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SAFETY CONSIDERATIONS FOR WATER FACILITIES

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SAFETY CONSIDERATIONS FOR WATER FACILITIES

November 1988

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La sécurité dans les installations de
traitement de l'eau

SAFETY CONSIDERATIONS FOR WATER FACILITIES

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SAFETY CONSIDERATIONS FOR WATER FACILITIES

1.0 INTRODUCTION

This publication presents basic information on safety practices at water facilities, and can form the basis for an effective safety program. Constant attention to safety in all phases of water management is stressed.

The backbone of any safety program is education and, regardless of the size of a utility, there is a need for some form of training.

The purpose of safety training is to bring safety to the attention of employees, and constantly remind them of its importance. It should have something of interest and value for all employees and should be systematically planned and continually promoted.

A safety program should be an integral part of all stages in the development of water systems. Help is available from the district or regional offices of INAC.

A safety program applies not only to the workers but also to the whole band who may be involved as pedestrians or motorists.

Safety has been described as thinking far enough ahead to do a job with proper tools, at the proper time and in the proper manner. Accidents are mostly caused by human error: accidents can be prevented.

To get a good safety program established, teamwork is essential involving management (the band), the supervisor and the operator. All safety programs should include the following:

a. provision and regular use of safety equipment;
b. proper job instruction;
c. a frequent review of safety practices;
d. adequate and competent supervision; and
e. planning the job through to completion.

Safety at wastewater facilities is covered in BTP-MS-16, Safety in Wastewater Systems.

2.0 ACCIDENT CAUSES

These are the major causes of accidents:

a. performing work when not qualified to do so;
b. operating or working at unsafe speed;
c. making safety devices inoperative;
d. using improper tools or appliances;
e. unsafe material handling;

f. unsafe piling of materials;
g. assuming a hazardous position or posture;
h. working on moving or dangerous equipment;
i. failure to use, or improper use of, safe attire or personal protective equipment;
j. failure to give or receive proper signals;
k. working without instructions;
l. failure to coordinate and cooperate;
m. errors in judgement;
n. violations of specific instructions;
o. failure to recognize an unsafe condition or practice;
p. lack of inspection and maintenance;
q. failure to establish safe working procedures; and
r. working while unfit for duty.

3.0 SAFETY PROGRAM

3.1 Responsibilities

3.1.1 Legal Responsibilities

Provincial occupational safety acts require that employers notify the provincial chief safety officer by telephone, telex or other suitable means when an employee is injured in a manner that causes, or may cause loss of limbs or faculties, or that requires hospitalization.

3.1.2 Band Responsibilities

The band council has the overall responsibility for safety. It should:

a. select employees carefully;
b. provide training;
c. make sure each employee knows how the operation works and what is expected of him/her;
d. maintain machinery and equipment and carry out repairs and improvements promptly;
e. provide appropriate safety devices;
f. correct any hazardous condition that comes to its attention; and
g. have a safety program that includes regular inspections of all facilities, equipment and procedures by supervising personnel.

3.1.3 Employees' Responsibilities

Employees also have responsibilities:

a. to themselves and their families, to avoid personal injury;
b. to their fellow workers, who they might endanger by ignoring safety practices; and
c. to management - safety is a team effort and everyone must cooperate.

3.2 Accident Procedures

3.2.1 Accident Reporting

It is imperative that accidents occurring during employment, and illness that may be employment related, be reported to the supervisor immediately, either by the affected employee or by someone else if necessary. This is essential, not only to comply with the requirements of workers' compensation boards but also to ensure prompt and effective medical treatment.

3.2.2 First Aid

The name, location and telephone numbers of doctors, clinics, hospitals and ambulance services should be posted in a prominent place. If none of these services is close to the work areas, employees properly trained in first aid treatment (preferably with certificates from the St. John's Ambulance Society) should be available. First aid kits should be readily available, and properly protected and maintained for immediate use.

Equipment is required for the physical protection of employees. Specific items include hard hats, safety shoes, safety eye glasses and protective clothing. More sophisticated equipment such as emergency oxygen units and resuscitators may be required at some locations, depending on the hazards that may be encountered.

4.0 PREVENTION OF INJURIES

4.1 General Remarks

The first step in any safety program is the regular inspection and maintenance of all the safety features and equipment.

It has been said that the "A, B, C" of accident prevention is "Always Be Careful." To put this into practice the worker should:

a. know his/her job;
b. be able to recognize and call attention to hazardous situations;
c. be able to differentiate between everyday strong smells and truly noxious gases; and
d. call attention to hazards.

4.2 Safety Correction Methods

If an employee encounters a hazardous situation or safety violation, she/he should be required to advise her/his supervisor and/or the band management immediately. The band should establish procedures to make sure such situations are corrected quickly.

4.3 Housekeeping

Housekeeping is the everyday attention to safety in and around the water facility. This includes the following:

a. the proper handling and storage of equipment and materials;
b. maintenance of the facility and grounds;
c. fire protection;
d. paying particular attention to the handling and storage of toxic chemicals such as chlorine; and
e. being aware of the hazards in floor openings, chutes, hatchways, and areas around open tanks or basins.

4.4 Illumination

Fixed artificial lighting should be provided in all work areas, suitable for the type of work performed. In those areas where there may be occasional night work, portable lighting should be provided.

4.5 Electrical and Power Generating Equipment

Most water works incorporate sophisticated electrical equipment, and many use power generating or standby equipment. Properly trained and qualified personnel are the only ones who should be permitted to operate and maintain such equipment. It is particularly hazardous to re-energize or de-energize circuits without warning persons working on them.

Storage batteries, particularly when on charge, emit hydrogen and oxygen that form a highly explosive mixture. They should be installed and operated only in well-ventilated locations. Smoking or the use of flame or other spark-producing or flame-igniting devices should not be permitted near batteries.

4.6 Handling of Electrical Circuits

When handling electrical circuits, take the following precautions:

a. Consider all electrical circuits to be dangerous.
b. Always consult a qualified electrician except for minor requirements such as overload resets, fuses, light fixtures etc.

5.0 SAFETY IN OPERATIONS

The plant operation must be thoroughly understood by management and the operators before the plant pre-start checkout operation stage is reached. The operators should be trained in every detail, preferably before the start of operations. Both management and the operators should know:

a. necessary plant routines;
b. operations that must be reported;

c. how to carry out the operation; and
d. in what form plant reports should be made and how often, for example, daily, weekly, monthly or yearly.

6.0 PERSONAL PROTECTIVE EQUIPMENT

6.1 Face and Eye Protection

The item of safety equipment with the widest variety of design is goggles. For protection of the eyes against impact, suitable spectacle or cup goggles and eye and face shields are available for almost any job.

6.2 Foot Protection

Well-made work shoes with a steel box toe are available from a number of manufacturers at slightly more than the cost of other good work shoes. This safety feature may also be obtained in most rubber boots.

6.3 Hand Protection

Hand leathers or heavy gloves or mittens of chrome-tanned cowhide, often reinforced with steel staples or wire, are usually used for protection against mechanical damage while handling such objects as lumber or rough castings.

7.0 RESPIRATORY EQUIPMENT

7.1 Respiratory Hazards

Respiratory hazards include:

a. nuisance dusts such as rock, cement, coal, wood, and flour particles;
b. dusts of toxic materials such as lead, arsenic and fluorides;
c. mists and fumes from chemicals and heated metals;
d. vapours and gases such as chlorine, ammonia and carbon monoxide; and
e. oxygen-deficient atmospheres resulting from depletion by chemical action or displacement by other gases or vapours.

As some of the most lethal gases and atmospheric conditions give few, if any, clearly recognizable warnings to unsuspecting workers, it is important to be aware of all possible air-contamination hazards so that the correct respiratory protection can be provided.

It should be emphasized that adequate ventilation or elimination of the dangerous process is the best method for dealing with a respiratory hazard.

7.2 First Aid

Any injury, no matter how slight, should receive prompt first aid and, if serious, should be treated as soon as possible by a physician.

Proper first-aid treatment requires availability of well-equipped chests or kits, which should be prominently displayed throughout the plant and provided in all passenger vehicles and trucks. All employees should be made aware of their location and use and someone, in the vicinity of each kit, should be made responsible for making sure that all required materials and components are in proper supply and in serviceable condition.

8.0 NEW EMPLOYEES

8.1 General Remarks

The foreman/woman should consider any person recently employed or transferred under his/her authority as a new employee and should:

a. instruct her/him thoroughly in the job;

b. inform her/him about plant safety requirements, proper clothing, safety goggles and other important items;

c. Place her/him for a time under the charge of a safety-minded employee for instruction, giving the person an opportunity to adjust to safe work procedures;

d. check to determine if he/she is doing the job safely; and

e. reinstruct, if necessary.

8.2 Lifting or Lowering

a. The right way to lift by hand is to:

1. get a good footing;
2. place feet about shoulder-width apart;
3. bend at the knees to grasp the weight;
4. keep the back straight;
5. get a firm hold;
6. keep the back as upright as possible, lifting gradually by straightening the legs;
7. turn the whole body, including the feet, rather than twist the back to change direction while holding a heavy weight; and
8. get help when a load is too heavy or bulky for one person to lift comfortably.

b. A worker should use mechanical handling equipment whenever possible and should:

1. check the load against the capacity of the equipment;
2. use safe slings properly applied; never use frayed rope or wire, which should be destroyed;
3. stand clear during lifting with mechanical equipment; and
4. wear a hard hat for construction work or whenever there is danger from falling objects.

c. When lowering anything, apply the same rules used for lifting.

8.3 Running and Walking

Keep the following in mind:

a. Do not run except for extreme emergencies.

b. Do not run or jump across ditches, scaffolds, or platforms.

c. Do not jump into or climb out of a trench; use a ladder.

d. Practice walking with open eyes and cautious feet.

e. Never run or hurry upstairs or downstairs.

f. Do not jump over piles of material; walk around them instead.

8.4 Stairways

For stairway safety, remember the following:

a. Never run on stairs. Take enough time to be safe, and use the hand rails provided.

b. Keep stairs free from grease, other wet or slippery substances, or conditions capable of causing a fall.

c. Inspect handrails frequently to make sure they are free of splinters or loosened nails and are not working loose from moorings.

d. Never store tools, supplies, or other materials on stairways. Keep them neat and clear to serve safely.

e. Always watch the steps just ahead. Never carry anything in such a way that vision is obstructed.

f. Take only one step at a time.

g. Be sure that stairways are properly lighted when used at night or on dark days.

h. Look carefully in the direction in which you are moving. If your attention is distracted, stop until you are ready to carry on.

i. Report all loose treads, risers, and hand rails for immediate repairs.

8.5 Handrails

For handrail safety, the following procedures are imperative:

a. Construction should be substantial and durable. No guard or railing should be installed or kept in use that can be broken, collapsed, or displaced by the weight of a person's body lurching against it. The top rail should withstand a 90 kg (200-lb.) load applied in any direction.

b. Handrails for stairs should be 760-860 mm (30-34 in.) high, and consist of three rails. Toeboards should be 6.35 mm (1/4 in.) above the floor. Railings around openings should be 1066 mm (42 in.) high.

c. The use of railings without a midrail should not be permitted.

8.6 Machine Guards

For machine guards:

a. Protective guards should not be removed during progress of work, and should be kept in repair.

b. Guards should be designed so that they do not interfere with the machine operation, and to give maximum protection to the operator.

9.0 PORTABLE HAND TOOLS

9.1 General Remarks

Shock is the chief hazard from electrically powered tools. Electric-flash burns, falls caused by a minor shock, and stumbling or tripping over the cord are other dangers.

9.2 Precautions to Take When Using Electrical Hand Tools

a. Keep tools in safe condition, cleaned, oiled and repaired.

b. Ground the tool when in use.

c. Use only approved and inspected extension cords.

d. Examine both the cord and connection carefully before use.

e. Because cords on the floor create a danger of stumbling or tripping, suspend them over aisles or work areas, where possible.

f. Avoid hanging an extension cord over nails or other sharp edges, allowing it to become kinked, or leaving it where a vehicle may run over it.

g. Protect the cord against contact with oil, hot surfaces and chemicals.

h. Never patch any serious injury to cord insulation with tape; shorten the line or get a new one.

i. Wear goggles or a face shield while using electric hand tools if there is any danger of flying particles.

j. In the presence of flammable vapours or gases, use pneumatic tools rather than electric ones.

k. Store extension cords in a clean, dry place where they can lie loosely coiled.

l. Never allow the flexible shaft of a portable power tool to form a loop, as this will make a knot, jerking the tool out of the operator's hand.

m. When using a portable grinder, always wear goggles and keep out of line with the wheel.

n. When using portable grinders or buffers on toxic material such as lead, zinc or brass, use adequate respiratory protection.

o. Do not wear loose clothing when using portable power tools.

p. Do not insert nails or other objects in the ventilating openings to hold the fan while tightening the chuck or performing any other operation.

q. Handle tools carefully to avoid dropping them.

r. Do not use the cord as a line to raise or lower a tool from one elevation to another.

s. The use of double-insulated power tools is another way to eliminate the shock hazard.

For more detailed information see BTP-FS-8, Electrical Safety in the Use of Power Tools.

10.0 PNEUMATIC TOOLS

The same danger of tripping or stumbling is presented by an air hose as by an electric cord. Persons or material accidentally striking the hose may unbalance the operator or cause the tool to fall from above. Lying on the ground, an air hose should be protected against vehicles and pedestrians by two boards laid on either side of it or by a runway built over it.

Accidents sometimes occur when the air hose becomes disconnected and whips about. Approved safety-type hose connections that do not readily come apart should always be used. A short chain attached to the hose and the tool housing is an extra precaution if the coupling should break. The hose should be kept away from oil and sharp objects that may weaken or cut it. The following points should be noted:

a. In operating portable air drills or reamers never wear loose, bulky or torn clothing.

b. Keep tools in good condition and be especially careful that bits are ground correctly, with uniform flutes and proper clearance.

c. In order to prevent the bit from sticking, avoid feeding the machine too fast.

d. Line up a drill straight with the hole; if tipped, the bit is almost certain to stick.

e. Have two persons operate larger tapping machines.

f. Install and maintain safety set-screws on all shaft collars.

g. Be particularly careful to see that all shaft collars are kept tight while tapping machines are in operation or when they are being carried to and from jobs.

h. Wear toe guards at all times when operating pneumatic tampers, paving breakers or similar equipment.

i. Wear eye protection when operating pavement breakers, chippers, buffers or grinders.

j. Never point a portable pneumatic tool at anyone.

k. Do not use compressed air to dust off clothing or any part of the body. Such a practice is dangerous, because the air may enter the tissues or a body opening and cause serious consequences.

l. Check all hose clamps routinely for tightness.

11.0 STOREROOMS

11.1 General Remarks

The safe and efficient operation of a storeroom, stockroom or other storage facility requires that the premises be maintained in a safe and orderly condition at all times. Every precaution must also be taken to prevent injuries to employees handling the stored materials.

11.2 Safety Rules

a. Keep all aisles and walkways clear. Passageways should be wide enough to permit the transportation of materials to and from storage.

b. Keep fire lanes clear to permit access by fire-extinguishing equipment.

c. Keep floors clear of all loose objects and free of water and oil.

d. To minimize fire hazards, do not permit waste-paper, scrap lumber or other waste material to accumulate.

12.0 WORKING IN MANHOLES

12.1 General Remarks

There is a danger of contaminated air in underground structures such as valve and meter manholes, and vaults. People have died in manholes that were contaminated by gas from a leaking gas main or methane from decaying organic matter.

12.2 Safety Precautions

Do not enter an underground structure without first making sure the air is safe. Follow these precautions:

a. To prevent foot and back injuries, use proper tools for opening the manhole or vault and handling the cover.

b. Protect the work area from traffic hazards. Barricades, signs, high warning devices and lights should conform to all local and provincial regulations so that they will provide adequate warning to traffic.

c. Before personnel are permitted to enter an underground chamber use approved equipment and methods to make sure there are no harmful or toxic gases. No manhole should be considered safe until it has been demonstrated to be free of harmful gases and to contain sufficient oxygen to sustain life (fresh air can be introduced mechanically). Oxygen deficiency may be determined

by a safety lamp. The flame is extinguished when the oxygen in the air is at or below 16.25 %. Normal air contains about 21 % oxygen. First effects of oxygen deficiency usually occur at a concentration of 15 %.

d. Adequate and efficient ventilation should be provided to ensure enough fresh air when there is someone in a vault or manhole. Where a blower is used for this purpose, the discharge end should be placed near the bottom of the manhole to force the air up and out.

e. Suitable measures should be taken to prevent surface water or debris from accidentally entering the vault or below-ground area while work is in progress.

f. Proper shoring and bracing should be used to prevent cave-ins while vaults or similar openings are under construction.

g. Tools should never be used or left in such a manner as to endanger the safety of personnel. Because falling tools are a distinct hazard, underground workers should always wear hard hats.

h. Mechanical lifting aids should be used to raise, lower or suspend heavy or bulky material to persons working in manholes or vaults.

i. A ladder should always be used for entering or leaving a manhole, vault or pit.

j. Smoking should not be permitted in or about a manhole unless it is definitely known to be free from flammable gas.

k. A helper should be stationed at the manhole entrance at all times.

l. The helper should be trained to apply artificial respiration. He/she should have immediate access to such rescue apparatus as respiratory equipment and a lifeline.

13.0 FIRE PROTECTION

13.1 General Remarks

A neat, well-ordered plant represents good safety policy. All crates, cartons, packing materials, papers and other debris should be disposed of promptly. Suitable containers should be conveniently available for discarded, soiled wiping cloths. The personnel on duty should be responsible for elimination of obvious fire hazards.

13.2 Safety Precautions

a. Extinguishers should be located conspicuously in hallways and near the doorways of workrooms. All employees should be instructed in the proper use of different types of extinguishers.

b. Portable fire extinguishers should be inspected periodically and maintained in accordance with local regulations.

c. Extinguishers should be recharged after every use.

d. The fire prevention service of the local fire department and/or fire insurance underwriters should be consulted for advice on:

(1) the choice of equipment and its use;

(2) the location, marking and lighting of exits;

(3) storage of flammable materials; and

(4) explosion proof lights. The fire department will usually cooperate fully in any fire prevention program.

e. The telephone numbers of the fire department and police department should be posted in a conspicuous location at every telephone, for quick reference in an emergency.

f. All employees should have first-aid instruction. This should, at the absolute minimum, include artificial respiration, treatment for shock, and the control of severe bleeding.

14.0 TRENCH CONSTRUCTION

14.1 Safety Precautions for Digging by Hand

a. Wear approved hard hats and safety boots when working in trenches.

b. Only use tools that are sharp and in good condition.

c. Keep a safe distance from other workers to avoid the danger of striking them with tools.

d. Do not jump into a trench, but sit on the shoulder and slide in if the trench is shallow. Use ladders where required.

e. When employees are required to be in trenches 1.2 m (4 ft.) deep or more, an adequate means of exit, such as ladders, must be provided no further than 7.6 m (25 ft.) from any point in the trench. The ladder should extend from the bottom of the trench

to at least 0.6 m (2 ft.) above the top. Before climbing out of a trench, look always for traffic.

f. Be careful to remove earth and other material in such a way that overhanging banks are avoided. If undercutting is necessary, adequate bracing should be provided. The public should be kept out of all braced areas.

g. Do not place excavated material closer than 600 mm (2 ft.) from the edge of a trench. Keep all tools, working material and loose objects orderly and away from the shoulder of the trench.

h. Keep tools, equipment and excavated material out of open traffic lanes. Pebbles and small stones should not be allowed to remain on hard-surface roadways where tires may pick them up and scatter them.

i. If possible, keep the spoil bank between workers and traffic.

j. Provide and maintain all necessary barriers, temporary bridges and walks, warning signs, flags, flares, lights, and , when necessary, watchers and flaggers for the protection of workers, vehicles and pedestrians.

k. Take all necessary measures to prevent accidents to personnel and damage to equipment (see 14.3).

l. Do not go under an overhanging bank; when working near one, be very cautious.

m. If it is necessary to remove an overhanging bank, work from one side toward the centre, always facing the point of danger.

n. If the walls of a trench contain glass, wire or other sharp objects, carefully remove them.

o. When resuming excavation after heavy rains or freezing weather, inspect all banks for cracks, which may indicate earth movement and the probability of cave-in.

p. Inspect the sides and rim of all open trenches frequently to guard against cave-in. Earth-moving equipment should be placed so that it does not imperil personnel or property by causing a cave-in due to vibration, stress or dead weight.

q. When making tunnels, be certain that the soil is either compact enough to prevent cave-in or is suitably braced.

r. If it is absolutely necessary to work on an overhanging bank, use a safety belt and a lifeline, with a helper nearby to assist in an emergency.

s. If caught in a landslide, jump or run up the bank, never down.

t. Exercise every precaution to avoid striking electric or telephone conduits, gas lines or other substructures, particularly when using a pick, sharpshooter or air gun. Make every effort to locate other utility installations before starting work.

u. Require workers to wear adequate eye and foot protection when using a jackhammer or when exposed to flying particles or falling objects. Protect passers-by and property with canvas screens around impact work.

v. Always face machinery such as clam shells, backhoes and trenching machines, and stay beyond one shovel length from the sweep of buckets or extended booms.

w. If tools have to be struck or sledged by another worker, hold them with tongs or a toolholder, and not by hand.

14.2 Trenching Machines

The following rules apply to all mechanical devices used to dig trenches and make excavations, including various types of trenchers, back-hoes, buckets and scoops. Operators should be qualified and should always wear hard hats.

a. Never attempt to oil or grease the mechanism or to repair or adjust any moving part of a trenching machine while it is in operation.

b. Guard all moving parts. Make sure, before starting the conveyor, that no person is endangered by it.

c. Always stop the machine before removing obstructions from the conveyor mechanism or buckets.

d. Watch out for materials that might roll off the conveyor.

e. When practicable, drop trench dirt between the trench and the highway to act as a barrier.

f. Use caution when filling gasoline tanks. Keep the spout in metallic contact with the machine to prevent static sparks from bridging the gap and igniting the fumes. Do not smoke.

g. Use flags by day and flashing lights or flares by night to warn the public of the presence of the trenching machine and its operations. These precautions are particularly important on highway and street work. The warning system should be planned before the work is started.

h. Operate the machine in a true vertical position to prevent undercutting the trench walls.

i. When loading or unloading trenching machines or other heavy equipment from truck beds, lowboys, or other conveyances, provide suitable skids and ample blocking to prevent the conveyance from moving.

14.3 Shoring

Proper trench shoring cannot be reduced to a standard formula. Each job is unique. Federal and provincial standards usually list specific recommendations for shoring of trenches, and bands undertaking projects requiring trenching should obtain copies of the Trench Safety Protection Act or similar acts in their respective province or territory. As a general precaution, no person should enter a trench deeper than 1:25 m (4 ft.) unless properly cutback or shored.

15.0 PIPE HANDLING

Successful, safe completion of work involving pipe handling rests on following a proved method. Do not take undue risks with the safety of the crew by trying unconfirmed short cuts, because the time saved is not worth the chance of a serious accident. Tested procedures for handling pipe are as follows:

a. Take the utmost care to see that members of each crew work together in moving pipe by hand. Accidents sometimes happen when one person starts to lift or lets go of the load before the others are ready.

b. Use a U-shaped carrying bar, carrying tongs or pipe sticks that are adequate for the pipe's size and weight: do not use makeshift tools. Pipe over 203 mm (8 in.) in diameter should be handled with mechanical aid.

c. Take a firm grip on the lifting bar or tongs; be sure the hold will not slip.

d. When lifting or lowering a weight, bend your knees, placing the load on the leg and thigh muscles, instead of on the abdominal and back muscles: keep your back fairly straight.

e. Lift and lower at a signal given by the person in charge, so that all members of a crew move together. Avoid sudden starts or stops.

f. Ensure that skids are of ample strength, and securely placed.

g. When unloading pipe from trucks or cars, lower individual pieces by snubs all the way down the skid.

h. Do not stand between the skids while pipe is being lowered.

i. Before snubbing operations are begun, inspect the ropes carefully for defects.

j. Wear gloves for all snubbing operations, as slipping rope may cause burns on bare hands.

k. Take every precaution to prevent the uncontrolled rolling of pipe, as a rolling pipe is dangerous. Use wood chocks when necessary.

l. When lifting or lowering pipe in a trench by hand, use two or more rope slings, looped under the pipe, and handle from each side of the trench. To prevent workers from being pulled into the trench by a heavy pipe, anchor one end of each rope sling to a massive object.

16.0 BLASTING OPERATIONS

Unless absolutely necessary, do not obtain, store or handle explosives. This activity (drilling and blasting operations) should be conducted only by experienced and competent contractors. The care, handling, storage and use of explosives is covered under the national Explosives Act and the RCMP must be notified of every purchase. Manufacturers will provide advice on request.

17.0 BARRICADES AND WARNING SIGNS

a. Warning signs, including instructions to drivers, should be placed well ahead of construction or repair areas.

b. Suitable barricades, traffic cones and other warning devices should be placed between the initial warning and the job site to safely divert pedestrians and vehicles.

c. The work area should be protected by barricades, barriers or planks to provide a safe working space. Flagmen/women to direct and slow down traffic may be essential in some areas. Where trucks or air compressors are used, they should be stationed between the work and the traffic.

d. During periods of reduced visibility, suitable and adequate lighting should be used in addition to other protective measures.

e. Adequate barriers, barricades, flashing lights and signs should warn and divert traffic during periods in which no work is in progress. Reflecting tape should be used on all barricades.

f. The construction and placement of warning devices should conform to local traffic requirements and regulations.

g. In winter, it may be necessary to stop traffic from using streets covered with ice because of a water-main break until a sanding or scarifying operation is complete and traffic can resume under safe driving conditions.

18.0 PUMPING STATIONS

18.1 General Remarks

Danger is always present where machinery, such as pumps and motors, operate and where high voltage electricity is used. Familiarity tends to breed carelessness and complacency. Constant attention and alertness is the best way to avoid injury.

18.2 Oiling

a. Stop machinery before cleaning, oiling, or adjusting it.

b. Lock the switchgear so that no one can start a machine being worked on.

c. Before starting a machine, be certain that personnel are clear of danger and that working parts are free to move without damage.

d. Follow the manufacturer's instructions.

18.3 Repairs and Solvents

a. Lock the controlling switchgear before beginning work, so that the machinery cannot be started by another person.

b. Before starting work, place substantial blocking under any equipment suspended or supported by jacks or a chain hoist.

c. Make sure the work area is properly ventilated.

d. Only use solvents with a flash point of 38° C (100°F) or higher. Petroleum solvents, such as Stoddard solvents and kerosene, have high flash points and are sufficiently effective for the cleaning operations involved in the maintenance of automotive equipment. They are also volatile enough to prevent hazardous concentrations in workrooms of ordinary size at the temperatures usually being reached.

e. Do not use solvents in confined places, such as tanks and pump pits, without good mechanical ventilation.

18.4 Guards

a. Guards should be adequately secured in place in order to shield, fence, rail, enclose or otherwise guard power transmission equipment, and machines and machine parts. (These procedures

will protect employees against exposure to, or accidental contact with, dangerous moving parts.)

b. The guard should be strong enough to provide real safety: guard structures should be constructed so that they cannot be pushed or bent against moving parts.

c. Guards should be removed and replaced for maintenance only when the machinery is not in operation.

18.5 Electric Switch Panels

a. Switchboards should be located and constructed in a manner that will reduce the fire hazard to a minimum.

b. Switchboards should be located where they will not be exposed to moisture or corrosive gases.

c. Adequate illumination should be provided for the front of all switchboards and for the back of those that have parts or equipment requiring adjustment, replacement or repair.

d. Clear working space of adequate size and secure footing should be provided and maintained around all switchboards and motor control equipment.

e. Special insulating mats should be placed on the floor at all switchboards.

f. Open switchboards should be accessible only to qualified and authorized personnel and should be properly guarded or screened.

g. All electric equipment, including switchboard frames, should be well grounded.

h. Permanent and conspicuous warning signs should be provided for panels carrying more than 600 V.

i. Areas screened off because of high voltage should be provided with locks that open from the inside without keys.

j. Lock switches should be open and properly tagged when equipment is being worked on.

k. Fully enclosed, shockproof panels should be used when possible: such equipment should be provided with interlocks so that it cannot be opened while the power is on.

19.0 ELEVATED TANKS

Only trained and experienced workers should be permitted to work on standpipes and elevated tanks, as this is a hazardous activity. It is seldom advisable to employ nonprofessionals for the necessary periodic inspections of tanks.

20.0 REFERENCES

American Water Works Association. 1982. "Safety Practice for Water Utilities" in Manual of Water Supply Practices - AWWA No. M3, Third Edition.

Ontario Water Resources Commission. Division of Plant Operations. 1971. Safety Regulations.

APPENDIX A

SAFETY AND COMMON SENSE RULES

The following rules are basic common sense:

1. Keep walkways clear of loose objects such as pails, shovels and loose rope.

2. Wipe up grease and oil spills immediately.

3. Salt or sand icy walks as soon as possible.

4. Pick up, clean and return all tools to their storage area.

5. When it is necessary to use tools in an empty tank or manhole, lower them in a pail on a rope and remove them the same way. Brooms and shovels can also be transported by rope. Do not attempt to climb up and down ladders with your hands full of tools.

6. Never overload yourself when using stairways; keep your load small enough to be able to see over it and have one hand free to use the hand rail.

7. Do not attempt to climb up or down a ladder or over a railing while handling a hose under pressure.

8. When washing down the floor of any tank, be sure you wear hip wader rubber boots with worn soles and heels.

9. When working in a narrow or confined passage where grit or sludge accumulates, wear the appropriate rubber clothing provided.

10. Always wear rubber or plastic-coated waterproof gloves when cleaning pumps, handling hoses, removing grit or sludge, loading sludge trucks, etc.

11. Always wear a hard hat when working below ground level (in tanks, manholes, etc. or under scaffolding.

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

13. Never enter confined spaces (manholes, closed tanks etc.) without ventilating them first. For example, manhole covers, both upstream and downstream, should be lifted to help ventilate the work area. In addition, an air supply blower that pushes air out of the manhole should also be used.

Appendix A (cont'd)

14. Manhole covers and trap doors to wells must be replaced, and closed after using or protected by guard rails if it is necessary to leave them open.

15. Use the proper tool when removing or replacing manhole covers. Do not attempt to move or close a manhole cover with your hands.

16. When working in manholes located in a street or road, signs with blinking amber lights and red flags must be posted at each approach to the area.

17. Always wear a safety belt with a short rope and a safety snap when leaning out through the railings over any tank (or cleaning out spray nozzles, etc.).

18. Never grease, oil or attempt to service any machinery while it is in operation. Pumps on automatic control must be locked out and the key carried by the operator during servicing.

19. Do not make any adjustment to operating machinery while alone. If it is necessary to run the unit to adjust it, a second person must be present and be beside the stop and go switch.

20. Do not enter any crawl space under flooring for any purpose until the area has been ventilated and a second person is present.

21. Do not service pumps and shafts in the dry wells of pumping stations, and in plants where the pumps and shafts are less than 1 m (3 feet) apart, without shutting off all pumps.

22. Do not, under any circumstances, attempt to grease or service pump shafting while standing on beams, piping, loose planks or guard rails, or by leaning out, over or through guard rails. If a ladder must be used, then a second person must be present to hold it steady.

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