



**LESOTHO ELECTRICITY AND WATER  
AUTHORITY**

**WATER AND SEWAGE TREATMENT FACILITIES  
SAFETY STANDARDS**

**01 MAY 2013**

# Water and Sewage Treatment Facilities Safety Standards

## I. SCOPE:

The standards apply to the operation and maintenance of all water and sewage treatment facilities operated by a licensee. The implementation of the standards shall be subject to labour and environment legislation.

The objectives of the safety standards are to avert accidents on water and sewage treatment plants, to mitigate health risks to workers and to ensure the protection of the environment.

It is the duty of the licensee to ensure that the installations on its water and sewage treatment plants and the operation of the plants comply with the standards listed hereafter. However, health and safety issues will not be regulated by the Authority, but will be monitored in order to ensure the compliance with the standards.

## II. SAFETY STANDARDS:

The water and sewage treatment industry has five major safety concerns:

1. Facilities and Equipment;
2. Operation;
3. Confined space;
4. Personnel Protective Equipment (PPE); and
5. Trench Excavation

All safety concerns cover very specific issues and all are equally important.

### 1. Facilities and Equipment:

These are safety standards to be complied with by the Licensee at its water and sewage treatment plants with regard to protection of the premises, safe access to the civil structures and use of safety apparatus.

- 1.1 Plants and all related installations shall be enclosed by fences and locked gates. Access to the plants shall be limited to authorised personnel only.
- 1.2 All installations and buildings shall be easily accessible. The premises and the access to major facilities shall be lit during the night.
- 1.3 Stepladders and step irons in manholes or buildings shall be installed in a correct way that shall allow their safe use. The distance between the step irons and the wall shall be more than 150 mm.

- 1.4 In ramp manholes with a height of more than 5m, a safety device for protecting employees from falling inside shall be provided. A platform shall be installed at intervals of 2.5 m onstepladders or step irons. In order to ensure safe entry into ramp or backdrop manholes with a height of more than 5 m, a railing with a height of at least 1 m shall be installed above the entrance level of the manhole.
- 1.5 The access to a manhole shall have a clear width of at least 60 cm.
- 1.6 Gas masks shall be used when entering manholes to avoid inhaling unpleasant and dangerous gases.
- 1.7 At ponds, tanks and channels where there is a risk of fall of over 1 m, a railing of 1.0 m height shall be installed.
- 1.8 Tanks in which employees can drown (over 1.35 m deep) shall be equipped with stepladder or step iron exits. In bigger tanks, several exits shall be installed in such a way that the distance between any point in the tank and the nearest exit does not exceed 15 m.
- 1.9 Dry wells and pump pits shall be ventilated. Pump pits shall have an outer access and shall be separated from other rooms of a pumping station.
- 1.10 Emergency cut-out of electromechanical installations shall be installed near these installations.
- 1.11 A sufficient number of washing facilities shall be installed. Cleaning facilities for shoes and polluted clothes shall be placed at entrances to operational buildings.
- 1.12 Workers shall keep their private clothes separately from their working clothes.

## **2 Operations:**

These are safety standards to be complied with by the Licensee at its water and sewage treatment plants pertaining to awareness and knowledge of a safe environment for carrying out work in or on equipment at the plants.

- 2.1 The Licensee shall publish the operation and safety notices in such a way that they are visible and readable to its employees. The operations and safety guidelines shall be written in all official languages.
- 2.2 The Licensee shall provide disinfection material to its employees.
- 2.3 When working in tanks or other facilities where there is a danger of drowning, employees shall wear floatation device and be roped up.

- 2.4 Works in pipes shall only be undertaken when the inner diameter of the pipe is larger than 1.0 m.
- 2.5 The Licensee shall prepare an emergency plan and shall provide first aid facilities.
- 2.6 When works in the area of rotating machines have to be carried out, the licensee shall ensure that a lockout/tagout procedure is implemented. Rotating machines shall be properly shut off and shall not be started up again prior to completion of maintenance or servicing work. The licensee shall ensure that hazardous power sources are "isolated and rendered inoperative" before any repair procedure is started. The device or the power source shall be locked and a tag shall be affixed to the locked device indicating that it should not be turned on.

### **3 Confined Space:**

These are safety standards to be complied with by the Licensee at its water and sewage treatment plants when working within restricted and cramped areas.

#### **3.1 Definition:**

A confined space is defined as an area that:

- Is large enough and so configured that an employee can bodily enter and perform assigned work.
- Has limited or restricted entry or exit.
- Is not designed for continuous employee occupancy.

A Permit-Required confined space is defined as a confined space that has one or more of the following characteristics:

- Contains or has a potential to contain a hazardous atmosphere.
- Contains a material that has the potential for engulfing an entrant.
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section.

Depending on individual sites, the following locations have the potential to be considered confined spaces in a sewage treatment plant:

- Aeration Basins
- Digesters
- Applicator Machines
- Primary Tanks
- Facultative and maturation ponds
- Manholes
- Vaulted Sampling Pits

3.2 General requirements:

- 3.2.1 The Licensee shall evaluate the workplace to determine if any spaces are permit-required confined spaces. If the workplace contains permit-required spaces, the licensee shall inform exposed employees, by posting danger signs or by any other equally effective means, of the existence and location of and the danger posed by the permit-required spaces.
- 3.2.2 A sign of one or a combination of the following as the circumstances may require: DANGER, PERMIT-REQUIRED, CONFINED SPACE, DO NOT ENTER or using other similar language would satisfy the requirement for a sign.

If the licensee decides that its employees will not enter permit-required spaces, the licensee shall take effective measures to prevent its employees from entering the permit-required spaces.

- 3.2.3 If the licensee decides that its employees will enter permit-required spaces, the licensee shall develop and implement a written permit-required space program. In this case the licensee can demonstrate that the only hazard posed by the permit-required space is an actual or potential hazardous atmosphere or that continuous forced air ventilation alone is sufficient to maintain that permit-required space safe for entry.

When there are changes in the use or configuration of a non-permit confined space that might increase the hazards to entrants, the licensee shall re-evaluate that space and, if necessary, reclassify it as a permit-required confined space.

- 3.2.4 A space classified by the licensee as a permit-required confined space may be reclassified as a non-permit confined space under the following procedures:  
If the permit-required space poses no actual or potential atmospheric hazards and if all hazards within the space are eliminated without entry into the space, the permit-required space may be reclassified as a non-permit confined space for as long as the non-atmospheric hazards remain eliminated.

3.3 Requirements for entering a permit-required confined space:

- 3.3.1 The Licensee shall provide the following equipment to employees, maintain and ensure that employees use that equipment properly:

- Testing and monitoring equipment;
- Ventilating equipment needed to obtain acceptable entry conditions;
- Communications equipment;
- Personal protective equipment insofar as feasible engineering and work practice controls do not adequately protect employees;
- Lighting equipment needed to enable employees to see well enough to work safely and to exit the space quickly in an emergency;

- Equipment, such as ladders, needed for safe ingress and egress by authorized entrants;
  - Rescue and emergency equipment except to the extent that the equipment is provided by rescue services; and
  - Any other equipment necessary for safe entry into and rescue from permit-required spaces.
- 3.3.2 Before entering, the licensee shall verify that the space is safe for entry and that the pre-entry measures of this section have been taken, through a written certification that contains the date, the location of the space, and the signature of the person providing the certification. The certification shall be made before entry and shall be made available to each employee entering the space or to that employee's authorized representative.
- 3.3.3 When entrance covers are removed, the opening shall be promptly guarded by a railing, temporary cover, or other temporary barrier that will prevent an accidental fall through the opening and that will protect each employee working in the space from foreign objects entering the space.
- 3.3.4 Before an employee enters the space, the internal atmosphere shall be tested, with a calibrated direct-reading instrument, for oxygen content, for flammable gases and vapors, and for potential toxic air contaminants, in that order. An employee, who enters the space, or any authorized person, shall be provided with an opportunity to observe the pre-entry testing.
- 3.3.5 When testing for atmospheric hazards, test first for oxygen, then for combustible gases and vapours, and then for toxic gases and vapours.
- 3.3.6 The forced air ventilation shall be so directed as to ventilate the immediate areas where an employee is or will be present within the space and shall continue until all employees have left the space. The air supply for the forced air ventilation shall be from a clean source and may not increase the hazards in the space.
- 3.3.7 The atmosphere within the space shall be periodically tested as necessary to ensure that the continuous forced air ventilation is preventing the accumulation of a hazardous atmosphere. If a hazardous atmosphere is detected during entry, each employee shall leave the space immediately and the space shall be evaluated to determine how the hazardous atmosphere developed. Measures shall be implemented to protect employees from the hazardous atmosphere before any subsequent entry takes place.
- 3.3.8 The Licensee shall provide at least one attendant outside the permit-required space into which entry is authorized for the duration of entry operations;

### 3.4 Task assignment, Rescue service and Training:

- 3.4.1 The Licensee shall designate persons who are to have active roles (as, for example, authorised entrants, attendants, entry supervisors, or persons who test or monitor the atmosphere in a permit-required space) in entry operations, identify the duties of each such employee, and provide each such employee with a training program.
- 3.4.2 The Licensee shall develop and implement procedures for summoning rescue and emergency services, for rescuing entrants from permit-required spaces, for providing necessary emergency services to rescued employees, and for preventing unauthorized personnel from attempting a rescue;
- 3.4.3 The Licensee shall provide training so that all employees whose work is regulated by this section acquire the understanding, knowledge, and skills necessary for the safe performance of the duties assigned under this section. The Licensee shall ensure that all authorized entrants:
- Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure;
  - Properly use equipment; and
  - Communicate with the attendant as necessary to enable the attendant to monitor entrant status and to enable the attendant to alert entrants of the need to evacuate the space.

## **4 Personnel Protective Equipment:**

These are safety standards to be complied with by the Licensee at its water and sewage treatment plants regarding the use of Personnel Protective Equipment (PPE)

### 4.1 Eye, Face and Ear Protection

Each employee shall wear protective safety glasses or goggles where there is a potential for injury to the eyes. Face shields are required where machines or operations present the hazard of flying objects, glare, liquids, injurious radiation, or a combination of these hazards. Each employee shall wear ear plugs when working in areas where there is a high level of noise.

### 4.2 Head Protection

Each employee shall wear protective helmets when working in areas where there is a potential for injury to the head from falling objects. The standard also covers conditions where electrical hazards are present.

#### 4.3 Foot Protection

Each employee shall wear protective footwear when working in areas where there is danger of foot injuries due to falling or rolling objects, or objects piercing the sole, and where such employees' feet are exposed to electrical hazards. Water resistant boots must be worn when working in wet areas.

#### 4.4 Hand Protection

Each employee shall wear appropriate hand protection for exposure to hazards such as those from skin absorption of harmful substances, severe cuts or lacerations, severe abrasions, punctures, chemical burns, thermal burns and temperature extremes. When choosing the proper glove, it is necessary to match material with each application or task. This includes assessing the job for chemical exposures and then selecting the appropriate glove based on material, thickness, length and other traits.

#### 4.5 Clothing

Each employee shall wear protective clothing where there is a potential for danger from hazardous chemicals and gases. Chemical resistance and suitable design need to be considered when selecting appropriate chemical protective clothing. Chemical resistance data is frequently published and available from many manufacturers and distributors. Unpublished data may also be requested from the manufacturer. Suit design deals with how the garment is assembled, designed and how it fits. Suits may also be selected of durable or disposable materials, depending on the chemical and its permeation and breakthrough data.

### **5 Trench Excavation:**

These are safety standards to be complied with by the Licensee at its water and sewage treatment plants when excavating trenches for water supply and sewer pipes. Laying of new or maintenance of old pipes shall respect the following Standards.

5.1 Trenches with a depth of more than 1.25 m have to be protected.

5.2 Trench excavations for pipes shall be open-cut trenches with minimum width according to the table below.



**WIDTH OF PIPE TRENCH**

Nominal Pipe Diameter (I.D. mm)	Overall Width of Trench (mm)	
	Pipes with sockets or collars	Plain ended pipes
100, 150, 200, 225	600	600
250, 300	900	800
375	1000	900
450	1100	1000
525	1200	1100
600	1300	1100
675	1400	1350
750	1500	1450
825	1600	1550
900	1700	1650
1050	2200	1800
1200	2400	1950
1350	2500	2200
1500	2700	2400
1650	2900	2600
1800	3000	2800
Greater than 1800	As per project specification	As per project specification

- 5.3 The access to a trench with a depth of more than 1.25 m has to be ensured by a ladder.
- 5.4 A security margin of at least 60 cm shall be arranged without any obstacle or excavation material on both sides of the top of the trench.
- 5.5 The walls of a trench shall be executed vertically or with an embankment and in such matter to avoid any harm to the workers. In particular, erosion of the wall has to be avoided. Unfinished trenches shall be marked with danger tape to prevent danger to the public.