

# BAND TECHNICAL PUBLICATIONS



SAFETY IN WASTEWATER SYSTEMS

AUGUST 1984

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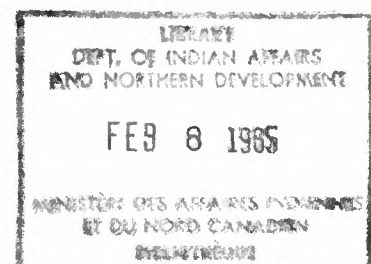


**Technical Services  
and Contracts**

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SAFETY IN WASTEWATER SYSTEMS

AUGUST 1984



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BTP MS-16

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SAFETY IN WASTEWATER SYSTEMS1.0 INTRODUCTION

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

Proper wastewater management is essential to preserve our environment and protect our health. A safety program is a basic must and should be an integral part of all stages in the development of wastewater systems. Expert help should be consulted and is available from the E&A regional offices and/or the Technical Services and Contracts Branch at DIAND headquarters.

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 between 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. frequent review of safety practices;
- d. adequate and competent supervision; and
- e. planning the job through to completion.

## 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 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 co-ordinate and co-operate;
- 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, telegraph 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 another employee 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. The equipment required at each facility is dictated by the hazards that may be encountered.

### 4.0 PREVENTION OF INJURIES AND ILLNESS

#### 4.1 General Remarks

Wastewater treatment systems pose special hazards such as chemicals, bacteria and noxious gases. 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 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 wastewater works. 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 Sanitation

By the very nature of their work, wastewater facilities workers suffer a maximum exposure to polluted water.

The best defences against infection and illness are good personal hygiene and prompt medical attention for any injury that breaks the skin. This will do much to safeguard employees but they should also be inoculated against certain diseases such as typhoid and para-typhoid fever, tetanus and polio. Booster shots should be given at scheduled intervals. Workers should keep their fingers away from the nose, mouth and eyes.

#### 4.6 Electrical and Power Generating Equipment

Most wastewater 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.

All electrically operated tools should either be double insulated or provided with third-wire ground for use with a properly grounded three-wire receptacle. Make periodic checks to ensure that no electrical leakage exists in the tool or cord. The use of ground fault interrupter equipment is sometimes recommended (see BTP-FS-8 "Electrical Safety in the Use of Portable Power Tools").

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.

#### 4.7 Handling of Electrical Circuits

When handling electrical circuits, take the following precautions:

- a. Consider all electrical circuits to be dangerous.
- b. Shut off the power when examining or making repairs or alterations to light and power circuits. When this is impractical, you must contact your supervisor for further instructions before you proceed with the work.
- c. Treat dead circuits as though they were alive. This prevents accidents if the circuit has become closed by mistake.
- d. Before examining, repairing or working on circuits, lock or block open the control devices, open the disconnect switches or remove the fuses. After these precautions have been taken, attach tie-up tags which say "Workers are Working on Line"; the tag shall bear the name of the worker.

## 5.0 SAFETY IN OPERATIONS

### 5.1 General Remarks

Before the plant pre-start checkout operation stage is reached, it is most important that the plant operation be thoroughly understood by management and the operators. The operators should be trained, preferably before the start of operations, in every detail of their operation. 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.

### 5.2 Safety Work Rules and Procedures

Safety work rules:

- a. should be formulated with the cooperation and participation of supervision and management;
- b. must be easily understood and realistic;
- c. must be logical and stress the individual's responsibility; and
- d. must be enforceable.

The last item is extremely important in that people will disregard rules that are not enforced. The rules should be explicit on this point, stressing that "Each employee shall comply with all rules, regulations, and orders . . . . which are applicable to his/her own action and conduct."

### 5.3 Safety Practices In and Around The Plant

#### 5.3.1 No Smoking Areas

Smoking should not be permitted in the following:

- a. influent areas;
- b. wet and dry wells of pumping stations;

- c. pump rooms containing raw sludge pumps;
- d. rooms where chlorine is stored or used;
- e. digesters and digester buildings;
- f. sewers and manholes; and
- g. covered sludge holding tanks or septic tanks.

#### 5.3.2 Unsafe Conditions

The following create unsafe conditions:

- a. improperly guarded equipment;
- b. faulty design and installation of equipment or structures;
- c. failure of machinery and equipment, or lack of essential materials;
- d. lack of safety devices on machinery, and poor housekeeping;
- e. inefficient illumination;
- f. hazardous dusts, gases, fumes and mists; and
- g. physical defects of employees, such as poor eyesight or hearing.

#### 5.3.3 Common Sense Rules

The following rules are basic common sense:

- a. Keep walkways clear of loose objects such as pails, shovels and loose rope.
- b. Wipe up grease and oil spills immediately.
- c. Salt or sand icy walks as soon as possible.
- d. Pick up, clean and return all tools to their storage area.
- e. When it is necessary to use tools in an empty tank or manhole etc., 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.



- f. Don't 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.
- g. Do not attempt to climb up or down a ladder or over a railing while handling a hose under pressure.
- h. When washing down the floor of any tank, be sure you wear hip wader rubber boots with good treaded soles, do not wear rubber boots with worn soles and heels.
- i. When working in a narrow or confined passage where grit or sludge accumulates, wear the appropriate rubber clothing provided.
- j. Always wear rubber or plastic-coated waterproof gloves when cleaning pumps, handling hoses, removing grit or sludge or loading sludge trucks, etc.
- k. Always wear a hard hat when working below ground level (in tanks, manholes, etc.) or under scaffolding.
- l. Do not hang clothes on electrical disconnect handles, light switches or control panel knobs.
- m. Don't 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.
- n. 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.
- o. Use the proper tool when removing or replacing manhole covers. Do not attempt to move or close a manhole cover with your hands.
- p. 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.
- q. 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.).

#### 5.3.4 Do Not . . .

Things you should not do:

- a. Do not 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.
- b. 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.
- c. Do not enter any crawl space under flooring for any purpose until the area has been ventilated and a second person is present.
- d. 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.
- e. 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.

#### 5.3.5 Pumping Stations

The items required for a pumping station are as follows:

- a. a fire extinguisher;
- b. signs: "START VENT BEFORE ENTERING"  
"DANGER PUMPS ON AUTOMATIC TIMER"  
"NO SMOKING",  
"DANGER DO NOT START"; and
- c. switch lockouts for comminutor control etc.

### 5.3.6 Dry Well

When operating a dry well:

- a. start the vent fan before entering the pumping station and leave it operating continuously while you are in the station;
- b. post "NO SMOKING" signs at the pump floor level; and
- c. put a switch lock-out on the control panel when someone is working on any pump at any floor level.

### 5.3.7 Wet Well

When operating a wet well:

- a. Start the vent fan, if available, before the operator enters and keep it in constant operation while she/he is in the area.
- b. Use only waterproof and explosion proof extension cord lights.
- c. Do not enter a wet well if there are strong odours present. If strong odours are present, a portable air blower can be used to pump in fresh air.
- d. Wear safety harness and rope when cleaning the wet well or servicing pump controls.
- e. Entry into any wet well, sewer, or underground room having no mechanical ventilation system must be done in accordance with your provincial industrial safety act.
- f. If a comminuting device located in the wet well requires servicing, the electrical disconnect shall be locked out and the key carried in the operator's pocket.
- g. When maintenance work or cleanout is required in the wet well of a pumping station in the care of one operator, she/he must enlist the aid of another person, to stand by for emergencies while she/he is in the wet well.

### 5.3.8 Manholes - Sewers

Numerous hazards are associated with sewers, the most dangerous being a buildup of toxic, explosive, or flammable gas, oxygen deficiency, or cave-ins. Other hazards are infections and physical injuries.

When a manhole is to be opened, a manhole hook should be used instead of a pick or pry bar. Also, there should be strict observance of the rule "lift with your legs instead of your back." The cover should be placed flat on the ground away from the opening. Manhole rungs should be used with extreme caution, because rungs that are not made of corrosion-resistant material may fail under a person's weight and, unless proven safe, should not be depended on.

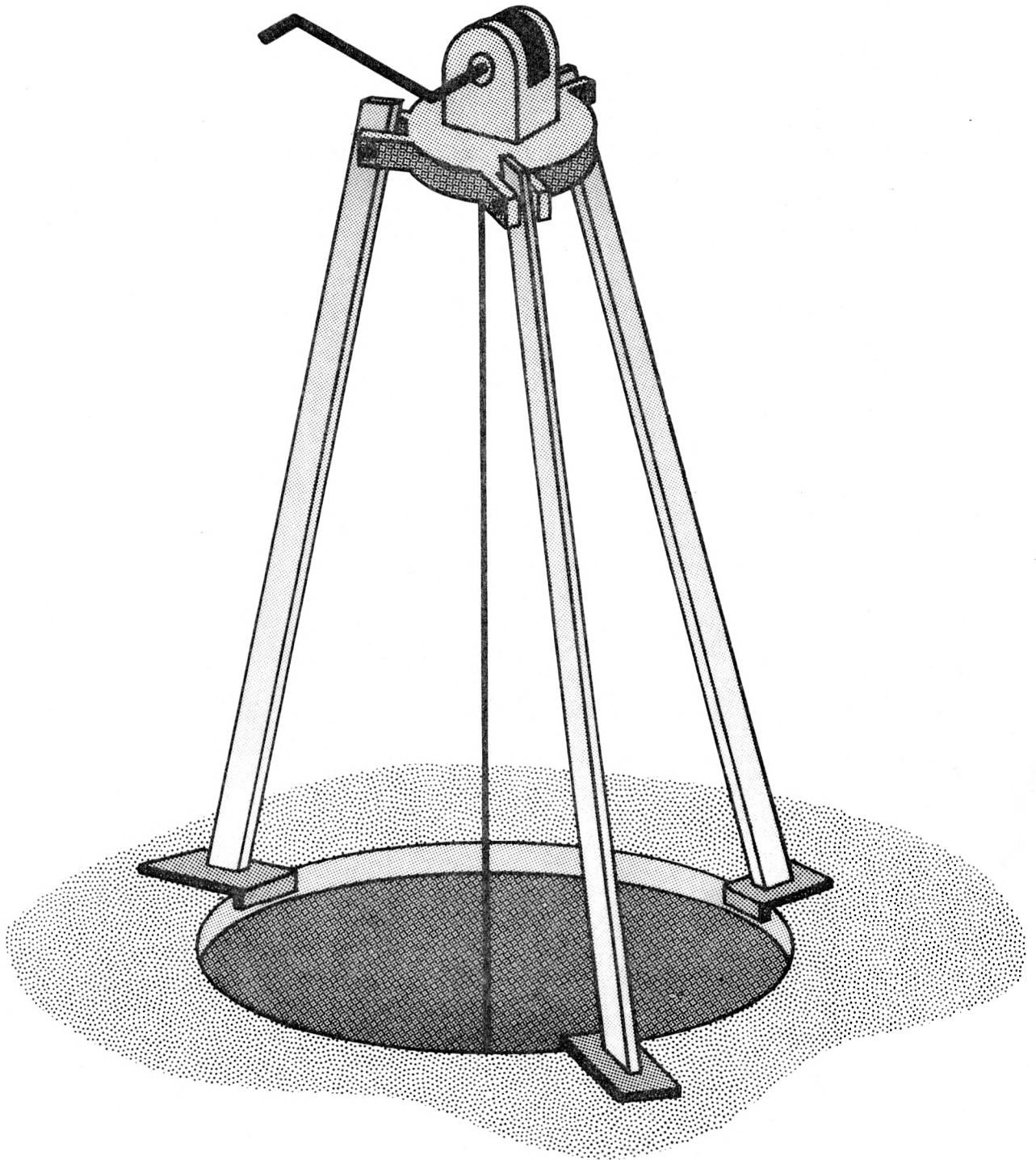
Before entering a manhole the work crew should be provided with adequate equipment including:

- a. the proper tool for removing and replacing manhole covers;
- b. a tripod-type lifting equipment with parachute-type harness readily available in case ladders are corroded or fail (see Figure 1);
- c. harness and individual life lines for each person going underground and for the standby crew above ground;
- d. protective clothing, including rubber boots, gloves, rain gear, hard hats and face shields or goggles;
- e. barricades, traffic cones and warning signs; and
- f. miscellaneous tools, including shovels, pike poles, chain jacks, pry bars and manhole hooks.



Figure 1

Manhole Tripod



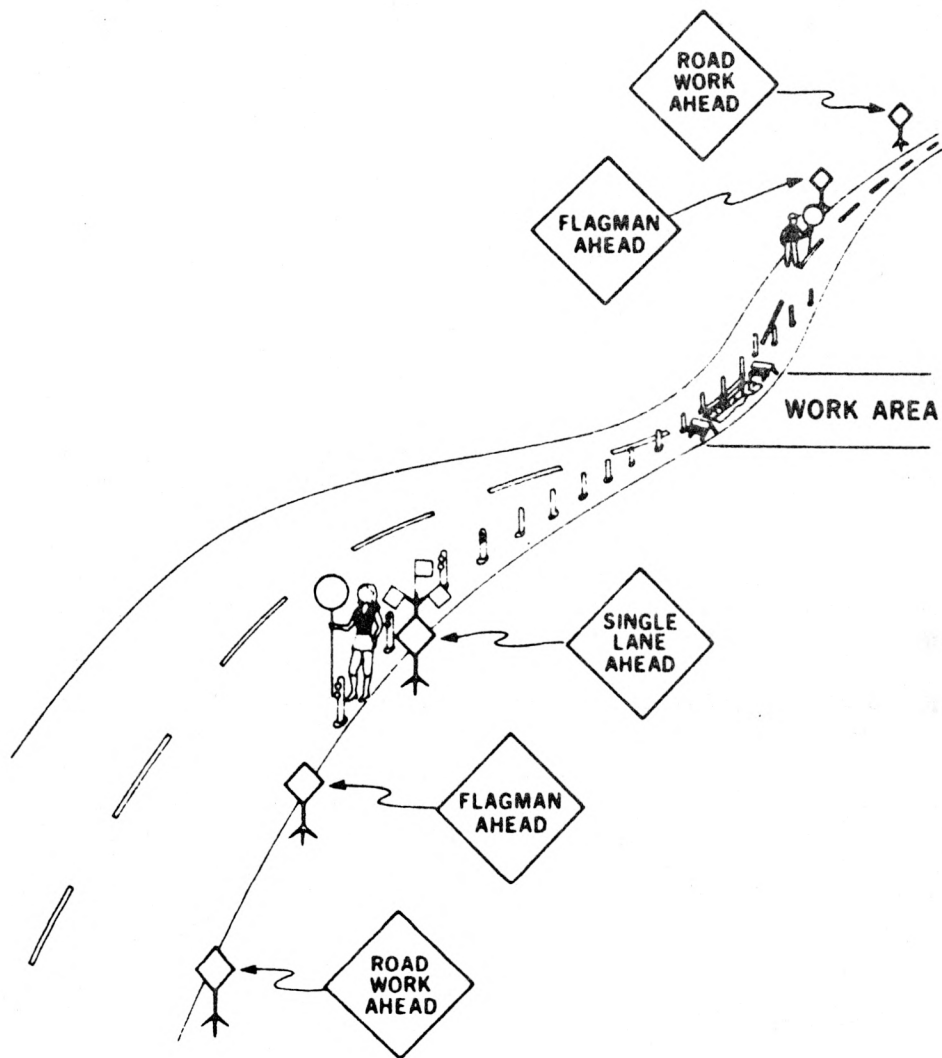
## 6.0 TRAFFIC HAZARDS

Much of the work in a wastewater collection system is done in areas where there is vehicular traffic. Traffic must be warned of the presence of maintenance crews by signs (see Figure 2).

Warning signs and/or flagmen/women must be located far enough ahead of the work area to allow motorists time to slow down, be alert for activity, and safely change lanes or follow a detour. Exact distances and the nature of advance warning depend on traffic speed, congestion, roadway conditions and local regulations.

If it is practical, park vehicles between oncoming traffic and the job site to serve as a warning barricade and to further protect workers.

Figure 2



## 7.0 GAS HAZARDS

Gas hazards are a very special concern for the collection system worker. Many gases are heavier than air and tend to be produced or released from deposits and slimes found at low levels or in underground structures where collection system workers must perform part of their work. These confined areas are often poorly ventilated, increasing the danger as they will tend to collect hazardous gases.

The main dangers are from poisonous gases, explosive gases and oxygen deficient atmospheres.

There are a number of poisonous gases found in the wastewater collection system. Hydrogen sulphide is the most dangerous. It is also the one that a worker is most likely to encounter because it results from the decomposition of organic matter. Hydrogen sulphide smells like rotten eggs and it tends to concentrate near the bottom of enclosed spaces. Even short exposure to this gas can kill, furthermore, it will knock out the sense of smell. If you smell it at first, and then can no longer detect any, get out of the area quickly. Meters are available for detecting the presence of hydrogen sulphide (see Figure 3).

Other poisonous gases sometimes found in the collection system include carbon monoxide, ammonia, and gases from industrial, highway or railway accidents and spills.

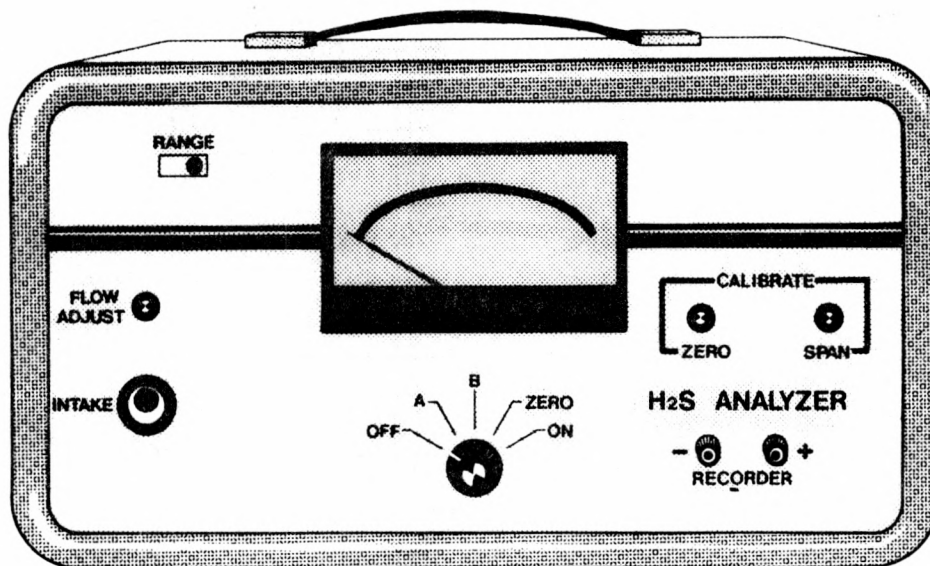
Plant operators have to be wary of poisonous and explosive atmospheres in the collection system and must be careful not to enter any area where there might not be enough oxygen. Even a relatively small shortage of oxygen will make a person less alert and more likely to have an accident. Before entering any enclosed space, the amount of oxygen in the air should be measured. Relatively inexpensive oxygen monitors are now on the market (see Figure 4). If less than 19.5% oxygen the confined space should not be entered. It is always a good idea to wear an air pack. A blower (see Figure 5) should be used to provide fresh air from below the actual working area.

Note, too, that a high oxygen level won't harm you, but it does increase the hazards of explosion and fire.



Any enclosed area, and especially manholes, should be tested for dangerous gases before they are entered. Before you enter any confined space, be sure that it is being ventilated properly, and that all safety procedures are being followed. There is test equipment available that will test the explosive level, and the oxygen level, and sound an alarm when the test results indicate dangerous conditions. Be sure test equipment is checked frequently to be sure that it is working properly.

Figure 3



#### FEATURES

- Reliability
- Monitor continuously
- Highly selective
- Low level measuring capability
- Accurate to + 1% F.S.
- Stable readings with a minimum of calibration
- Easy to operate and calibrate
- Easy to maintain
- All solid state plug-in circuitry
- Rapid Rise Time — within 25 seconds
- Recorder output for permanent records

#### A truly portable monitor.

This portable detector is lightweight — under 10 pounds. It operates on built-in rechargeable N/Cd batteries or AC current, and can be hand-carried anywhere for reliable spot checking or to continuously measure wherever  $H_2S$  is a potential hazard.

#### A rugged, high-sensitivity sensor in every monitor.

The sensor utilizes a patented three-electrode electro-chemical oxidation principle, potentiostatically controlled to maintain a constant voltage between electrodes. A sample of gas is continuously drawn over a catalytically active electrode where the toxic gas is either oxidized or reduced. The signal is amplified electronically and linearly displayed on the meter in ppm.

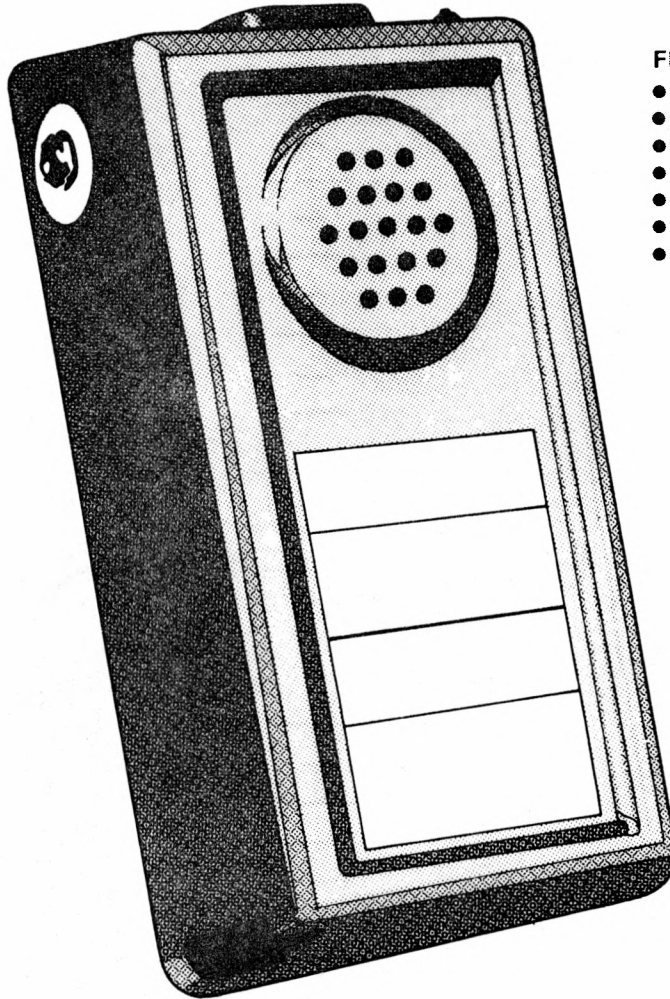
#### Highly accurate, economical

The linearity, reproducibility and accuracy of this unit circumvents the need for larger, more-complicated, expensive gas analyzers.

#### Alarm option.

The Detector can be equipped with an optional audible alarm that activates whenever toxic gas levels exceed pre-set limits. They respond almost instantly, reaching 90% of signal within 30 seconds of exposure to  $H_2S$ .

Figure 4

**FEATURES:**

- High pitch audible alarm indicates an oxygen deficiency
- Varying pitch audible alarm indicates combustible gas.
- Flashing LED indicates oxygen deficiency.
- Continuous 8-hour operation.
- Rechargeable battery.
- Belt worn.
- Earphone.

**DESCRIPTION:**

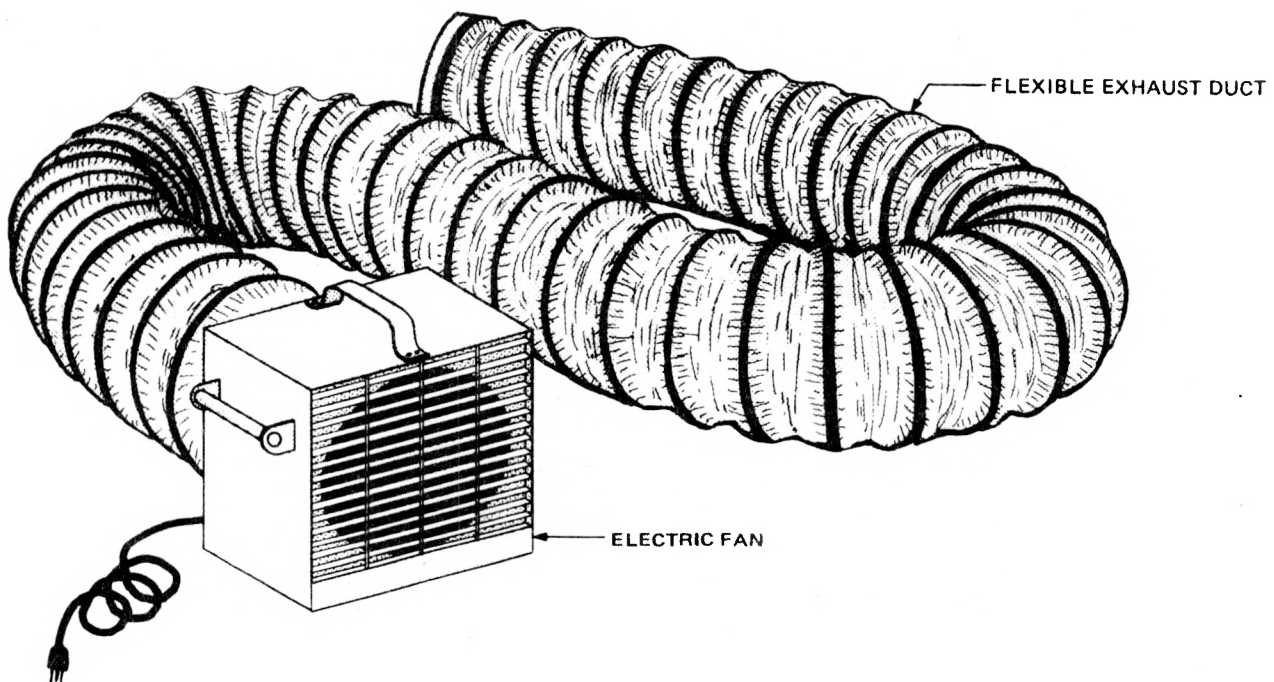
This detector is an oxygen deficiency and combustible gas personal monitor. It is belt worn and operates continuously for eight (8) hours providing personal protection. This intrinsically safe and nonincendive instrument is designed to provide the wearer a personal indication of a hazardous condition. This pulsating LED and high-pitched alarm indicates the oxygen level is below 19.5%. A varying pitch audible alarm is produced when the combustible gas level rises over 20% LEL. The pitch increases as the concentration increases. There is also a low battery alarm.

**APPLICATION:**

Confined space entry, tank cleaning, manhole entry

Figure 5

## Portable Ventilation Equipment





## 8.0 INFECTION AND INFECTIOUS DISEASES

### 8.1 Personal Hygiene

As you know, wastewater is just that ... WASTEwater. It contains all of the waste of a community, including domestic sewage, and everything that goes down the toilet. Obviously, you are not likely to drink this material; however, there are other ways in which it can be taken into the body, resulting in sickness or infection. Your personal health depends to a great extent upon your personal cleanliness.

### 8.2 Don't Let the Bugs Bite!

As you are aware, micro-organisms naturally present in wastewater play a major role in the wastewater treatment process. Many of these micro-organisms can cause infection and disease. Obviously, you can make contact with these disease causing bacteria during any of your many daily work routines. From the time wastewater enters the sewer until it is fully treated, it is a source of infection. If you do not follow some basic rules of personal protection, you are in danger of catching some nasty diseases such as typhoid, hepatitis, dysentery, roundworm, tuberculosis and poliomyelitis.

### 8.3 It's Your Health

How can you protect yourself? By making use of all the various protective devices and safety procedures that your work requires. REMEMBER, it is for your health and the health of your family that this list of do's and don'ts for personal hygienic habits is given here.

## 9.0 PERSONAL PROTECTION RULES

1. Wear work gloves when cleaning or disposing of any wastewater debris, or when handling rough or sharp pieces of material or equipment. Gloves will protect hands from the nicks, cuts, scrapes, and scratches that invite infection.

Remember, a small cut can cause a major disability if infection sets in.

2. Wear gloves when in direct contact with wastewater, such as when repairing sewer pipe, handling anything that has been in the wastewater, or when cleaning or repairing plant equipment that could be contaminated. Do not put the gloves on when your hands are dirty. Wash first.
3. Wash thoroughly after touching any contaminated objects. Bring a tin of waterless soap and a roll of paper towel with you when working on the collection system. Use it until you can wash properly with hot water and soap.
4. Wash with plenty of water or take a shower immediately after being splashed with wastewater, sludge, or any chemical. Don't delay!
5. Wash your hands thoroughly, they should be free from any harmful bacteria before you eat, smoke, or put anything in your mouth. Do not smoke while working on any wastewater equipment as you inhale or ingest the filth that collects on the cigarette from your dirty hands. If you really have to smoke, save it for lunch hours. After working around wastewater, hands should be washed with soap and hot water before you eat. A stiff brush should be used if necessary.
6. A good policy is never to put your hands above your collar when working on any wastewater equipment.
7. Any open sore, cut, or other break in the skin is particularly dangerous as it provides direct access for bacteria into the body. When suffering such an injury, disinfect the wound immediately. After first aid is applied, the wound should be checked by medical personnel. Covering the wound with a bandage and changing the bandage often are necessities. Taking chances with infection doesn't pay!
8. Always wear steel toed rubber boots when working in manholes, around sludge, in tanks, while washing down, etc. Don't wear your street shoes.
9. Keep your street clothes, that is those you wear to and from work, separate from your working clothes in separate lockers. Never wear your coveralls or rubber boots in your car or home and always completely change your clothes before leaving the plant. Never allow harmful dirt on your work clothes to contaminate the clothes of your family. Always wash your work clothes separately.

10. Keep your street shoes in your locker; remember that what your shoes pick up at the plant will be left on the floor of your home.
11. Keep your fingernails short and clean. They're excellent carrying places for dirt and bacteria.
12. Always clean equipment such as safety belts, harnesses, face masks, gloves, etc. immediately after use, so that they will be clean for the next person to use, probably you!
13. A proper storage space, free from contamination, should be provided for all protective devices such as air packs, dust masks, harnesses, etc. Separate lockers should be provided for street clothes and work clothes.
14. Make sure that you have updated your typhoid and tetanus shots according to the schedule set out by the local District Medical Health Officer.
15. If you experience headaches, feel sick to your stomach, have diarrhoea, or feel feverish or sleepy, see your doctor. Prompt action can save you a lot of pain and trouble in the future and also help protect your family, friends and your fellow workers. Remember, it may not be just a flu, you may have contacted some infectious disease.

#### 10.0 IMMUNIZATION

Public health officials generally agree that tetanus, polio and typhoid infections are the major dangers in wastewater. Typhoid was once considered the most dangerous water borne infection; however, recent medical discoveries make it more easily curable and tetanus is now considered the most dangerous. Tetanus is easy to prevent, but difficult to treat. Immunization against typhoid is only about 60% effective. While polio immunization is effective and simple to administer, it is still a very dangerous disease. All three diseases should be included in an operator's immunization schedule with booster shots at recommended intervals.

#### 11.0 REFERENCES

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



Snider Consultants. 1981. Safety Practices and Operator Protection Section-D, Operations and Maintenance Manual for Eel Ground Indian Reserve.

Water Pollution Control Federation. 1975. Manual of Practice  
No. 1 - Safety in Wastewater Works.

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LOWE-MARTIN No. 1137

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