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CHAPTER 8 SAFETY REQUIREMENTS

8.1 INTRODUCTION

8.1.1 Wastewater or Water Treatment Plants Are Hazardous Places

The operation of wastewater treatment plants and pumping stations is a dangerous occupation if proper safety procedures are not followed. Physical injuries and body infections are continuous threats. Explosions and asphyxiation from gases or oxygen deficiency are constant hazards.

Injuries to wastewater collection and treatment personnel are relatively high compared to other industrial groupings.

Safety measures for operation and maintenance of wastewater treatment plants are effective if hazards are known and if proper safety precautions are followed. Be aware of hazards, preventive measures, and emergency procedures. Immediately investigate and record any accidents or injuries which occur.

8.2 OSHA APPLIES TO YOUR SITE

8.2.1 Federal vs. State Laws

Federal OSHA regulations require states to administer and enforce safety programs that are as effective as or more than those imposed by the Federal regulations. Therefore, it is safe to use the Federal standards as a start for your safety program.

However, the State may regularly amend these regulations. Be sure to be in touch with your state safety office whenever you will start any new safety program. To contact the State OSHA office regulating this plant:

Name

Office

Address

City, State Zip

Telephone Fax

Name of Contact

Title

8.3 WHAT IS A SAFETY PROGRAM?

8.3.1 Mandated Programs

The safety regulatory system mandates a number of safety programs for your site. Safety programs consist of:

a) A written plan specific to your site stating your program. The written plan is your source document, which states your policies, communicates with your workers and documents your compliance. It must be available for inspection and be up-to-date.

b) Training and communications for your workers. Training needs to be documented with signed statements, test results, etc.

c) An implementation program including procedures that you are following

d) A record-keeping system that documents compliance

e) An updating program that ensures your program stays up-to-date

The following is a list of the safety plans that are required under

8.4 YOUR HEALTH & SAFETY PLAN

8.4.1 Keep in mind



Refer to Figure 8.4.1 at the end of this section

Don't forget that this plan does no good just sitting on the shelf! You need to update it with information relevant to your site. It is a working document. Here is a list of minimum requirements:

8.4.2 The written H&S plan is a requirement



The written H&S plan is a requirement under OSHA regulations. This plan should be as specific to your plant as possible. This plan needs to cover a variety of issues, including:

- a) The hazards' assessment at your site
- b) The required level of protection for each type of activity. For example, for confined entry, for handling specific chemicals, for operations inside certain buildings, etc.
- c) Your plan to handle hazardous materials.
- d) Policies for required safety gear should be clearly stated. For example, at this site, all workers are required to wear safety shoes, safety glasses, and hard hats.
- e) A list of your safety gear and where it is located
- f) Reference to programs that require a separate plan and training program. (This document can be the catch all safety manual)

Refer to O&M Writer Chapter 12 for a full H&S Plan (Advanced Version).

8.4.3 Training and Communication



Training and Communication is an integral part of the H&S Plan. You need to determine what type of training you will need and set up a schedule and plan. You also need to keep detailed training records (See the O&M Writer Training Module that came with this package).

Your entire training program should be clearly listed in the manual and be implemented.

8.4.4 Implementation



A list of your personnel and their safety responsibilities as well as a log or file of reports indicating your progress in this area throughout the year should be filed.

8.4.5 Record-keeping



Carefull records are key to a successful program that will stand up in court in the event of an accident.Keep a file of all of your safety records, including reports of injuries, etc.

Any other update items should go into the Health and Safetu file, including changes to the regulations.

8.5 YOUR EMERGENCY RESPONSE & FIRE

8.5.1 OSHA regulations under 1910.38



*Refer to Figure
8.5.1 at the end of
this section*

Federal OSHA regulations under 191.38 require every plant or facility employing more than 1 people to keep a written plan that covers emergency situations, such as chlorine leaks, explosions, or floods and fires.

8.5.2 The written plans should cover



The written plans should cover specifically:

- a) The steps that will be taken in the event of an emergency
- b) A list of personnel responsible
- c) Gathering places where to meet
- d) Site maps with escape routes
- e) Emergency phone numbers
- f) Procedures for notifying the community or the state in case of fires, spills, etc.
- g) Other relevant information about emergencies at your site

Your state regulatory agency can provide an outline of what your Emergency Plan should contain. OSHA regulations also contain details about emergency planning under paragraph 191.38.

8.5.3 The most important part -communicating to your workers



The most important part of your emergency plan, is communicating to your workers. Everyone should know what to do in case of an emergency. This is not only makes good sense, but it is the law. Be sure you go over this plan often in your training.

8.5.4 Don't wait for an emergency



Don't wait for an emergency to happen to find out how well your plan works. You need to hold regular drills and keep records. In the event of a real emergency, write a report right after the emergency. This will help keep your memory fresh in the event of an investigation.

Prominently post the phone numbers of several physicians, the nearest hospital, the police and fire stations, and one or more ambulance services at each plant phone.

Most the phone number of CHEMTREC (Chemical Transportation Emergency Center) for ready reference in the event of any chemical emergency.

8.5.5 Record-keeping



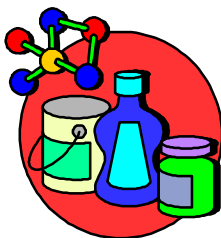
Be sure you keep records of manuals being delivered, correspondence with agencies, new regulations, and any drills, training, or other items that took place related to emergency planning.

Updating

Keep this plan up-to-date

8.6 YOUR HAZARD COMMUNICATION PLAN

8.6.1 The Federal R-T-K Law



Refer to Figure 8.6.1 at the end of this section

The Federal R-T-K Law or Hazard Communication Standard is a standard promulgated by OSHA to insure that the hazards of all chemicals manufactured or imported to the U.S.A by chemical producers or distributors are evaluated, and that information on these hazards and the required precautions for safe use of these chemicals is given to employees and others who may be exposed to these substances.

State and local R-T-K Laws supplement the Federal law to reflect local needs. State and local laws may be more stringent but not less, so as to preempt the Federal regulation.

The objective of the law is to reduce the incidence of occupational illness and injuries associated with chemicals.

To accomplish this objective the scope of the law requires that the manufacturer, distributor or importers of chemicals assess the hazards associated with those chemicals. This assessment is a hazard determination.

The scope further includes communication of those hazards to the people exposed to the chemicals.

The instruments for this communication are:

- * hazard warning labels
- * material safety data sheets
- * a written hazard communications program
- * training.

8.6.2 Labels must be affixed



Labels must be affixed by the manufacturer, distributor or importer and identify the contents, show the hazard warning, and the name and address of the source. They cannot be removed except to be immediately replaced with another one.

Additional labeling requirements include: in plant storage at point of possible contact. The exception is small transfer containers.

8.6.3 Material Safety Data Sheets



Material safety data sheets (MSDS) must report findings of the hazard determination, be kept updated, be on file at work place, and be available to workers. MSDS must include:

- a) Product name
- b) Hazardous ingredients
- c) Physical data
- d) Fire and explosion data
- e) Health effects
- f) Spill and disposal procedures
- g) Protection information
- h) Handling and storage precautions, and
- i) Emergency contact

8.6.4 Written Plan

Written Plan

A written hazardous communication program must be prepared for each work place. The written program shall:

- a) List all hazardous chemicals in the work place
- b) Contain written procedures for compliance with the law
- c) Describe hazards and safe procedures for non routine tasks
- d) List contents of unlabeled pipes
- e) Contain the information to be provided to a contractor who may be exposed to hazardous substances

Training

Training must be initially provided to all workers by the employer and updated annually. Training must be detailed so the worker can identify hazardous substances, detect a release of a hazardous substance, and have specific procedures to assure personal safety while handling a hazardous substance.

8.7 YOUR BLOODBORNE PATHOGENS PLAN

8.7.1 The Federal OSHA regulations and



*Refer to Figure
8.7.1 at the end of
this section*

The Federal OSHA regulations and your state require establishments who employ workers that may be exposed to bloodborne diseases to maintain a written plan. At this point, most WWTP's are maintaining a BBP program. It consists of a written plan, training, and some equipment to disposed of contaminated materials.

8.7.2 The BBP program was officially



The BBP program was officially designed to prevent the spread of HIV and Hepatitis B. It does cover sewer workers because they could be exposed to a number of disease through their work. In strict terms, the BBP program covers only instances where someone comes into direct contact with blood. For example, in the case that a rescue worker provides first aid and contacts the blood of the patient. However, most plants are combining this program with their hygiene program, which is designed to prevent water or sludge - borne infections.

Contact your state regulatory agency for an up-to-date program for your plant.

8.8 YOUR LABORATORY SAFETY PLAN

8.8.1 Why you need one



*Refer to Figure
8.8.1 at the end of
this section*

Even though there is only one chemist employed in your lab, he or she may regularly handle hazardous substances. The chemist and people near the lab could be potentially exposed to these substances, if not handled properly. For this reason, you need to have a written chemical hygiene plan, which is specific to your laboratory and covers the materials typical to your lab, lists the MSDS sheets, and provides a listing of typical flammables and carcinogens. Consult your state agency for state requirements.

The Chemical Laboratory Safety plan is an OSHA requirement.

8.9 THE CONFINED SPACE ENTRY PLAN

8.9.1 Introduction

A confined space entry plan, training and program is required by law. The confined space entry regulation is extensive and is being regularly updated. It is beyond the scope of this O&M manual to cover its details.

These should be covered in a separately written plan. The plan needs to cover and document:

- 1) The regulation
- 2) The list of confined spaces at your site
- 3) The steps to do a confined entry and a discussion of your permit program
- 4) A file of your permits
- 5) A list of your safety equipment, and where it is located
- 6) A log of all confined entries
- 7) A copy of the permits for each confined entry
- 8) A blank set of confined entry forms
- 9) Documentation of your confined entry training: who took the course, who tested for it, what their grade was, etc.

8.10 LOCKOUT TAGOUT

8.10.1 Lockout/Tagout is important



Refer to Figure 8.10.1 at the end of this section

Lockout/Tagout is a very important safety program. It is the law. It is beyond the scope of this manual to go into extensive details about this program. The regulation is available through both your state agency and your Federal FCR. A number of commercial systems for lockout tagout are available which provide the tags, keys and other material. The objective of this program is to prevent workers from getting injured by mechanical or electrical equipment that is inadvertently started while they are at work.

8.10.2 What the program requires

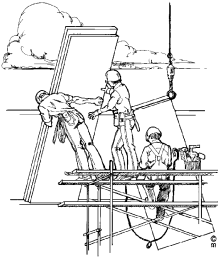


The program requires that any worker doing maintenance or other work around machinery or electrical equipment, lockout and tag the main switch to the equipment. The equipment comes equipped with locking devices that allow only one worker to open the device, the one doing the work.

You need to regularly train workers on the use of these tags and continuously monitor that they are being used. Operating procedures throughout this manual refer to Lockout Tagout. It is important to remember that skipping this is not only unsafe, but a violation of the law.

8.11 FALL PROTECTION REGULATION

8.11.1 One of the newest regulations to come along



*Refer to Figure
8.11.1 at the end
of this section*

One of the newest regulations to come along is the fall protection regulation. It is principally aimed at construction workers doing work high up on scaffolds, roofs or other hazardous places.

The regulation requires that for extensive work, where falling could be a possibility, the plant prepare a written plan prior to the start of the work. Details are available in the regulation.

8.11.2 Falling hazards - high places

This wastewater treatment plant has a number of high platforms, particularly on the aerated grit chambers and on the roofs. Any worker assigned to work in these high areas should be protected from falls by the appropriate harnesses or scaffolds and with a written plan for fall protection. You, as the owner are also responsible for the safety of contractors, and must make sure they also protect their workers.

8.11.3 Falling hazards - low places

In addition to the obvious high places, there are other areas in this plant that may not be obvious to the untrained eye, but present very serious fall hazards. The aeration chambers, for example, are deeper than 6 feet. The density of the aerated water is lower than standing water, and so a person can't possibly swim or float. He/she will immediately sink. This means that any work taking place in or around these vessels, whether the vessel is empty or not requires very careful planning to prevent falls and accidents. Workers should have a safety line attached to a secure place. If a railing is used, be sure it is anchored securely to hold the weight. Here are some safety recommendations for fall protection in the aeration tanks.

8.11.4 Establish safety rules to prevent falls into tanks

Here are some examples:

Don't use regular floating devices as a means of rescue, as it might be ineffective in this area. A lifeline attached to the workers is your best defense.

* Never allow workers to work alone in this area

* Always have a radio or other communication device.

Be sure someone can stop the blowers immediately if someone falls in. to facilitate rescue.

8.12 PROCESS SAFETY MANAGEMENT AND EPA'S RISK

8.12.1 Introduction



*Refer to Figure
8.12.1 at the end
of this section*

This plant stores four cylinders of chlorine in the chlorine building. This means that this portion of the building comes under the Process Safety Management regulation, 191.119. Your state safety office can best tell you how this regulation is being implemented in the State of _____. The process safety management regulation was originally mandated by the EPA under the clean air act. OSHA enforces it to prevent workers from being injured by accidental release of highly hazardous chemicals, such as chlorine.

The EPA has a similar regulation, which is designed to protect the community which requires that a Risk Management Plan be prepared. The deadline for compliance with the EPA regulation, which was finalized in June of 1996, is 1999.

A booklet is available from the Federal Government which goes through this regulation step by step. Ask for the booklet on regulation 191.119, Process Safety Management.

8.12.2 The principal area of concern for your plant

The principal area of concern for your plant is the **chlorine building**. You need to keep up-to-date drawings of the system (provided by the vendor), up-to-date operating procedures, and you need to keep up a regular training program for handling chlorine. In addition, you must have a proper maintenance program. It is important that you plan for emergencies, such as fires, that could reach these cylinders. This particularly true in West Haven, where the chlorine room is in the same building as the incinerator. A fire in the incineration area that spreads to the chlorine room could be disastrous. The process safety management regulation requires you to prepare an emergency plan that will cope with this highly dangerous emergency, as well as all possible types of chlorine leaks. The plan should be written in cooperation with your fire department and other emergency workers. They need to be aware of the procedures in the event an accident could release chlorine. The town officials must have an evacuation plan as well.

8.12.3 What is more important, is your documentation and

The principal area of concern for your plant is the chlorine building. You need to keep up-to-date drawings of the system (provided by the vendor), up-to-date operating procedures, and you need to keep up a regular training program for handling chlorine. In addition, you must have a proper maintenance program. It is important that you plan for emergencies, such as fires, that could reach these cylinders. This particularly true in West Haven, where the chlorine room is in the same building as the incinerator. A fire in the incineration area that spreads to the chlorine room could be disastrous. The process safety management regulation requires you to prepare an emergency plan that will cope with this highly dangerous emergency, as well as all possible types of chlorine leaks. The plan should be written in cooperation with your fire department and other emergency workers. They need to be aware of the procedures in the event an accident could release chlorine. The town officials must have an evacuation plan as well.

8.13 ASBESTOS REGULATIONS

8.13.1 Asbestos regulations are very complex and extensive

*Refer to Table
8.13.1 at the end of
this section*

Asbestos regulations are very complex and extensive. In addition to the hundreds of pages of Federal regulation, you have a layer of state regulations that cover Asbestos. States generally set how workers will be trained and license to handle Asbestos.

Older buildings in the name of your plant could have piping insulation, tile floors, ceilings or other materials that could contain Asbestos. If you are planning a renovation or construction in an existing building, just assuming there is no Asbestos is not enough. You need to have approved testing done of the material before workers are allowed to work in them.

8.13.2 Your contractor will be generally responsible for this

Your contractor will be generally responsible for this job, but it will be costly. If your contractor does not follow the regulation and exposes their workers and your workers as a result, your plant will be responsible. This is why it is important to determine whether asbestos is present prior to proceeding with any construction

8.14 CONTRACTORS NEED TO ADHERE TO

8.14.1 Policy

Your contractors need to comply with all of the safety regulations. You are responsible for their workers while they are on your site. Your contracts need to require that contractors follow the safety regulations. In addition, while on your site, they need to follow your safety rules.

Enter your current policies regarding contractors here.

8.15 VISITOR POLICIES/ ACCESS RESTRICTIONS

8.15.1 Introduction

You are responsible for the visitor's safety while they visit your plant. Be sure they are familiar with the safety regulations. Provide escorted plant tours. Be sure that they are not alone or isolated in any site where they could be overcome by fumes.

Establish a guest sign in and sign out book, and check to see that all guests are accounted for at the end of a shift.

A quickie emergency plan card -

Prepare a card or sheet with emergency instructions and escape route and make sure every guest takes it with them. Make sure that they know where to report and what to do in case of an emergency.

8.15.2 Our Visitor Policy

1. Visitors must be registered at the desk prior to entering plant or buildings.
2. All visitors must wear appropriate safety gear such as hard hats, safety glasses, gloves (if required), noise protection, safety shoes and clothing that protects arms and legs.
3. All visitors must be escorted through the plant
4. All visitors should read the Fire Escape Plan posted on the Bulletin Board and the Emergency Procedures.
5. Visitors with health problems that prevent them from entering certain areas should consult the plant manager or supervisor before proceeding.
6. Cameras, videotape or other recording devices are to be used with the approval of the plant manager only.
7. Visitors are not to touch or attempt to operate any equipment without the express approval of the plant manager.

8.15.3 Emergency Rules Quick Card

Type here the emergency rules for your plant. Make this a short 1,2,3 quickie. This is to be used for the card.

8.16 REPORTING ACCIDENTS/ RECORD KEEPING

8.16.1 Regulatory Requirements

In addition to keeping the OSHA state poster, you need to report all illnesses and accidents using the OSHA injury log reporting form, **form 2** and supplementary information on **form 1**

You are required to post a summary of your occupational injuries and injuries for the previous calendar year. The summary must be posted no later than February 1st and must remain in place until March 1st. Your workers must have access to the information compiled in these forms.

Form 1 must be kept on hand and be filled out. You must keep forms on hand for the last 5 years, at least. The form covers: the name of the person, the circumstances of the accident or illnesses, date and other data. You can use substitute forms, such as worker's compensation reports if they meet the requirements.

Work related fatalities - report within 8 hours to the state OSHA office 1-800-321-OSHA. Report within 48 hours directly to the nearest OSHA office.

What Workers Should Do - 1) Report any injury, however slight, to the plant manager by means of a standard form. This procedure gives some legal protection to both employee and employer. 2) Complete the state "Employer's First Report of Injury" form.

Incident Investigation - After an accident has occurred, make an injury investigation (formal or informal) to find the cause of the injury and to prevent a recurrence. If plant personnel are allowed to play a role in determining the cause of an injury, overall safety-consciousness is likely to increase.

Make copies of accident reports for review by all employees. They can then adjust their work habits to avoid similar injuries



Safety Requirements

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8.16 - 3

8.17 EMPLOYEE ACCESS TO MEDICAL RECORDS

8.17.1 Requirements

Your employees are entitled to access to not only the injury logs and supplementary data, but also to the medical records of employees exposed to toxic substances and harmful physical agents. Union representatives should also be allowed access to this information. Union and health professionals must have a written consent, to allow access.

The **bloodborne pathogens** regulation further complicates this issue. If a person is exposed to another person's blood at work, the exposed party can legally request a blood test from the person whose blood they were exposed to. Your plant must not only mediate, but provide the test and results free of charge and in complete confidence. This information is privy only to the parties involved. No one else should have access to the that worker's HIV status.

Consult your state agency for procedures in this case. They should provide literature with specific procedures.

8.18 SAFETY COMMITTEE

8.18.1 How to establish one

*Refer to Table
8.18.1 at the end of
this section*

One of the most effective methods of establishing and maintaining an effective safety program is to appoint a safety committee.

The committee creates an interest in safety among the workers at the plant and emphasizes the employee's responsibility for preventing accidents.

8.18.2 The duties of this committee

The duties of this committee follow:

1. Report unsafe conditions or practices to the plant manager
2. Warn plant employees of dangerous practices
3. Instruct plant employees in safe practices
4. Investigate accidents and make recommendations and
5. Stimulate an interest in safety

8.19 SPECIFIC OCCUPATIONAL HAZARDS AT WWTP

8.19.1 Specific Hazards

The hazards commonly associated with this type of wastewater treatment plant are classified into the following broad categories:

8.19.2 Bacterial and Viral

Constant caution is necessary to prevent infection by the bacteria and viruses present in sewage.

Workers are continually exposed to such waterborne diseases as typhoid fever, amoebic dysentery, and infectious hepatitis. Tetanus and skin diseases must also be guarded against.

Request that the local health department notify plant personnel when cases of waterborne diseases are encountered.

Some of the more basic, if not obvious, rules of safety are outlined in the following section.

8.20 GENERAL HYGIENE RULES FOR SEWER WORKERS

8.20.1 Some rules

1. PERSONAL CLEANLINESS CANNOT BE STRESSED TOO STRONGLY. FREQUENTLY AND THOROUGHLY WASH WITH AN ANTISEPTIC SOAP AND HOT WATER, ESPECIALLY BEFORE MEALS AND BEFORE LEAVING THE PLANT.
2. WASTEWATER AND SLUDGE ON HANDS CONTAMINATES DOORKNOBS AND FIXTURES. DIRTY CLOTHING OR CARELESS HAND WASHING SPREADS INFECTION BEYOND THE WASTEWATER PLANT AREA. WASH WORK CLOTHES SEPARATELY.
3. PROMPTLY GIVE EMERGENCY FIRST AID TO ALL MINOR CUTS OR INJURIES. A PHYSICIAN MUST TREAT MAJOR INJURIES AT ONCE. AS MANY PERSONS AS POSSIBLE SHOULD HAVE RED CROSS FIRST AID TRAINING.
4. WEAR RUBBER GLOVES WHEN HANDLING SLUDGE, WASTEWATER OR SIMILAR MATERIALS. TAKE SPECIAL PRECAUTIONS TO PREVENT WASTEWATER FROM COMING IN CONTACT WITH OPEN CUTS OR OTHER INJURIES. KEEP FINGERS OUT OF THE NOSE, MOUTH, AND EYES AT ALL TIMES.
5. DRINKING WATER FROM ANY SOURCE OTHER THAN REGULAR DRINKING FOUNTAINS IS PROHIBITED. THOROUGHLY WASH HANDS BEFORE USING THE DRINKING FOUNTAINS.
6. PERSONNEL MUST HAVE TYPHOID AND TETANUS INOCULATIONS FOLLOWED BY BOOSTER SHOTS AT APPROPRIATE INTERVALS.
7. NO SMOKING IS ALLOWED IN MANHOLES OR IN OTHER AREAS IN THE VICINITY OF WASTEWATER OR SLUDGE. IT IS IMPOSSIBLE TO AVOID CONTAMINATION OF THE ENDS OF CIGARS, CIGARETTES OR PIPES.
8. CONDUCT CROSS-CONNECTION INSPECTIONS FREQUENTLY TO PREVENT ANY ACCIDENT RESULTING IN EXPOSURE OF AN OPERATOR TO WATERBORNE DISEASE

8.21 MECHANICAL AND PHYSICAL HAZARDS

8.21.1 Introduction

Some of the general safety precautions to take against mechanical and physical hazards follow:

ALWAYS:

Place permanent warning signs at all hazardous locations and supplement with temporary signs during emergency operation.

8.21.2 Power Off/Guards On

* Take care when repairing or performing maintenance on automatic or remote-controlled equipment to ensure power is shut off so equipment cannot be started. Lock out switches at the equipment motor and mark them with red tags. Where this procedure is impossible, lock out power at the motor control center or lighting panel as appropriate and mark the breaker with a red tag. The red tag should read "WORKMAN IS WORKING ON LINE" and be signed by the workman. Only the person whose name is on the tag can remove the lock.

* Do not lubricate or adjust machinery in operation. If such services must be performed on operating machinery, station a second man at the stop-start switch.

* Keep belt guards in place.

8.21.3 Keep area clean to prevent falls and accidents

* Keep floors and stairways clean, dry, and free of grease, oil, and ice to prevent slipping.

* Pick up tools and keep manhole covers or hatch covers closed. If it is necessary for openings to be uncovered, protect them with guards and warning signals.

8.21.4 Fire Prevention

Fire prevention is an important part of every safety program. Keep flammable materials in approved safety cans. Store oily rags outdoors in a covered bin.

8.21.5 Common Sense

* Wear hard hats if working in areas where tools or other heavy items may be dropped from above.

* One of the most common injuries results from improperly lifting objects. Familiarize all personnel with correct lifting techniques and use hoists and power equipment wherever possible.

* While washing floors, wear rubber boots with good, treaded soles and heels.

* Never hang clothes on electrical disconnect handles, light switches or control panel knobs.

8.21.6 High places/railings

- * Attach life rings with throw lines to railings around open tanks. Also note that it is almost impossible for a person who falls into an aerated tank to swim.
- * Lower tools to be used in an empty tank in a canvas bag on a rope and remove in the same way.
- * When an extension ladder is used to enter an empty tank, lash the ladder to a handrail.
- * Use a safety belt with a short rope and safety snap when leaning out through the railings over any tank.
- * Pad and identify sharp projections or locations of low headroom by either marking clearly or painting with a contrasting color.
- * Wear ear protecting devices when working in noisy areas for prolonged periods.
- * Keep manhole covers, hatch covers, gratings, and other similar protection devices in place. Whenever the opening is exposed, constantly attend it or protect it with removable standard railings.

8.21.7 Wear ear protecting devices when working in noisy

- * Using fans and blowers, thoroughly ventilate confined spaces before entering and during any work being done inside. This supplies oxygen as well as removing dangerous gases.
- * Never enter a confined space alone. Station at least two persons outside but within visual contact of the work party to provide assistance in case of an emergency.
- * Use all safety equipment designated for confined space entry, i.e., safety harness, explosimeters, explosion proof lighting, and non-sparking tools. Obey no smoking signs.
- * Always inspect rungs of a wet well or tank before entering for safe footing. Using a ladder to enter a wet well ensures proper footing.

8.22 HOISTING EQUIPMENT

8.22.1 Some Rules

Permit only experienced personnel to use the hoisting equipment. Take the following safety precautions with hoists:

1. Never pick up a load beyond the rated capacity appearing on the hoist.
2. Never carry personnel on the hook or the load.
3. Never lift a load with the hoist until all personnel are clear.
4. Never use the hoist rope or chain as a sling.
5. Do not allow unqualified personnel to operate the hoist.
6. Do not transport a load over personnel.
7. Do not use the chain or rope as a ground for welding.
8. Never touch a welding electrode to the chain or rope.
9. Do not leave a load suspended in the air for extended or unattended periods.
10. Center the hoist unit over the load before lifting. Avoid side pull.
11. Be sure the sling is properly seated in the saddle of the hook.
12. Make sure a load clears neighboring stockpiles or machinery before moving.
13. Avoid plugging, excessive inching, and quick reversals of load.
14. Avoid swinging the load or load hook when moving the hoist

head.

15. Check limit devices and the braking mechanism daily for operator function. Check the wire rope or chain daily for improper seating, twisting, kinking, wear, or other defects before operating the hoist.

16. Be sure the power supply is disconnected before performing maintenance and repair procedures.

17. Do not operate a hoist if it is functioning improperly.

18. Do not use the limit clutch to stop the loaded hook

8.23 PRESSURE VESSELS & HYDRAULIC SYSTEMS

8.23.1 Some Rules

Pressurized fluids in pressure vessels can seriously injure persons if suddenly discharged. Therefore, follow proper safety procedures when dealing with pressure vessels:

1. Monitor pressures and temperatures. Do not ignore surging pressures or abnormally high temperatures.
2. Never operate piping and pressure vessels at pressures exceeding their rated capacity.
3. Before inspecting or cleaning pipes and vessels, completely de-pressurize associated piping and vessels and leave all vents, drains, nozzles, etc., open to relieve any pressure.
4. Well ventilate large vessels, completely isolate them, and test their atmosphere before persons enter. Persons entering a vessel should wear a safety harness or safety lines tended by others outside.

8.24 ELECTRICAL HAZARDS

8.24.1 Some General Rules

1. Only licensed, qualified electricians perform electrical maintenance and repairs.
2. Only use electrical tools and lights having 3-wire grounded extension cords.
3. Become familiar with the types of electrical accidents, how to administer first aid and CPR (cardiopulmonary resuscitation), and how to rescue another person without endangering yourself.
4. Place rubber mats on the floors in front of switchgear when doing work on this equipment.
5. Before servicing equipment, lockout and tag the equipment both at the local lockout switch and at the MCC or lighting panel. When doing work on equipment controlled by a switch located at some distance from the equipment, also tag the switch with a red card to prevent others from closing the circuit.
6. Consider all electrical circuits to be dangerous. Contact with even low-voltage wiring has caused workmen to fall from ladders and scaffolds.
7. Treat dead circuits as though they were alive; an accident can result from the negligent closure of the circuit by another person.

8.25 GASEOUS HAZARDOUS

8.25.1 Chlorine Hazards

The most hazardous chemicals used in the plant are chlorine, hydrated lime, polymer, propane, quicklime, and sulfur dioxide. Refer to the Material Safety Data Sheet for each chemical, available from the supplier, for specific details on safety and handling.

The book by the Chlorine Institute and the Wallace and Tiernan manual's provide very complete chlorine handling information.

Chlorine gas is an extremely active chemical which is very toxic and corrosive in moist atmospheres. As a result, chlorine must be handled in an intelligent and cautious manner. Following these suggested rules help to prevent accidents or, if an accident occurs, to minimize the damage.

8.25.2 Dealing with chlorine

1. At least one and preferably two employees on each shift should be fully informed concerning the safe handling of chlorine and the repairing of leaks, and should be responsible for proper handling of chlorine containers, for maintenance of chlorination equipment, and for inspection and care of the self-contained breathing apparatus. Instruct all other employees in the principles of safely handling chlorine and procedures to follow in case of an emergency.
2. Do not drop chlorine containers or allow them to hit each other, as it may damage the fusible plugs or other container parts and allow chlorine gas to escape.
3. Do not heat chlorine containers or store them where the temperature may exceed 125 degrees F (such as adjacent to steam lines). Fusible plugs may soften or melt allowing the chlorine within the container to discharge to the atmosphere.
4. Chlorine gas, as drawn from a container, is dry and noncorrosive to metals. In combination with moisture, however, chlorine attacks all but the noble metals (gold, silver, platinum, etc.) and a few other materials. Liquid chlorine attacks both hard and soft rubber. Chlorine in the atmosphere, even in small amounts, is particularly damaging to metal objects and electrical equipment.
5. Carefully inspect connections between gas headers and chlorine containers at regular intervals and replace promptly when defects are found.
6. Replace the flexible connections between the chlorine containers and the manifold yearly. Deterioration on the inside of these pipes can be extensive and may not be readily noticed. Any small pinhole enlarges very rapidly.
7. Wear proper gloves when changing containers or making

connections.

8. When connecting a chlorine container to the headers, eliminate bending stresses at the ends of unions of the flexible-tube connectors.

9. When connecting piping to containers or when it is necessary to break a connection and re-couple it, use a new lead or fiber washer.

10. Never connect a full container to a header with other containers until the temperatures of all containers are approximately the same. Chlorine tends to flow from the warmer to the cooler container and causes it to overfill. Bursting pressures may develop as the temperature of the cool, overfilled container increases.

11. Keep the valve protection caps on containers except when they are in use. Caps include both the small cap on the valve outlet and the large cap enclosing the entire valve assembly.

12. Close the valve on a container as soon as it is empty and replace the protective caps.

13. All lines used for chlorine must be perfectly dry. Thoroughly remove all oil and grease on metal with an approved solvent rather than water.

14. After installing full chlorine containers, check all joints for leaks.

15. Do not start up a chlorinator or turn on a container unless self-contained breathing apparatus is on hand in the chlorine area.

16. Give the slightest leaks of chlorine gas immediate attention. Leaks are located by passing an opened bottle of commercial strength (26 degree Baume) ammonia solution along the pipelines and fittings. If chlorine leaks are present, white fumes

appear at the mouth of the bottle. (Do not allow the ammonia solution to enter any fittings.)

Note: Household ammonia is not strong enough for this purpose.

17. Inaccessible locations are conveniently leak-checked by tying a cloth saturated with ammonia solution to the end of a long pole.

18. Open chlorine valves only one turn so they can be closed quickly in case of emergency.

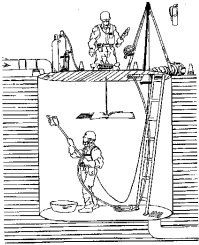
19. Use self-contained breathing apparatus when entering the chlorine area to repair a leak. Store the breathing apparatus outside any area likely to be affected by a chlorine leak.

20. Have drills at frequent intervals to review the use of the emergency repair kits and the emergency procedures followed in the event of a leak.

21. Instruct local fire and police departments in emergency procedures and have them participate in the drills at the plant.

8.26 CONFINED SPACES

8.26.1 About Confined Spaces



Refer to Figure
8.26.1 at the end
of this section

Please note that the following rules are guides. Consult your confined space entry program and H&S Plan for more detailed information.

The air within confined spaces, such as wet wells, tanks, and manholes, is often deficient of oxygen or contains noxious or toxic gases.

Normal air contains about 21 percent oxygen by volume. Any atmosphere containing less than 21 percent oxygen is dangerous to human beings and termed "oxygen deficient." Such a situation may occur in any confined space if another gas displaces the oxygen.

Oxygen deficiency also occurs in a confined space, such as a basement, where sludges or other organic material has spilled.

Use an oxygen-deficiency indicator to measure the amount of oxygen in an area.

Use a portable air blower to restore adequate ventilation. Extend the discharge hose well into the structure, allow the blower to run for a sufficient amount of time to remove gases, and re-test the atmosphere before anyone attempts entrance.

There may be noxious and toxic gases or vapors in enclosed

8.26.2 Common Confined Space Hazards

The following are some of the more common hazardous situations found in treatment plants:

1. Gas emitted by wastewater or sludge is explosive when mixed with certain proportions of air, can be asphyxiating, and is sometimes toxic. Methane is the main constituent of such gas mixtures and accounts for 6 to 7 percent of their volume. It is odorless and colorless and undetectable without testing equipment. Never enter manholes, wet wells, and other enclosed or poorly ventilated spaces for inspection or repairs until their atmosphere has been tested for flammable gas mixtures, for oxygen deficiency, and for hydrogen sulfide. If in doubt about the quality of air in a confined space, use positive ventilation or self-contained breathing apparatus. Two other people of ample strength should always be present in case of trouble.
2. Hydrogen sulfide has an odor similar to rotten eggs and is easily detected by smell in small concentrations. However, in strong concentrations, it causes impairment or temporary loss of the sense of smell and may cause suffocation before one realizes what is happening. Never enter manholes, wet wells, and other poorly ventilated spaces if a hydrogen sulfide reading obtained by a detector is in excess of 5 percent.
3. Gasoline and other flammable and volatile substances find their way into the sewer systems from time to time. Such materials pose a serious fire and/or explosion hazard in sewers, wet wells, or wherever there is an open surface of wastewater. Smoking or open flames are absolutely prohibited in such areas and only explosion-proof lights or flashlights are allowed. Use only non-sparking tools.
4. Materials releasing toxic gases also enter the sewer occasionally and cause personnel hazards in the previously mentioned areas. Be alert to such danger and be sure that an area is purged of all foreign gases before entering. If irritation of

the eyes, nose or throat is experienced, leave immediately.

5. The first worker to enter a confined area should wear a safety harness and be "witnessed" by two persons of ample strength to pull him or her to safety if necessary. A good rule to observe around treatment plants is never to go alone into a tank or other hazardous location. Have someone present who can observe the worker's condition and who is equipped to give all necessary assistance in case of emergency.

6. Smoking is prohibited in or near hazardous areas such as manholes or wet wells.

7. Familiarize yourself with the care and use of the oxygen-deficiency detector, the combustible gas detector, the hydrogen-sulfide detector, the self-contained breathing apparatus, the safety belt, and the safety harness.

8. Properly ventilate confined areas where painting is being done.

8.26.3 When a leak is detected

When a leak is detected, include the following emergency procedures:

- a. Ensure the ventilating system is operating in the area involved if the leak is within a building.
- b. Since chlorine gas is heavier than air, personnel without breathing apparatus in areas lower in elevation or downwind of the chlorine leak should leave those locations and go to areas higher in elevation and upwind of the leak.
- c. Use the self-contained breathing apparatus and investigate the source and severity of the leak. Locate the point of leakage with ammonia as previously described.
- d. Notify the police and fire departments of the emergency.
- e. Notify the chemical supplier or CHEMTREC and request the assistance of emergency personnel.
- f. Never put water on a leak since water always makes the situation worse.
- g. If the leak is downstream of the valve on the container or tank, turn off that valve before repairing the leak.
- h. If the leak is in a fusible plug on a one-ton container, lessen the flow by reducing the pressure. Reduce pressure by increasing the rate of chlorine feed to the treatment plant to the maximum, turning off any other containers connected to the header and rotating the ton container until only gaseous chlorine escapes. Liquid chlorine cools as it changes to gas thereby reducing pressure and causing the gas to discharge at a lower rate. The container may also be insulated with rags or similar material to decrease the amount of heat transferred to the container from the

surroundings.

I. Chlorine gas may be readily absorbed in solutions of either caustic soda or soda ash. One pound of chlorine requires 1.25 pounds of caustic soda or 3 pounds of soda ash. Prepare solutions by using 10 gallons of water to dissolve either 25 pounds of caustic soda or 30 pounds of soda ash. Pass the chlorine into the solution near the bottom of the container of caustic soda or soda ash through an iron pipe or weighted rubber hose.

This procedure is impractical for major leaks since the design of most plants does not include the required facilities.

23. Never work alone on a leak. Always have someone observe the worker, equipped to go to his aid if necessary.

24. If the leak is large, ready plans for large scale evacuation of nearby populated areas for implementation if necessary.

25. If repair of the leak requires the body exposure (with the exception of the face area protected by the breathing apparatus) to chlorine gas for an extended period, shower and change clothes as soon as possible after repair is completed to avoid skin irritations. Wash clothes before wearing.

26. Call for help in a chlorine emergency.

8.26.4 Confined Space Entry Rules

Confined Space Entry Rules (consult your regulations for additional information)

- a. If all tests (combustible gases, hydrogen sulfide, and oxygen deficiency) show no hazardous conditions, then a worker in a safety harness may enter the potentially hazardous structure.
- b. Two persons must be available outside the structure to assist.
- c. No one inside the structure should smoke.
- d. Always use non-sparking tools.
- e. Test the air at frequent intervals since the composition of air in the structure may change.

If tests show noxious gases or an oxygen deficiency, thoroughly ventilate and re-test the structure until the tests prove negative.

If tests show a hazardous condition and there is an emergency such as an unconscious worker, then other workers must have the proper type of breathing apparatus to enter the structure. Work in an explosive or dangerous atmosphere is extremely hazardous and must be attempted only by those fully aware of the dangers and of the proper procedures for encountering the dangers.

8.27 THE PLANT LABORATORY SAFETY

8.27.1 General Rules

Permit only experienced or well instructed personnel to work in the plant laboratory. Use the laboratory and its equipment only for its intended purpose.

Follow these safety precautions in the laboratory:

1. Store all strong acids and alkalies in clearly marked bottles where they can be conveniently reached without climbing.
2. Use rubber bulbs on pipettes.
3. Keep lab tables clear when not in use.
4. Wear protective gloves, aprons, and goggles when handling hazardous materials.
5. Use water-soluble jellies when making glass-to-hose or other similar connections.
6. Keep labware clean.
7. Discard any chemicals that cannot be identified.

8.28 FIREFIGHTING EQUIPMENT

8.28.1 General

Know the exact locations of all extinguishers and familiarize yourself with their use. Check extinguishers periodically for operability and charge as recommended by the local fire department.

Enter here a complete list of your fire extinguisher locations and other information.

8.29 FIRST AID EQUIPMENT

8.29.1 General Rules

*Refer to Table
8.29.1 at the end of
this section*

First aid kits are provided throughout the treatment plant. Keep the cabinets and kits well supplied, neat, clean, and in order. Replace items in the kit before the supply is exhausted to ensure availability when needed.

Familiarize yourself with first aid procedures. In case of serious injury, call rescue personnel immediately. Take the injured person to a hospital by ambulance.

