner herein acknowledges that they are responsible for the proper operation and maintenance of the structure and the internal systems that have been constructed, installed, upgraded, designed, serviced, cleaned, modified, altered, and/or repaired by O,R&L pursuant to written agreement with the client/owner. Client/owner will indemnify O,R&L for any claims, including but not limited to mold or fungi claims, arising from or related to the owner’s client’s maintenance, operation, modification, alteration and/or changes made to the structure and internal system without the involvement of O,R&L.**

*I hereby certify that I have read and understood the information contained in this Mold Prevention in Structures – Building Owner Notification Form.*

Owner Name \_\_\_\_\_ Owner Signature \_\_\_\_\_ Date \_\_\_\_\_

Information provided by: Contractor \_\_\_\_\_

Contractor Rep. \_\_\_\_\_ Signature \_\_\_\_\_ Date \_\_\_\_\_

## O,R&L Safety Violation Notice

(Circle On) Employee Subcontractor

O,R&L considers the safety of its clients, associates employees and subcontractors to be of primary importance. Therefore to prevent accidents this policy enforces OSHA and Company safety rules strictly. Infraction of safety rules will result in at least the following:

1 <sup>st</sup> infraction	Written/verbal warning
2 <sup>nd</sup> infraction	Written warning
3 <sup>rd</sup> infraction	Corrective action taken with fines (could include offending person removal from site
4 <sup>th</sup> infraction	Termination of contract for cause

To: \_\_\_\_\_ (subcontractor or Construction Manager)

You and/or your employee have been observed behaving in the following unsafe manner contrary to OSHA regulation and O,R&L safety rules and regulations.

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This is your \_\_\_\_\_ infraction

Action Taken:

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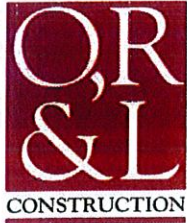
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O,R&L Supervisor: \_\_\_\_\_ Date: \_\_\_\_\_

Subcontractor: \_\_\_\_\_ Date: \_\_\_\_\_

O,R&L reserves the right to terminate the contract of any subcontractor immediately and without prior warning if the subcontractor is operating in a manner that endangers any person on and O,R&L jobsites.



# Site Safety Inspection Report

Job Name: \_\_\_\_\_  
 Job Number: \_\_\_\_\_  
 Location: \_\_\_\_\_

Superintendent: \_\_\_\_\_ Date: \_\_\_\_\_

Inspector: \_\_\_\_\_

A - Adequate at time of inspection  
 B - Needs Consideration  
 C - Needs Immediate Attention  
 N/A - Not Applicable

Job Information	A	B	C	D	N/A
State Employment Poster Displayed					
OSHA 300 Log Posted in Field Office					
MSDS manual maintained in field office					
Safety Bulletins, Signage information posted					
Fire Extinguisher located in field office					
Emergency contact of Jobsite posted					
Closest Medical Facility posted					
Hardhats provided and wearing enforced					
Personal Fall Arrest Systems available					
Eye, Ear and breathing protection available					
Job trailer has proper stairs and handrails					

**Comments:**  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Job Site	A	B	C	D	N/A
Temporary site barricades in place					
Site Signage in place at entrance					
Area illuminated to ensure safe work environment					
Fire Extinguishers located every 1,500SF throughout space					

**Comments:**  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Housekeeping & Miscellaneous	A	B	C	D	N/A
Materials neatly piled					
Passageways and aisle kept clear					
Scrap controlled and disposed off properly					
Sanitary facility provided					
Drinking water provided					
Food containers, cups all disposed off					
Floors in clean condition					

**Comments:**  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

<b>Tools &amp; Equipment</b>	A	B	C	D	N/A
Reporting of defective tools to site superintendent					
Defective equipment removed from site					
Power actuated tools used by qualified person					
Protective equipment used during operation					
Safety guards in place on tools					

**Comments:**

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<b>Ladders, Stairs and Walkways</b>	A	B	C	D	N/A
Ladder Extended 36" above work surface					
Tops of ladders tied off					
Ladder shoes are stable and properly placed					
Fiberglass ladders used around electrical					
Ladders placed with proper 4:1 Pitch					
Stairways equipped with handrails					
Stairways equipped with guardrails					
Steps equal in rise height and clean from debris					

**Comments:**

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<b>Floor, Wall and Roof Openings</b>	A	B	C	D	N/A
Roof & floor openings protected with covers or proper guardrail system					
Are covers secured down					
Guardrails in place on all open sides of holes					

**Comments:**

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<b>Electrical</b>	A	B	C	D	N/A
Temp. lights equipped with guards					
Lights hung properly					
Area illuminated with at least 5ft candles					
GFCI receptacles used					
"Danger/High Voltage" signage used					
Cords inspected for wear					
Panels properly covered and guarded					
Grounding of generators over 5kw					

**Comments:**

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<b>Hazardous Communications</b>	A	B	C	D	N/A
Hazardous Materials list up to date					
MSDS available to employees					
Job site workers instructed on MSDS					
Warning signs posted when needed					
Containers labeled					
Written Hazardous Communication Plan					
Employee training documentation					

**Comments:**

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<b>Fall Protection</b>	A	B	C	D	N/A
Fall protection system in place for work surfaces over 6' above lower surface					
Guardrail systems have top, mid and toe board					
Rails are 42" high, and support 200lbs					
Gates offset at ladder ways					
Safety Nets less than 30' below surface					
Debris removed from nets					
Net extends 8' to 13' away from space					
Are PFAS systems inspected and worn					
PFAS Systems support 5,000lbs per person					
Horizontal Life Line with 2:1 safety factor					
Max free fall distance of 6'					
Positioning system have free fall of 2' or less					
Flagging lines 6' from edge					
controlled access zones not less than 10' from edge of brick laying area					
Safety monitor used with no other responsibilities and within 50' of workers					

**Comments:**

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<b>Trenches, Excavation &amp; Shoring</b>	A	B	C	D	N/A
Competent person on hand to perform work					
Excavations are shored or sloped back					
Material are stored at least two feet from trench					
Equipment is a safe distance from the edge of trench					
Fuel tanks properly labeled and stored					

**Comments:**

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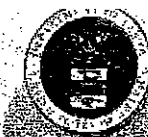
<b>Welding &amp; Burning</b>	A	B	C	D	N/A
Gas Cylinders stored upright and labeled					
Proper Separation distance between fuels and oxygen					
Burning/welding goggles or shields used					
Fire Extinguishers nearby any hot work					
Hoses in good condition					

**Comments:**  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

<b>Cranes</b>	A	B	C	D	N/A
Outriggers are extending and swing radius barricade in place					
Operator is licensed and familiar with load charts of crane					
Hand signal chart on crane					
Signaler is qualified to perform duty					
Employees kept from being under suspended loads					

**Comments:**  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Additional Comments:**  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



**Regulations (Standards - 29 CFR)**  
**(Mandatory) Information for Employees Using Respirators When**  
**not Required Under Standard. - 1910.134 App D**

**Regulations (Standards - 29 CFR) - Table of Contents**

o Part Number:	1910
o Part Title:	Occupational Safety and Health Standards
o Subpart:	1
o Subpart Title:	Personal Protective Equipment
o Standard Number:	1910.134 App D
o Title:	(Mandatory) Information for Employees Using Respirators When not Required Under Standard.

**Appendix D to Sec. 1910.134 (Mandatory) Information for Employees Using Respirators When Not Required Under the Standard**

Respirators are an effective method of protection against designated hazards when properly selected and worn. Respirator use is encouraged, even when exposures are below the exposure limit, to provide an additional level of comfort and protection for workers. However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to the worker. Sometimes, workers may wear respirators to avoid exposures to hazards, even if the amount of hazardous substance does not exceed the limits set by OSHA standards. If your employer provides respirators for your voluntary use, or if you provide your own respirator, you need to take certain precautions to be sure that the respirator itself does not present a hazard.

**You should do the following:**

1. Read and heed all instructions provided by the manufacturer on use, maintenance, cleaning and care, and warnings regarding the respirator's limitations.
2. Choose respirators certified for use to protect against the contaminant of concern. NIOSH, the National Institute for Occupational Safety and Health of the U.S. Department of Health and Human Services, certifies respirators. A label or statement of certification should appear on the respirator or respirator packaging. It will tell you what the respirator is designed for and how much it will protect you.
3. Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designed to protect against. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, or very small solid particles of fumes or smoke.
4. Keep track of your respirator so that you do not mistakenly use someone else's respirator.

(29 CFR 1152, Jan. 9, 1998) (29 CFR 20098, April 23, 1998)

I have read and understood the information contained in this document.

Signature

Date



## Safety Disciplinary Warning

Date: \_\_\_\_\_ Employee: \_\_\_\_\_

Describe Incident:

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Witness: \_\_\_\_\_ Witness: \_\_\_\_\_

Management Use Only:

- 1) Was this action due to the employee's negligence? Y \_\_\_ N \_\_\_
- 2) Was this action due to the employee's not understanding the safety regulations? Y \_\_\_ N \_\_\_
- 3) OSHA Section violated: \_\_\_\_\_ Description: \_\_\_\_\_
- 4) Verbal Warning Y \_\_\_ N \_\_\_
- 5) Written Warning Y \_\_\_ N \_\_\_ (1,2,3) \_\_\_\_\_
- 6) Time-off Y \_\_\_ N \_\_\_
- 7) Dismissed Y \_\_\_ N \_\_\_

Employee Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Safety Officer Signature: \_\_\_\_\_ Date: \_\_\_\_\_

*\*File copy in HR personnel folder and in Safety Dept. records*



## Scaffold Sign-Off Sheet

Project Name: \_\_\_\_\_ Date: \_\_\_\_\_

Project Manager: \_\_\_\_\_ Phone: \_\_\_\_\_

Project Location: \_\_\_\_\_

Name of qualified contractor erecting scaffolding: \_\_\_\_\_

Name of contractor using scaffolding: \_\_\_\_\_

On-site competent person: \_\_\_\_\_ Phone: \_\_\_\_\_

*Note: At least one competent person must be on-site per shift. Alternates must be selected)*

Alternate competent person: \_\_\_\_\_ Phone: \_\_\_\_\_



## System Shut-Down Request

Requestors Name: \_\_\_\_\_

System Identification: \_\_\_\_\_  
*Note: Describe system*

Location of Shut-Down: \_\_\_\_\_

Date Shut-Down Required: \_\_\_\_\_

Duration of Shutdown: \_\_\_\_\_

Reason for Shut-Down: \_\_\_\_\_

### To Be Completed By Engineering Department:

Approved By: \_\_\_\_\_

Date Approved: \_\_\_\_\_

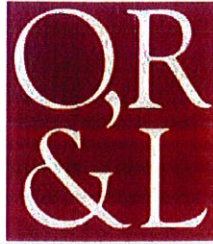
Areas Affected: \_\_\_\_\_

Shut-Down Date: \_\_\_\_\_

Shut-Down Time: \_\_\_\_\_

Engineering Resources Required:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



**CONSTRUCTION**

<b>OSHA VISIT REMINDER CHECKLIST</b>		<b>Comments</b>
Have appropriate management personnel at site present for inspection		
Reason for inspection?		
Complaint based inspection?		
Fatality based inspection?		
Targeted inspection		
Media based inspection?		
Copy of complaint		
Safety or industrial hygiene inspection?		
Is this a whistleblower inspection?		
Designate an employee representative , if appropriate		
Limit scope to area in question only		
OSHA posters etc. in place?		
Take photos and/or videos of what inspector takes		
Debrief hourly employees who have been interviewed		
Closing conference		



# Confined Space Entry Permit

### General Information

Space to be entered: \_\_\_\_\_

Location: \_\_\_\_\_

Purpose of entry: \_\_\_\_\_

Anticipated Duration: From \_\_\_\_\_ To \_\_\_\_\_

Permit Space Hazards	
_____	Oxygen deficiency (less than 19.5%)
_____	Oxygen enrichment (greater than 23.5%)
_____	Flammable gases or vapors (greater than 10% of LFL)
_____	Airborne combustible dust (meets or exceeds LFL)
_____	Toxic gases or vapors (greater than PEL)
_____	Mechanical hazards
_____	Electrical shock
_____	Materials harmful to skin
_____	Engulfment
_____	Other

### Preparation for Entry

\_\_\_\_\_ Notification of affected departments of service interruption

\_\_\_\_\_ Isolation methods:

- |                        |                   |                 |
|------------------------|-------------------|-----------------|
| _____ Lockout/tagout   | _____ Purge/clean | _____ Inert     |
| _____ Atmospheric test | _____ Blank/blind | _____ Ventilate |
| _____ Barriers         |                   |                 |

\_\_\_\_\_ Personal Awareness:

- \_\_\_\_\_ Pre-entry briefing on specific hazards and control methods
- \_\_\_\_\_ Notify contractors of permit and hazard conditions
- \_\_\_\_\_ Other

\_\_\_\_\_ Additional permits required and/or attached:

- \_\_\_\_\_ Hotwork
- \_\_\_\_\_ Line Breaking
- \_\_\_\_\_ Other

### Equipment Required For Entry- *Please specify*

Personal Protective Equipment: \_\_\_\_\_

**This Permit Must be Posted On The Job Site At All Times**

Respiratory Protection: \_\_\_\_\_

Atmospheric/Testing Equipment: \_\_\_\_\_

Communication: \_\_\_\_\_

Other: \_\_\_\_\_

**Communication Procedures** --To be used by attendants and entrants

**Authorized Entrants**

_____	_____
_____	_____
_____	_____

**Authorized Attendants**

_____	_____
_____	_____
_____	_____

**Entry Supervisor Certification**

I certify that all required precautions have been taken and necessary equipment provided for the safe entry and work in this confined space:

Print Name	Signature	Date/Time
_____	_____	_____
_____	_____	_____
_____	_____	_____

<b>Testing Record</b>							
Time (report in AM/PM)							
Oxygen Min.							
Oxygen Max.							
Flamability							
H/2S							
Toxic (specify)							
Cl2							
CO							
SO/2							
Heat							
Other							
Tester Initials							

**This Permit Must be Posted On The Job Site At All Times**



## CONTRACTOR SAFETY INSPECTION CHECKLIST

These are suggested guidelines. You may need to add or subtract items for specific jobs or locations. The facility safety officer should complete a safety inspection of the contractor's job on a weekly basis and file the inspection results with the contractor's job records. Results must be reviewed with the contractor and records should be kept of the responses and timeliness of any corrective actions. These should be taken into consideration when evaluating the contractor at the completion of the job.

Facility Safety Officer/Inspector \_\_\_\_\_

Project Title and Number \_\_\_\_\_

Contractor being inspected \_\_\_\_\_

General Contractor \_\_\_\_\_

Date of Inspection \_\_\_\_\_

Safety Equipment							
Safety Glasses				Respirators			
Steel-toed shoes				Hearing Protection			
Clothing				Face Shields			
Gloves				Hard Hats			
Other:				Other:			

Comments: \_\_\_\_\_  
 \_\_\_\_\_

Tools							
Pneumatic				Electrical			
Hydraulic				Procedural Requirements			

Comments: \_\_\_\_\_  
 \_\_\_\_\_

Other Safety Items							
Hot Work Permits				Welding Goggles			
Fire Extinguishers				Hearing Protection			
Cable Trays Protected				Water Hoses			
Gas Bottles				Fire Watches			
Other:				Other:			

Comments: \_\_\_\_\_  
 \_\_\_\_\_

Entry Permit				Safety Equipment			
Other:				Other:			

Comments: \_\_\_\_\_  
 \_\_\_\_\_

Ladders				Electrical Cords			
Grinders				Air Hoses			
Back-up Alarms				Ground Fault Interrupts			
Lift Trucks				Guards			
Compressors				Other:			
Other:							

Comments: \_\_\_\_\_  
 \_\_\_\_\_

Cables				Slings			
Hand Rails				Cleated Boards			
Tie Lines				Safety Harnesses			
Safety Hooks				Foundation (base)			

Comments: \_\_\_\_\_  
 \_\_\_\_\_

Welding Rods				Port-a-johns			
Trash Receptacles				Potable Water			
Scrap Dumpsters				Air Hoses			
Electrical Cords				Welding Leads			
Plastic				Other:			

Comments: \_\_\_\_\_  
 \_\_\_\_\_


**All deficiencies have been corrected:** \_\_\_\_\_  
Signature of Contractor Coordinator      Date \_\_\_\_\_



## Fire System Shut-Down Request

Requestors Name: \_\_\_\_\_

System Identification: \_\_\_\_\_

*Note: Indicate building, floor and/or location on floor*

Date Shut-Down Required: \_\_\_\_\_

Duration of Shutdown: \_\_\_\_\_

Reason for Shut-Down: \_\_\_\_\_

### To Be Completed By Facility Fire Marshall:

Approved By: \_\_\_\_\_

Date Approved: \_\_\_\_\_

Areas Affected: \_\_\_\_\_

Shut-Down Date: \_\_\_\_\_

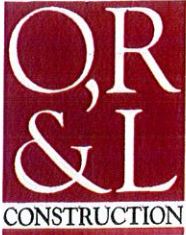
Shut-Down Time: \_\_\_\_\_

Resources Required: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



## Site Specific Safety Plan



# site specific safety plan

constructing a safe & sustainable future

## O,R&L Contact Information

**Site Superintendent:**

**Project Manager:**

**Safety Officer:**

### O,R&L Construction Office

Phone: (203) 483-2040

Fax: (203) 483-3676

## ABC Company Kitchen Renovation

### Site Specific Safety Personnel

During working hours at the ABC Company Kitchen Renovation project O,R&L Construction will have a Superintendent on site at all times. This representative will be responsible for ensuring that the work environment will comply with all ABC Company, O,R&L and OSHA Safety regulations. No work shall be underway unless this Site Superintendent is on site. The Site Superintendent is First Aid and CPR trained, in case if any injury it will be required that they are notified.

The O,R&L Construction Superintendent for this site will be Tony Grammatico. Tony will be assisting all subcontractors in safety preparations and review of work procedures as they are performed. All employees on site are required to fill out a JHA (Job Hazard Analysis) with Tony before each work activity to review and plan their safety precautions before the work will commence.

### Scope of Work Overview

The project will have a wide variety of construction activities underway while being in an occupied space. The kitchen and adjacent mechanical room will be temporarily blocked off for the length of the construction project. This area will have some demolition work, new mechanical work, installation of new grease trap and new finishes and owners equipment installed.

On the exterior of the building there will be some work performed on mechanical equipment. Both on the roof and ground mechanical work will be completed, as with the interior work this will all be coordinated with ABC Company during the time the work in this area is being completed.

### Hazard/Risk Assessment (JHA)

As subcontractors are brought onboard with the project, they will be required to conduct JHA reviews with the Superintendent. With each JHA, both O,R&L and the subcontractor will identify potential hazards and identify the proper safety equipment and PPE ( Personnel Protective Equipment) needed to conduct the work. The potential hazards will take into account the workers performing the work, working in the immediate area and also throughout the building.

### Safety Control Measures

Access to the site will be monitored by the Site Superintendent. Each visitor must sign into the field office before entering the site. Deliveries to the site will be coordinated by the superintendent. All information pertaining to safety must be communicated through the Superintendent.



## ABC Company Kitchen Renovation

### Inspection Procedures

The onsite Superintendent will be supervising work underway each day and filling out weekly inspection reports. An O,R&L Safety Officer will make monthly visits to the site, as well as visits for critical activities if requested by O,R&L site personnel.

### Safety Education

Once a week, O,R&L will be conducting a Tool Box Talk that will cover work activities that are currently underway and ready to begin. This is the time where all workers can educate themselves on their surroundings and ask any questions they may have. Once work begins, the O,R&L Superintendent will be supervising the work to ensure all safety precautions are being taken and PPE is being utilized.

### Violation Disciplinary Actions

O,R&L will be enforcing a Zero Tolerance policy on this job site. Any individual that does not comply with the safety regulations of ABC Company, O,R&L Construction and OSHA will be removed from the work site completely. The Safety regulations for both ABC Company and O,R&L Construction will be sent to each subcontractor and are also available in the O,R&L Field Office. The guidelines for this policy will be conveyed to each subcontractor to insure awareness of the policy.

### Hazard Correction Procedure

As work is being completed and an unforeseen hazard occurs the work presenting this hazard must be corrected. There will be three steps that need to be followed to correctly address the present hazard. First, the work in this area must stop. The workers completing the work must notify the Superintendent. Once the area of work is temporarily protected from hazard, the subcontractor conducting the work must review the activity with the safety representative and fill out a JHA to identify corrective measures and plans to prevent this hazard from occurring again. Lastly, the subcontractor must ensure the implemented systems are effectively correcting the hazard and record the results of the hazard.

### Training & Instruction

All subcontractors are required to submit all training records of employees for work activities that will be completed on this site. The superintendent will be collecting these training records, if an individual is not trained in a certain activity, the superintendent will be able to assist in finding a training program for the individual(s) before they are allowed to start the work. All equipment operators must be trained and certified for use of the equipment they will be handling.



## ABC Company Kitchen Renovation

### Hazardous Communication Plan

Before chemicals or other hazardous materials are brought on site, the subcontractor will be required to notify the Site Superintendent. There must be a MSDS sheet provided by the subcontractor to O,R&L before bringing the materials on site. These MSDS sheets will be reviewed and added to the MSDS binder located in the Field Office. The O,R&L field staff will also update the list of chemicals that will be located in the field office. Once the materials are brought on site all containers must be inspected for proper labels and container use. Each employee will review this material with the Superintendent during their introduction on site and made aware of the MSDS binder, chemical list and OSHA Hazard Communication Standard. **No hazardous materials may be stored on site.**

### Record Keeping

O,R&L will keep all records on site in the field office. These records will be available for all employees on site to review and discuss with the Superintendent.

#### Materials available for review:

- O,R&L Subcontractor Safety Manual
- O,R&L Policy and Procedure Manual
- OSHA 1926 Construction Regulation book
- Inspection reports
- Hazardous materials inventory
- Job Hazard Analysis'
- Work Permits
- Tool Box Talks
- Accident Investigation Reports

### Accident Investigation Reporting

If an accident occurs the first step is to care for the injured. After the injured are cared for and the site is safe to enter, the area will be preserved by preventing any unnecessary individual from entering the area. The area will be photographed and documented for conditions at the time of the incident, this as well as other steps will be conducted in the investigation as deemed necessary by the CMR. The report will be completed and distributed as required.

## ABC Company Kitchen Renovation

### ABC Company Personnel/Residents/Visitor Safety

Working in an occupied area with ABC Company employees and residents will be an important safety focus of this site. Noise, air quality and physical hazards must be taken into account for the safety needs of individuals near the work areas. Coordination of the work with ABC Company will be critical to the safety of the employees and residents.

### Personnel Protective Equipment

Personnel Protective Equipment must be in place at all times. On this site a minimum of hardhats, safety glasses and proper attire are required. Depending on the work activity, additional PPE may be required. During the JHA process the PPE requirements will be identified.

### Evacuation Plan

In case of emergency, all contractors working on the project will need to meet at the evacuation meeting location in the SW corner of the construction site. This area is designated on the Site Logistics plan that follows in this packet. If you have any questions please contact the O,R&L field staff.

### Site Logistics Plan

O,R&L will require strict coordination on this site to ensure that all work and deliveries are conducted safely and efficiently. Please reference the site layout drawing following this section, and discuss with the site Superintendent if you have any questions or concerns.

### Medical Emergency Reporting

All injuries on site must be reported to the O,R&L field staff. First Aid kits are in every O,R&L Trailer. All O,R&L employees are CPR trained. O,R&L will post signage both in the field office and construction areas identifying the location of the work site for **911** calls and directions to the nearest Medical Facility. Please reference the attached signage and directions and be familiar with them in case of emergency medical needs.

**ABC Company Kitchen Renovation**

**Emergency Signage:**

**Yale New Haven Hospital**  
20 York Street, New Haven

- 1) Head Northwest on Cedar St (0.3 mi)
- 2) Turn left onto ramp I-95 S to New Haven (5.5 mi)
- 3) Take Exit 47/CT-34 (0.9 mi)
- 4) Exit onto N Frontage Road (0.2 mi)
- 5) Turn onto Park Street (0.2 mi)
- 6) Left onto Howard Ave. (0.1 mi)
- 7) Turn left onto York
- 8) Emergency Room entrance on the left



**Site Layout Plan for entrance, parking and evacuation locations:**

