

CHAPTER VII

SAFETY

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A. GENERAL

1. Management's Responsibility

a. Safety Information to Employees

Employees in maintenance work and in the operation of wastewater treatment plants are more than ordinarily exposed to personal injuries. Slippery ladders, walks, and steps; heavy lifting; fast-flowing water and deep tanks to fall into; exposed machinery; electric currents; and explosive and asphyxiating gases are ever present and lead to the necessity for the exercise of every reasonable safety precaution.

Accidents are commonly caused by unsafe acts of employees or result from hazardous conditions, or they may be a combination of both.

However, a lot of accidents, in some cases, can be prevented by the practice of proper safety procedures. Accident prevention is the result of thoughtfulness, and the application of a few basic principles and knowledge of the hazards involved. It has been said that the first step for accident prevention is "Always be Careful". Every one working at this treatment facility must learn how to be careful and what to avoid. With this knowledge he can then always think and practice safety.

b. Hazardous Working Condition Elimination

Employee hazards in pollution abatement plants include exposure to physical injuries, body infections, oxygen deficiency, noxious gases or vapors, and various others.

The prevention of physical injuries begins with good housekeeping. Tools, parts and other things should not be left lying around. Warning signs, railings and covers in place can protect against low piping, open tanks and open manholes or hatches.

The body infections can be prevented by wearing protective clothing, gloves, and goggles. Proper tools should be used also.

The depletion of oxygen and occurrence of noxious gases or vapors usually happen in a confined space as a result of organic processes in closed or poorly ventilated chambers. Working conditions can be improved by providing better ventilation of enclosed spaces by inducing a draft, filling and emptying the space with water, or by some means of displacing the gases with breathable air; avoiding sparks from electrical equipment, tools, shoes, matches, and other flames; providing gas masks and other safety equipment; and analyzing the atmosphere before entering.

c. Motivate Employees to be Safety Minded

These occupational hazards are largely avoided by the execution of safe practices and the use of safety equipment. The dangers are many. This is supported by the manhour accident records of insurance companies.

It is the responsibility of the pollution abatement facility operator to acquaint himself with the hazards associated with plant maintenance and operation, and to take steps to eliminate them. Accidents do not happen--they are caused! By thinking "safety," it can soon become a state of mind.

Accident prevention is of the utmost importance, but knowing what to do when an accident occurs is also important. It may be too late to learn how to use life saving procedures or equipment after an accident. BE PREPARED by staging periodic, emergency first aid drills.

When the Water Pollution Control Facility was designed and constructed, the laws governing occupational safety were followed precisely and all required safety features were installed in the plant.

d. Entry to Confined Spaces

Chapter 201 of the Pennsylvania Department of Environmental Resources Rules and Regulations requires that "no employer shall permit any employee to enter any confined space unless another workman supplied with appropriate emergency protective equipment, as determined by the Department, is stationed outside the confined space to summon help and assist the workman in the event of an emergency."

No worker shall be permitted to enter a confined space unless the worker has received instructions and training in the proper entry procedures to be used. Before any worker enters a confined space, tests must be taken by a trained responsible person, to determine the amount of oxygen and combustible gas contained in the confined space. Measurements should be made at the entry port and at different levels by using a probe. Under no circumstances should a confined space be entered to make these tests.

The confined space should not be entered if the combustible gas reading is greater than 10 percent of the lower explosive limit or the oxygen content is less than 19 percent by volume. If the tests show no hazardous situation as to combustible gas or lack of oxygen, the worker may enter the confined space. Even though the tests show no hazards, the situation may change so tests should be repeated at five minute intervals while any work is being done in a confined space.

No employer shall permit any employee to enter any confined space unless a confined space entry procedure is used incorporating one of the following conditions:

i. The employer has ascertained by air sampling performed by a trained person prior to and periodically during occupancy that: (a) the atmosphere in the confined space contains an adequate quantity of oxygen (19 percent) and (b) harmful atmospheric contaminants have been diluted to safe concentrations; or

ii. The employer has equipped the workman with supplied-air respirator or self-contained breathing apparatus, safety harness, a safety line and where necessary, protective clothing; or

iii. The employer has documented to the satisfaction of the Department that no harmful contaminants should be present nor will be introduced and that adequate mechanically induced dilution ventilation is used before entry and during occupancy to ensure that a minimum of 19 percent oxygen is supplied to the confined space."

The worker shall wear protective clothing, hard hat and a safety harness when entering the confined space. One other workman shall remain outside of the confined space while the worker is inside. The workman outside shall at all times be in communications with the worker inside the confined space, and shall have rescue equipment available immediately, such as safety lines, safety harness, and a supplied-air respirator hose mask. No one shall smoke within the confined space and only approved safety lighting will be used. Sparks from tools shall be prevented by the use of non-sparking beryllium-copper alloy tools.

If the tests, before entering, show combustible gases or oxygen deficiency, the confined space shall be thoroughly ventilated by using the fresh air blower equipment. After thorough ventilation, at least five complete air changes, and combustible gases and oxygen tests indicate a safe situation, the worker shall be permitted to enter the confined space following the same procedures as mentioned above. The blower shall continue to operate while the worker is in the confined space.

If the tests before entering show a hazardous situation, but an emergency exists because of flooding or a workman is overcome, the worker, in addition to the above procedures, must be equipped with the supplied air respirator hose mask before entering the confined space.

Any time it is necessary for treatment plant personnel to enter confined spaces, a Confined Space Entry Permit must be completed. A sample form is shown in Chapter V of this manual. These forms must be kept on file at the treatment plant for a minimum of six months, during which time they are subject to review or acquisition upon written request by the Bureau of Occupational Health, Department of Environmental Resources.

The following is to be posted, in a plasticized form, near the doorways on the plant, in maintenance vehicles and at confined space entry points.

NOTICE TO TREATMENT PLANT EMPLOYEES

PROCEDURE FOR CONFINED SPACE ENTRY

1. All entry ports are open and ventilators operating on continuous basis.
2. Standby employee available trained in space entry procedure with knowledge of emergency rescue equipment and location of same.
3. To sample atmosphere in confined space for oxygen content which must be 19% and sample for combustible gases which must be 10% or lower. This must be done at different levels.
4. Flush contaminants from space with blower if above sampling tests are not satisfactory.
5. Sampling with meter must be carried out during work time in confined space.
6. Emergency equipment shall include blower, harness, safety line and breathing apparatus.
7. Safety clothing should be worn such as rainwear, boots, gloves and headgear.

2. Operator's Responsibility

Although management has assumed the responsibility of providing certain safeguards it is the Operator's responsibility to assure that safety procedures are followed by himself and other working and visiting personnel. Where written procedures have not been made available the Operator's best judgement shall be exercised. Some areas of caution:

- i. Exposure to harmful chemicals and/or noxious gases
- ii. Electrical hazards
- iii. Rotating equipment
- iv. Fire and flammable substances
- v. Heat and Cold Atmospheric conditions
- vi. Noise levels

B. ELECTRICAL HAZARDS

1. Grounding of Electric Tools

Electrical shock hazards are present in many wastewater treatment plants. To avoid injury, portable rubber mats should be utilized. Grounding of all equipment is essential. Portable power tools should be equipped with ground wires and special outlets and plugs. Accidents can be, and have been, caused by such equipment not being grounded. When work is to be done on equipment controlled by a switch located at some distance from the equipment, the switch should be tagged out with a red card to prevent others from closing the circuit.

2. First Aid for Electric Shock Victim

In the event of electrical shock these measures should be taken.

- i. Do not attempt to move the victim
- ii. Keep him warm by covering him with a blanket
- iii. Do not leave the victim unattended
- iv. Remain calm and try to reassure the victim
- v. Immediately notify the ambulance service.

3. Authorized Personnel to Perform Electrical Repairs

The plant operator and his assistant should be familiar with the basic electrical operation of the plant. They must be cautioned, however, that they are only responsible for minor electrical repairs. If there is ever any question in their mind while performing any electrical repairs they shall acquire the services of a qualified licensed electrician equipped with the knowledge, tools, and equipment to safely diagnose and correct any problems in the electrical system.

4. Safety Precautions

Electrical hazards require careful attention. Listed below are some suggestions which might be helpful to prevent accidents pertaining to them.

- i. Do not ground yourself in water or on pipes or drains. Avoid them when working near any electricity.
- ii. Allow only authorized people to work on electrical equipment and repairs.
- iii. Keep all electrical controls accessible and well marked.

- iv. Keep rubber mats on the floor in front of electrical panels; keep edges trimmed so that they do not become a tripping hazard.
- v. Keep wires from becoming a tripping hazard.
- vi. Work in pairs around electrical equipment.
- vii. Place "Man on Line" signs and lock the switches when working on electrical equipment which another person can turn on.
- viii. Never use metal ladders around electrical equipment.
- ix. Handle breaker wires as though they were "live" wires.
- x. When there is a question about any electrical hazard, ask before you expose yourself to it.
- xi. Do not use any part of your body to test a circuit.
- xii. Ground all electric tools.
- xiii. When working around electrical equipment, as with any other hazardous work, keep your mind on the hazards at all times.

C. MECHANICAL EQUIPMENT HAZARDS

1. Equipment Guards

To prevent injuries associated with mechanical equipment employees should avoid wearing loose clothing which may become entangled in the plant's machinery. Extreme caution must be used in working around rotating, revolving, oscillating, nutating, or otherwise moving equipment, belts, chains, pump couplings, etc. Equipment guards have been provided in certain areas for the protection of the operator and service personnel.

Periodic checks should be made to insure that all equipment anchoring devices and support structures are firm, rigid, and adjusted to the tolerances required by the manufacturer.

When hosing, sweeping, or dusting around the mechanical parts in the plant, employees must be careful to keep debris away from the machines so that it cannot be thrown back at them.

2. Noise Level Considerations

Excessive noise levels may present some problems in communication among plant personnel around moving machinery. To prevent accidents, personnel must be sure instructions are clearly understood before beginning work in areas of higher noise levels. Earplugs may be used by personnel to alleviate discomfort but it must be remembered that communication will be inhibited.

In areas where the noise levels were expected to be excessive, such as the blower room, special treatment to the building walls, ceilings, etc. was performed but additional facilities may be required to reduce the noise to a reasonable level.

3. Authorized Personnel to Perform Mechanical Repairs

Only authorized personnel should perform maintenance on mechanical equipment. Major repairs which call for specialized training should not be attempted by plant personnel; instead, they should be referred to the manufacturer's service representative.

4. Space

Adequate space has been provided around each major item of equipment to properly service and perform preventive maintenance on the equipment. Should a major repair item be needed, a work room is available to conveniently store malfunction items until repaired and to provide a safe area for working on the equipment.

D. FIRE HAZARDS

1. Storage of Flammable Materials

To eliminate the potential hazards of explosions or fires all flammable materials should be stored in leak-proof containers and placed in areas which are not subjected to excessive heat. These containers should be stored in an orderly manner and be clearly labeled as to their specific contents to avoid any errors in their practical use.

A fire extinguisher should be readily accessible to the area in which these materials are stored.

2. Fire Extinguisher

The control building is equipped with a portable CO₂ type extinguisher which can effectively control combustibles such as flammable liquids, gases, greases, etc. They are made of steel with a red enamel finish complete with wall-hanging brackets.

3. Flammable Vapor

This wastewater treatment plant is not equipped with a vapor detector. If a situation occurs in which personnel feel that flammable vapors are existing, they should contact the local fire department for assistance.

E. LABORATORY HAZARDS

1. Volatile Materials Handling

Volatile materials should be stored in special explosion proof containers and should not be stored in areas of excessive heat. They should not be used around open flames, and smoking should be prohibited in their presence and in the laboratory. The laboratory should also be well ventilated by opening windows and doors or with portable equipment when volatile reagents are used.

2. Protective Clothing and Emergency Equipment

To prevent hazards associated with laboratory testing, protective clothing and proper emergency equipment must be available and within easy access at all times.

Treatment plant personnel should wear safety goggles and full length lab coats and/or aprons when performing certain laboratory analyses

Proper emergency equipment includes the proper type of fire extinguisher(s), a shower to flush chemicals off the lab technician in the event of a spill and proper first aid supplies.

In the event of a spill, immediately flush the affected part of the body with cool running water. If burns result from chemical spill, consult a physician immediately.

3. Ventilation

The laboratory is not equipped with a powered ventilation system. Generally tests performed in the laboratory will require only the opening of doors or windows for ventilation.

Should an accidental spill occur, then portable forced air ventilation equipment must be placed in operation.

4. Safety Practices

Safety practices in wastewater treatment works laboratories are listed below:

- i. All chipped or cracked glassware should be discarded
- ii. Special explosion-proof containers should be used for storage of volatile materials

- iii. The possibility of fire or explosion when working with acids must always be kept in mind
- iv. Chemicals should not be handled with bare hands
- v. A concentrated acid should be added to water and not water to the acid
- vi. Suction bulbs on pipettes are desirable to avoid contact with the mouth of a contaminated pipette.
- vii. Aprons and goggles should be worn when working with dangerous chemicals
- viii. All chemicals should be clearly labeled
- ix. Avoid smoking and eating when working with infectious materials such as raw sludge
- x. Adequate ventilation is mandatory
- xi. A fire extinguisher should be mounted in a readily accessible location

F. SAFETY EQUIPMENT

According to current standards, the plant should be equipped with the following safety equipment:

- i. Goggles
- ii. Safety Helmets
- iii. Jacket
- iv. Overalls
- v. Gloves
- vi. Boots
- vii. Safety Harness
- viii. Lanyard
- ix. Safety Line
- x. Resuscitator
- xi. Ventilator
- xii. Gas/Oxygen Detector
- xiii. Self-Contained Breathing Apparatus
- xiv. Respirator
- xv. First Aid Kit