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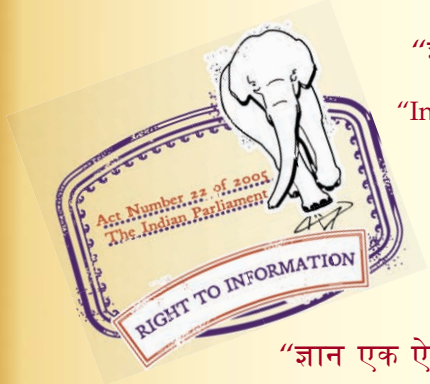

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IS : 11972 • 1987
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Indian Standard

CODE OF PRACTICE FOR SAFETY PRECAUTIONS TO BE TAKEN WHEN ENTERING A SEWERAGE SYSTEM

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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CODE OF PRACTICE FOR SAFETY PRECAUTIONS TO BE TAKEN WHEN ENTERING A SEWERAGE SYSTEM

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(*Continued on page* 9)

Indian Standard

CODE OF PRACTICE FOR SAFETY PRECAUTIONS TO BE TAKEN WHEN ENTERING A SEWERAGE SYSTEM

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 27 March 1987, after the draft finalized by the Public Health Engineering Equipment Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Personnel engaged in operation and maintenance of sewerage systems including sewage pumping stations are exposed to different types of occupational hazards like physical injuries, injuries caused by chemical and radioactive wastes, infections caused by pathogenic organisms in sewage and dangers inherant with explosive or noxious vapours or oxygen deficiency.

0.3 The health and safety of personnel can be safeguarded to a great extent by use of safety equipment and by taking precautions appropriate for each hazardous condition. It is desirable to give thorough knowledge to the sewermen of the equipments being used by them. This standard has been prepared with a view to provide some basic guidance for selection of sewermen and proper job instruction for safe working in a sewerage system and it is hoped it would be found useful by local bodies, public health engineering departments and other engaged in this field.

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1. SCOPE

1.1 This standard lays down guidelines for selection of sewermen and safe system of work in sewerage system.

2. SELECTION OF SEWERMEN

2.1 The selection of prospective employees for the sewerage and sewage disposal functions should take into account the duties they will be expected to perform. Those duties may be divided into two categories:

a) Duties not requiring entry into confined spaces, and

b) Duties requiring entry into confined spaces.

2.2 Guidance for Selection of Sewermen — General guidance for selecting sewermen depending on the type of duties is given in Appendix A.

3. PRECAUTIONS

3.1 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, the following precautions shall be taken:

a) Allow no smoking or open flames and guard against spark;

b) Erect warning signs;

c) Use only safety gas-proof electric lighting equipment or mirror for reflection of light;

d) 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;

e) If the atmosphere is normal, workmen 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;

f) 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.

g) If the gas or oxgen 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;

h) Workmen descending a manhole shaft to inspect or clean sewers shall try each ladder step or rung 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 shall be available for lifting workers from the manhole in the event of serious injury; and

j) 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 flame-proof 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 fiexible ducting to displace out air from the manhole.

3.2 Precautions Against Infection — The personnel working in sewerage maintenance systems are prone to infections and hence the following precautions should be taken:

a) The workers should be educated 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, etc, should be done by vaccination;

b) The importance of personal hygiene should be emphasized and the worker 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;

c) 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.

d) The worker 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;

e) When the work is completed, thoroughly wash all contaminated parts of the body.

4. SAFETY EQUIPMENT

4.1 The sewermen should be equipped with the following equipment for his own protection:

a) Safety helmet preferably with cap lamp (explosion proof);

b) Safety belt;

c) Protective gloves;

d) Overall, heavy coat or other heavy duty protective clothing preferably waterproof;

e) Knee or thigh length safety boots with toe protection and antispark studs;

f) Gas masks and breathing apparatus;

g) Eye protectors;

h) Portable lighting equipment;

j) Non-sparking tools;

k) Portable air blowers;

m) Gas test equipments, such as safety candle lamps, Davy's safety lamps, lead acetate papers and electronic gas detectors; and

n) First aid equipment.

5. PROCEDURE FOR WORKING IN A SEWER

5.1 To ensure proper safety standards, the following steps should be followed:

STEP 1 — Before Leaving the Depot

a) Collect and check all safety equipment; and

b) Check working location with supervisor and list all known or potential hazards.

STEP 2 — On Arrival at the Site

a) Set up adequate road markings; and

b) Ventilate the system (guarding all openings) on a sewer open up,

i) The working manhole,

ii) Next manhole upstream, and

iii) Next manhole downstream.

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

STEP 3 — Entry Procedure

a) Check for gas (if in doubt — stay out);

b) Tie safety belt and rope before entering;

c) Check ladders, step iron, etc, for defects (if in doubt, use a rope attached to the safety belt);

d) Keep safety ropes, spare lamps, breathing sets, close to working area for immediate use in case of emergency; and

e) If considered safe, enter sewer.

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

STEP 4 — Working Inside the Sewer

a) Check the gas every three minutes, and

b) Every three minutes the topmen calls to the man working in the sewer. Every message shall be acknowledged.

STEP 5 — Completion of Work

a) Top men informed and ready;

b) Ganger (normally last men out) checks that all tools, ropes, etc, are out and that the sewer is clear;

c) Replace all grids, guardrails, manholes covers;

d) Road signs to be removed and site cleared;

e) Supervisor to be informed that work is completed; and

f) Wash thoroughly before eating or smoking.

6. GAS EMERGENCY

6.1 If a gas emergency occurs everyone should immediately put on their escape sets (breathing apparatus) and alarm raised.

6.2 The top men are trained rescuers and they should down the rescue sets and await 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.

6.3 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.

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

a) Remove him to fresh air as soon as possible;

b) Apply artificial respiration with an oxygen resuscitation if he is not breathing. If one is not abailable, apply mouth to mouth breathing; and

c) Keep him lying down and wait for an ambulance.

APPENDIX A

(*Clause* 2.2)

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:

a) History of fits, blackouts, fainting attacks;

b) Chronic skin disease; and

c) Meniers disease or diseases involving loss of balance.

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

A-2.1 Persons 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:

a) A history of fits, blackouts or fainting attacks;

b) A history of heart disease or disorder;

c) High blood pressure;

d) Asthma, bronchitis or a shortness of breath on exertion;

e) Deafness;

f) Meniers disease or disease involving giddiness or loss of balance;

g) Clanstropholia or nervous or mental disorder;

h) Back pain or joint trouble that would limit mobility in confined spaces;

j) Deformity or disease of the lower limbs limiting movement;

k) Chronic skin disease;

m) Serious defects in eyesight; and

n) 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.

(*Continued from page* 2)

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INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	Unit	Symbol
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	Unit	Symbol	Definition
Force	newton	N	1 N = 1 kg.m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2