**Occupational safety and health— sewermen— code of practice**

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Kenyatta National Hospital (KNH)

Radiation Protection Board

Kenya Medical Research Institute (KEMRI)

Kenyatta University — Department of Environmental Health

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**Occupational safety and health— sewermen—code of practice**

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**Foreword**

This Kenya Standard has been prepared by the Sub-Technical Committee on Occupational Health and Safety under the guidance of the Standards Projects Committee, and it is in accordance with the procedures of the Kenya Bureau of Standards.

During the preparation of this standard, reference was made to the following documents:

ISO 45001:2018- Occupational health and safety management systems — Requirements with guidance for use

ISO 14123-1:2015- Safety of machinery — Reduction of risks to health resulting from hazardous substances emitted by machinery — Part 1: Principles and Specifications for machinery manufacturers

Acknowledgement is hereby made for the assistance received from these sources.

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**1 Scope and field of application**

**1.1 Scope**

This Kenya Standard lays down guidelines for selection of sewermen and safe system of work in sewerage system. It also recommends requisite training of workers be considered where applicable. These safety and health guidelines shall be adhered to during the work process when working in sewerage system.

**1.2 Application**

This standard shall apply to personnel engaged in operation and maintenance of sewerage systems

including sewage pumping stations and sewage treatment plants

**2 Normative references**

The following referenced documents are indispensable for the application of this Kenya Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 45001:2018- Occupational health and safety management systems — Requirements with guidance for use

ISO 14123-1:2015 Safety of machinery — Reduction of risks to health resulting from hazardous substances emitted by machinery — Part 1: Principles and Specifications for machinery manufacturers

**3 Terms and definitions**

For the purposes of this document, the following terms and definitions shall apply

**sewer**

a pipe or conduit which is the property of or is vested in the County Government and which is used or intended to be used for the conveyance of sewage.

**sewermen**

men and women personnel engaged in operation and maintenance of sewerage systems, including sewage pumping stations and sewage treatment plants

**sewage**

waste water, soil water, industrial effluent other liquid waste, either separately or in combination but does not include storm water.

**sewerage system**

system for removal of sewage usually from beyond the cartilage of more than one site.

**top men**

are trained rescuers

**permit to work**

a written notice, which sets out the work to be done, the hazards involved and the precautions to be taken before the work commences in order to secure the safety and health of the employee or employees

**employee**

a person employed for wages or a salary and includes an apprentice and indentured learner

**employer**

any person, public body, firm, corporation or company who or which has entered into a contract of service to employ any individual and includes the agent, foreman, manager or factor of such person, public body, firm, corporation or company

**regulatory Authority**

Government agency formed or mandated under the terms of a legislative act (statute) to ensure compliance with the provisions of the act, and in carrying out its purpose.

**personal protective equipment (PPEs)**

include protective clothing and appliances

**hazardous gas**

include toxic, noxious, dangerous, and inflammables gases

1. **Selection of sewermen**

The employer should select the prospective employees for the sewerage and sewerage disposal functions, taking into account the duties they will be expected to perform. Those duties may be divided into two categories:

1. duties not requiring entry into confined spaces, and
2. duties requiring entry into confined spaces.

Requisite training of the selected workers shall where applicable be considered

* 1. **Guidance for selecting sewermen**

General guidance for selecting sewermen depending on the type of duties is given in Appendix A.

1. **Precautions**
   1. **Precautions against gas hazards**

When a sewer or a manhole is required to be entered for cleaning or clearing an obstruction, where dangerous gas or oxygen deficiencies may be present, both the supervisor and workers shall observe the following precautions:

1. allow no smoking nor open flames and guard against spark;
2. erect warning signs;
3. use only safety gas-proof electric lighting equipment or mirror for reflection of light;
4. test the atmosphere for noxious gases and oxygen deficiencies. In case of scum formation, the water and sediments in the manhole should be agitated with the help of rod or any other suitable instrument for trapped gases and the manhole should be checked for noxious gases and oxygen deficiencies;
5. if the atmosphere is normal, workers may enter with a safety belt attached and with at least two men available at top. For extended jobs, the gas tests shall be repeated every three minutes while men are in the sewer;
6. if oxygen deficiency or noxious gas is found, the structure shall be ventilated with pure air by keeping open at least one manhole cover each on upstream and downstream side for quick exist of toxic gases or by forced ventilation using a portable blower. The gas tests shall be repeated before entering. Adequate ventilation shall be maintained during the work and the gas test shall be repeated every three minutes.
7. if the gas or oxygen deficiency is present and it is not practicable to ventilate adequately before workers enter, a hose masks shall be worn and extreme care shall be taken to avoid all sources of ignition. Workers shall be taught how to use the hose equipment. In these cases, they shall always use permissible safety lights (not ordinary flash lights) rubber boots or non-sparking shoes and non-sparking tools;
8. workers descending a manhole shaft to inspect or clean sewers shall try each ladder step orrung carefully before putting the full weight on it to guard against insecure fastening due to corrosion of the rung at the manhole wall. When work is going on in deep sewers, at least two men (topmen) shall be available for lifting workers from the manhole in the event of serious injury; and
9. portable air blowers, for ventilating manhole, are recommended for all tank, pit or manhole work where there is a possibility of presence of noxious gas, vapours or oxygen deficiency. The motor of these air blowers shall be of weatherproof and flameproof type, compression - ignitions - diesel type (without sparking plug). These shall be placed not less than 2 m away from the opening and on the leeward side protected from wind so that they will not serve as a source of ignition for any inflammable gas which may be present. Forced type ventilation should be provided by blower located at ground level with suitable flexible ducting to displace out air from the manhole.
   1. **Precautions against infection**

The personnel working in sewerage maintenance systems are prone to infections. The employer should therefore ensure that the following precautions are taken:

1. the workers should be sensitized about the hazards of waterborne diseases such as typhoid and cholera through sewage and tetanus through cuts and wounds. Cuts and grazes should be covered with waterproof plasters. Effective immunization of workers against diseases such as typhoid, cholera, tetanus, HBV, etc., should be done by vaccination;
2. the importance of personal hygiene should be emphasized and the workers should be instructed to keep finger nails short and well-trimmed, wash hands with soap and hot water before taking food or smoking and to keep fingers out of nose, mouth and eyes, because the hands carry most infection;
3. use of rubber gloves shall be insisted so that sewage or sludge does not come in direct contact with hand. Before starting work, skin likely to be exposed to sewage should be covered with barrier cream.
4. the workers should be provided with a complete change of work clothes to be worn during working hours. Gum boots should also be provided for the workers;
5. when the work is completed, workers should thoroughly wash all contaminated parts of the body.
6. **Safety equipment**

The work supervisor shall ensure that every sewerman is equipped with the following equipment for own protection while at work.

1. safety helmet preferably with cap lamp (explosion proof);
2. safety belt;
3. protective gloves;
4. overall, heavy coat or other heavy duty protective clothing, preferably waterproof;
5. knee or thigh length safety boots with toe protection and anti-spark studs;
6. gas masks and breathing apparatus;
7. eye protectors;
8. portable lighting equipment;
9. non-sparking tools;
10. portable air blowers;
11. gas test equipment, such as safety candle lamps, Davy’s safety

lamps, lead acetate papers and electronic gas detectors; and

1. first aid equipment.
2. **Permit to work**

An employer shall issue a permit to work to any employee, likely to be exposed to hazardous work processes or hazardous working environment in order to secure the safety and health of the employee.

Such work and work environment that may require permit to work include:

1. entry to or work in confined spaces;
2. working in an environment with the likelihood of contact with hazardous material or toxic gas exposure.

The permit to work procedure should be used:

1. to ensure that personnel working in the restricted area are aware of the hazards involved, the identity, nature and extent of the work to be done and precautions to be taken.
2. to ensure that a formal check is undertaken to confirm that the hazard involved is within the accepted limit and that appropriate PPEs are provided before workers are allowed to enter or work in the restricted area; and
3. if the work requires the authorization of more than one person, or there is a time limit on entry.
4. **Procedure for working in a sewer**

To ensure proper safety standards, the work supervisor shall ensure that the following steps are followed:

* 1. **before leaving the depot**

1. all appropriate and adequate safety equipment should be checked and verified for usability; and
2. all anticipated potential hazards should be analysed based on the work, working location and work conditions.
   1. **on arrival at the site**
3. adequate road markings should be set up; and
4. the system (guarding all openings) on a sewer open up should be ventilated, that is,
5. the working manhole,
6. next manhole upstream, and
7. next manhole downstream.

NOTE - This is minimum requirement. Use may be made of air blowers, if necessary.

* 1. **entry procedure**

1. the topmen shall be determined before entry of the workers into the sewer.
2. gas shall be checked (if in doubt - stay out);
3. every worker shall tie safety belt and rope before entering;
4. ladders, step iron, etc., should be checked for defects (if in doubt, use a rope attached to the safety belt);
5. safety ropes, spare lamps, breathing sets, shall be kept close to working area for immediate use in case of emergency; and
6. if considered safe, workers should be allowed to enter sewer.

NOTE - In deep sewers, the waste water level in the sewers should be checked before entering.

* 1. **Working inside the sewer**

1. the presence of gas should be checked every three minutes, and
2. the topmen should call to the man working in the sewer every three minutes. Every message shall be acknowledged.

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* 1. **Completion of work**

1. after the work is completely done, the top men should be informed;
2. ganger (normally last men out) should check and ensure that all tools, ropes, etc., are out and that the sewer is clear;
3. all grids, guardrails, manholes covers should be replaced
4. road safety signs should be removed and site cleared;
5. workers should wash thoroughly before eating or smoking.
6. **Gas emergency**
7. If a gas emergency occurs everyone should immediately put on their escape sets (breathing apparatus) and alarm raised.
8. The top men are trained rescuers and they should let down the rescue sets and wait the men working in sewer to come out. The top men shall attempt to rescue the man inside sewer with all the equipment at their disposal.
9. If there is a casualty, he should be propped up out of water in a comfortable position. Immediately call the emergency services (ambulance, fire brigade). When the victim has gas mask put on if he is breathing, a rescuer should always be with him because he may vomit thereby choking the supply of oxygen.

Guidelines for giving first-aid to a gas victim are given below:

1. remove the victim to place with fresh air as soon as possible;
2. apply artificial respiration with an oxygen resuscitation if he is not breathing. If one is not available, apply mouth to mouth breathing; and
3. keep the victim lying down on a recovery position and wait for an ambulance.

**APPENDIX A**

**GUIDANCE FOR SELECTION OF SEWERMEN**

**A-1. REQUIREMENTS FOR DUTIES NOT REQUIRING ENTRY INTO CONFINED SPACE**

A-.1.1 No specific requirements except a routine medical examination shall be made. Those with the following disabilities shall not be selected as any of the disease involves risks to the health and safety of both the prospective employee and/or other employees:

1. History of fits, blackouts, fainting attacks;
2. Chronic skin disease; and
3. Meniers disease or diseases involving loss of balance.

**A-2. REQUIREMENTS FOR DUTIES REQUIRING ENTRY INTO CONFINED SPACE**

A-2.1Persons considered for employment in confined spaces shall be physically fit and capable of understanding training given. Those with the undernoted disabilities shall not be recruited for this type of work and those who contract these should cease to be employed in this capacity:

1. A history of fits, blackouts or fainting attacks;
2. A history of heart disease or disorder;
3. High blood pressure;
4. Asthma, bronchitis or a shortness of breath on exertion;
5. Deafness;
6. Meniers disease or disease involving giddiness or loss of balance;
7. Claustrophobia or nervous or mental disorder;
8. Back pain or joint trouble that would limit mobility in confined spaces;
9. Deformity or disease of the lower limbs limiting movement;
10. Chronic skin disease;
11. Serious defects in eyesight; and
12. Lack of sense of smell.

A-2.1.1 Employees should be medically re-examined at reasonable intervals, taking into account the person’s age and duties.