

Swachh Bharat Mission - Urban

Training Module for SANITARY WORKERS ON CLEANING OF SEWERS AND SEPTIC TANKS



Central Public Health and Environmental Engineering Organisation (CPHEEO)

Ministry of Housing and Urban Affairs
Government of India

www.swachhbharaturban.gov.in | www.cpheeo.gov.in

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दुर्गा शंकर मिश्र

सचिव

Durga Shanker Mishra
Secretary



भारत सरकार
आवासन और शहरी कार्य मंत्रालय
निर्माण भवन, नई दिल्ली-110011
Government of India
Ministry of Housing and Urban Affairs
Nirman Bhawan, New Delhi-110011

FOREWORD

Indian cities have a combination of sewerage networks (40%) and septic tank based systems (60%). Cleaning of sewers and septic tanks are routine but essential O&M requirements and need to be carried out using mechanized equipments and trained personnel.

*Aiming at standardising the maintenance procedure, with inherent objective of discouraging hazardous cleaning and promoting mechanised system for maintenance of sewers and septic tanks, this Ministry issued an SOP for cleaning of sewers and septic tanks in year 2018. In continuation to that, this Training Booklet on “**Standard Operating Procedure for Cleaning of Sewers and Septic Tanks**” aims at enhancing inter and intra understanding of ULB officials / engaged agencies in general and sewer-men and supporting staff engaged in cleaning of sewers and septic tank, in particular.*

I believe, adoption of the SOP issued earlier together with this Training Booklet, ULBs across India will be able to enhance their capabilities in effectively maintaining the waterborne sanitation infrastructure and at the same time prevent unfortunate deaths during cleaning of sewers and septic tanks.

I congratulate CPHEEO team to bring out this training booklet in short span of time for the benefit of ULB officials / agencies engaged in maintenance of Sewers and Septic Tanks.

I urge States/UTs and cities to make best use of this document.


(Durga Shanker Mishra)

New Delhi
12 November, 2020

Office Address: Room No. 122 'C' Wing, Nirman Bhawan, New Delhi-110011
Tel.: 011-23062377, 23061179; Fax: 011-23061459; Email: secyurban@nic.in
Website: www.mohua.gov.in

कामरान रिज़वी
अपर सचिव
KAMRAN RIZVI
Additional Secretary



भारत सरकार
आवासन और शहरी कार्य मंत्रालय
निर्माण भवन, नई दिल्ली-110011
GOVERNMENT OF INDIA
MINISTRY OF HOUSING AND URBAN AFFAIRS
NIRMAN BHAWAN, NEW DELHI-110011

PREFACE

Sewer networks require regular cleaning to prevent possible chokings. However, frequent blockages occur in the sewers due to accumulation of silt, municipal garbage including rags and plastic and construction debris and also due to lateral expansion of roots which clog the sewers. Similarly, septic tanks systems also need periodic maintenance.

Urban local bodies (ULBs) in the country procure from time to time sewer/septic tank cleaning equipment such as suction equipment, sewer-jetting machines or a combination of both and sewer rodding equipment with various accessories and safety gears. However, lot more needs to be done by ULBs to ensure that the cleaning of sewers and septic tanks follows the defined protocols.

*The Training Booklet on “**Standard Operating Procedure for Cleaning of Sewers and Septic Tanks**” is divided in Two Parts: [1] Training Module and [2] Q & A. Under the training module, the booklet includes technical as well as logical aspects of the sewer and septic tanks’ maintenance. The booklet also includes the details of the preventive and precautionary measures along with details of associated safety gears needs to be adopted while executing / facilitating the cleaning operation.*

This booklet is designed to suit the requirements of the practicing sanitary workers/ sewer-men who are in the field of maintaining sewerage and septic tanks system. I am sure that this Training Module will be of immense use for ULBs/ agencies engaged in the field at ULBs level and entrusted with the day-to-day Operation & Maintenance works.

I congratulate CPHEEO team particularly Dr V K Chaurasia JA(PHEE), Sh Rohit Kakkar, DA(PHE), Sh Sathish Kumar S, TO(PHE) and consultants Sh Vipul Gulati, Dr. Manoj K. M. Chaturvedi and Dr S Saktheeswaran for bringing it in short span of time.


(Kamran Rizvi)

Tel: +91-11-23062309 (O), Fax: +91-11-23062477, Email: asd-mhua@nic.in
URL: <http://mohua.gov.in>

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Background

- Standard Operating Procedure (SOP) for Cleaning of Sewers/Septic Tanks was published in Nov. 2018 to eradicate hazardous cleaning of sewers/septic tanks
- The relevant provisions of SOP has been customized to suit the training requirements of the sanitation workers
- Q & A section has been introduced to evaluate the effectiveness of the training program
- For evaluation purpose under city challenge photographs and participant list of the training program to be presented by the ULB as supporting document
- Independent on-site validation will be carried out by the assessors at the time of assessment
- Periodic(Quarterly for first year) training shall be ensured by the ULBs



Standard Operating Procedure (SOP) for Cleaning of Sewers and Septic Tanks



Central Public Health and Environmental Engineering Organization (CPHEEO)

Ministry of Housing and Urban Affairs
Government of India

www.amrur.gov.in
November 2018



PART-A TRAINING MODULE

Introduction

- Prohibition of Employment as Manual Scavengers and their Rehabilitation Act 2013 bans hazardous cleaning of sewer/ septic tanks
- Definition: Hazardous cleaning by an employee, in relation to a sewer or septic tank, means its manual cleaning by such employee without the employer fulfilling his obligations to provide protective gear and other cleaning devices and ensuring observance of safety precautions, as may be prescribed or provided in any other law, for the time being in force or rules made thereunder
- Hazardous cleaning exposes employee to incidents like falls/ slips, fire or explosion, oxygen depletion, gas poisoning, heat stress, drowning, in some extreme cases, loss of life as well.



Where Manual Cleaning is Allowed

No person shall be allowed to clean a sewer manually, with protective gear and safety devices except :

- for the removal of concrete or FRP (Fibre Reinforced Plastic) or damaged manhole door where mechanical equipments cannot be put into operation.
- for inter-linking the newly laid sewer main with the existing sewer main, in case of sewer of size of more than 300 mm diameter.
- for removal of submersible pump sets fixed at the bottom of the suction wells.
- for the reconstruction of the manhole or rectification of the sewer main.
- Any circumstance, when it is absolutely necessary to have manual sewer cleaning, after the CEO of the local authority has permitted to do so after recording in writing the specific valid reasons for allowing such cleaning.

The entire procedure right from entry of the employee (with safety gear, etc) to the exit of the employee from the sewer to be video graphed and stored as a digital record.

Initiatives by Government of India

Prohibition of Employment as Manual Scavengers and their Rehabilitation Act & Rules, 2013

Whoever engages or employs any person for hazardous cleaning of sewer or septic tank shall be imprisoned up to two years or fined up to two lakh rupees or with both, for the first contravention

Whoever engages or employs any person for hazardous cleaning of sewer or septic tank shall be imprisoned up to five years or fined up to five lakh rupees or with both, from second contravention onwards

Manual on Sewerage & Sewage Treatment Systems 2013

Standard Operating Procedure (SOP) for Cleaning of Sewers and Septic Tanks 2018

IS 11972 – 2002: Code Of Practice For Safety Precautions To Be Taken When Entering A Sewerage System

Cleaning Frequency

Sewer

Depends on the prevailing local conditions, complaints received

Desirable to clean the sewer at least once in every two years (ideally once just before monsoon)

Septic Tank

Determined by the local conditions including loading rate and performance.

Cleaning Once in a 2-3 years based on its design criteria

Type of Inspections of Sewers

Direct Method

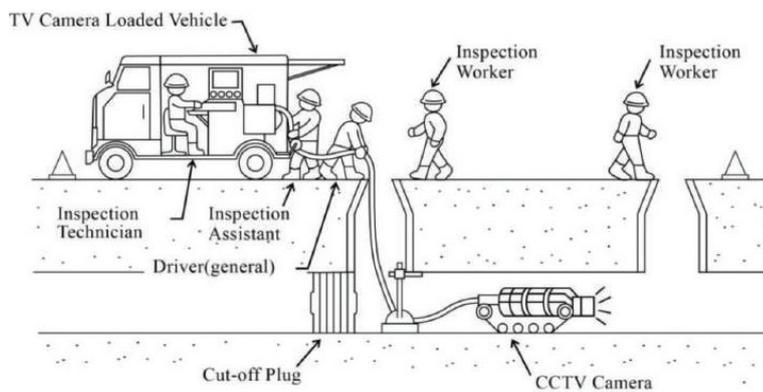
Direct visual inspection by trained individual. [Pl refer clause 2.2.4.1 on Direct Inspection and Examination in Part B (Operation and Maintenance) Manual on Sewerage & Sewage Treatment Systems.]

Indirect Method

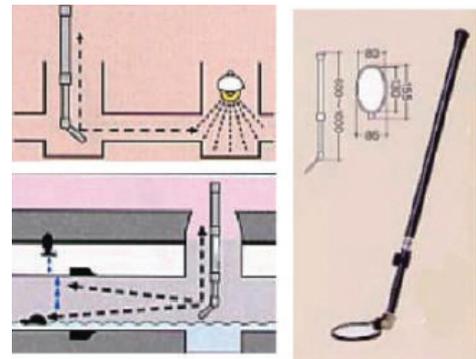
Light and Mirror Method

Closed Conduit Camera Method

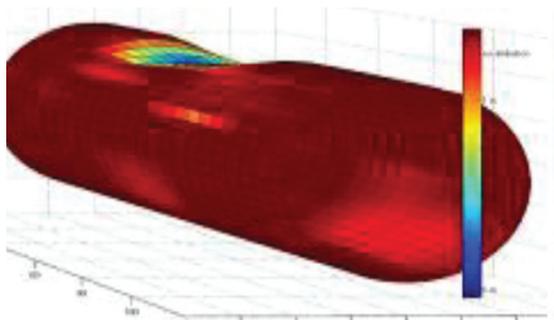
Sonar System



CCTV camera inspection



Light and Mirror Method



Photographs showing Structural Damage and Longitudinal cracked condition of the Sewer

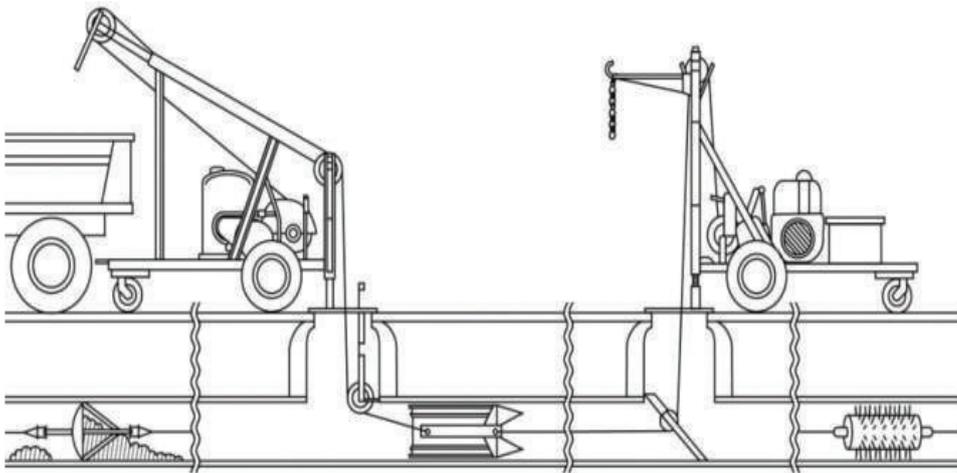
Types & Methods of Cleaning

Manual Cleaning

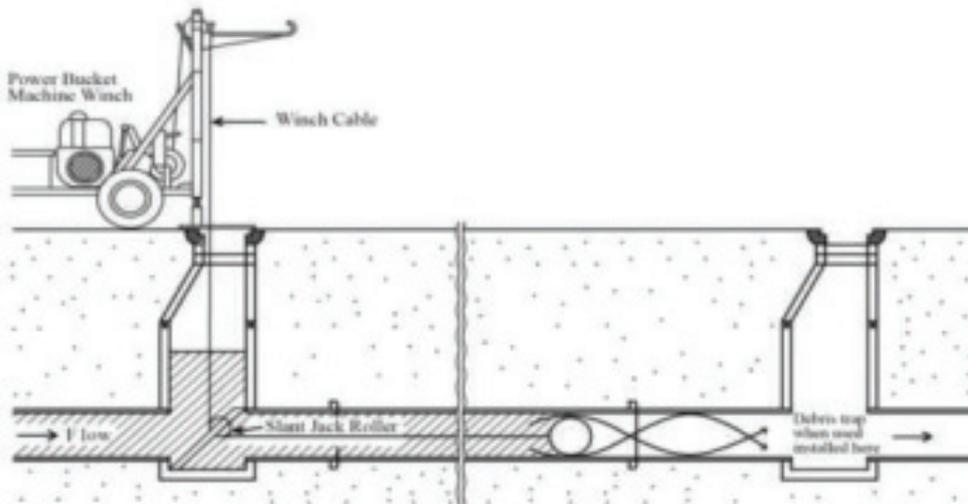
Sectional Sewer Rods
Scraper

Mechanical Cleaning

Sewer Cleaning Bucket Machine
Rodding Machine with Flexible Sewer Rod
Hydraulically Propelled Devices
Velocity Cleaners (Jetting Machine)
Dredger (Clamp-Shell)
Gully Emptier and OTHERS



Power Bucket machine setup



Hydraulic cleaning using sewer ball

Procedure for Mechanical Cleaning of Sewers

Step 1: Reaching the site: Supervisor along with adequate machinery and selected staff.

Step 2: Identification and isolation of the area: Identify the stretch to be cleaned and barricade it.

Step 3: Verify the presence of any gases or other hindrances:

- Ventilate the sewer line by opening 2-3 manholes on both sides of the working stretch for 1 hour before to start the work. Use Dummy Manhole covers (Safety Grill) during ventilation.
- Use gas monitor, detector lamp, wet acetate paper or gas detector masks and dummy manhole cover

Step 4: Removal of silt/wax - Mechanical Process: Use appropriate machines to remove the silt/wax.

Step 5: Departing from the site: All the equipment, safety gears, barricades etc shall be removed.



Mechanical Cleaning



Procedure for Mechanical Cleaning of Sewers

Step 1 to 3 : Same as the procedure of Mechanical cleaning

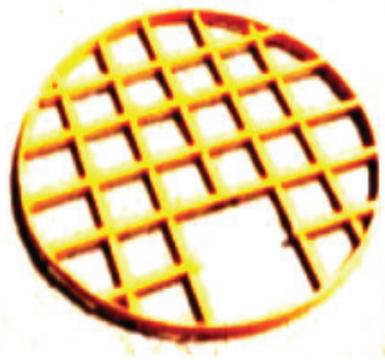
Step 4: Removal of silt/wax - Manual Process:

- Identify and close off or re-route the inlet sewage
- Full body suit if depth is > 5 ft. or partial fishing wade suits if depth less than 5 ft.
- Check the oxygen level (19.5% -21%)
- Fastened safety belt, wear full-face mask with at least 10-minute air supply & monitored by CCTV cameras
- Duration not to exceed 90 minute in one slot and an interval of 30 minute between two intervals

Step 5: Same as Mechanical procedure

*No entry into manholes less than 600 mm dia.

*Always use protective gear while manual cleaning



Dummy Manhole cover (Safety Grill)

Procedures for Mechanical Cleaning (Vacuum Trucks) Septic Tanks

- Inspect the site, break the mortar seal and connect the hoses from the truck to the tank.
- Park the truck within 25 m from septic tanks. In case of more than 25 m of linear distance and 4 m in elevation gain, intermediate pumping is required.
- Break the mortar seal of the septic tank lid. Inspect the tank for cracks or damage before and after the emptying of tank.
- Lay out and connect the hoses from the truck to the tank or pit to be emptied.
- Increase the vacuum to the proper level to take out fecal sludge out of the tank.



Procedures for Mechanical Cleaning (Vacuum Trucks) Septic Tanks

- Break up fecal sludge and empty the septic tanks between 90% and 95% of its contents.
- Operators shall leave behind sludge not less than 25 mm in depth in the bottom of the septic tank.
- Clean up any spillage using proper sorbent materials. Cover top and the area around is sprayed with 1 % chlorine solution.
- Prepare a written report indicating: how much waste was removed; the condition of the tank or pit; any recommendations for repairs.
- Replace & seal the cover with plaster.



Cleaning Tools



Rodding Tools



Safety Gears



Sewer Suction Machine

Precautions before entering a sewer/ manhole

- Do Not Allow smoking or open flames.
- Test the atmosphere for noxious gases and oxygen deficiencies
- Ventilate with pure air by keeping open at least one manhole cover each on upstream and downstream side
- At least two men available at the ground level all the time.
- Wear hose masks all the time.
- Portable air blowers placed not less than 2m away.
- keep finger nails short and well-trimmed, wash hands with soap and hot water
- Change of work clothes and Gum boots to be available
- Use traffic controls in conformance with the Local Transport Authority.
- Use Detours, warning signs, or barricades. Flagmen may also be required



Emergency Preparedness

- Prepare emergency plan (EPP) before heading to the site
- Team to Familiarize with the EPP
- Put a tripod and harness for retrieving the injured worker.
- Soap, skin cream & first aid kit shall be readily available at the site.
- A list of nearby medical care center and an ambulance shall be available at the site.



Gas Emergency

If a gas emergency occurs everyone should immediately put on their breathing apparatus and raise the alarm.

The men at the ground level shall immediately send down the rescue sets and await the men working in sewer to come out.

If there is a casualty, immediately call the emergency services.

Apply artificial respiration with an oxygen resuscitation if he is not breathing. Keep him lying down and wait for an ambulance.



Protective Gears and Safety Devices

Air compressor for blower	Airline breathing apparatus
Airline respirator with manually operated air blower	Air purifier gas mask/chin cortege
Artificial respiration/reticulate	Barrier caution tape
Barrier cream	Barrier cone
Blower	Breath mask
Breathing apparatus	Caution board
Chlorine mask	Emergency medical oxygen resuscitator kit
First aid box	Face mask
Gas monitor (4 gases)	Guide pipe set
Full body wader suit	Fishing wader suit attached with boots
Hand gloves	Head lamps
Helmet	Helmet demolishing
Lead acetate paper	Life guard pad
Modular airlines supply trolley system	Normal face mask
Nylon rope ladder – 5 m	Nylon safety belt
Pocket book	Port oxy
Raincoat	Reflecting jacket
Safety belt	Safety body clothing
Safety body harness	Safety goggles
Safety gumboots	Safety helmets
Safety showers	Safety torch
Safety tripod set	Search light

Basic Personal Safety Kit



Oxygen Cylinder



PVC Safety kit



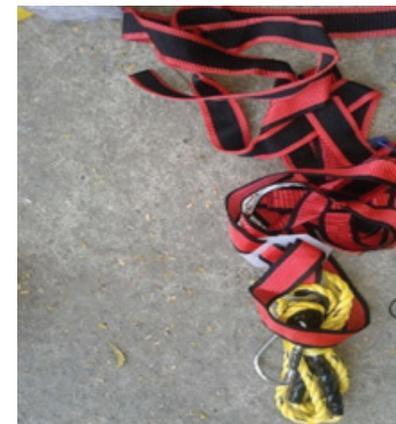
Safety Grills



Torch Light



Radium Jacket



Safety Belt with Rope



Glasses



First-Aid Kit

Health Requirements of Cleaning Employees

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:

- Fits, blackouts or fainting attacks, heart disease or disorder;
 - High blood pressure;
 - Asthma, bronchitis or a shortness of breath on exertion;
 - Deafness;
 - Meniers disease or disease involving giddiness or loss of balance;
 - Claustrophobia or nervous or mental disorder;
 - Deformity or disease of the lower limbs limiting movement;
 - Chronic skin disease;
 - Serious defects in eyesight; and
 - Lack of sense of smell.
- Only routine medical examination is required



Roles & Responsibilities of Employee

Employee

- Familiarize themselves with the SOP and follow the procedures.
- In case of any doubt, report the same to the concerned Authorities.
- Use all the necessary safety gears and cleaning devices
- Take consent of the competent authority before involving in cleaning of sewers/ septic tanks.

<u>Checklist for Minimum constituents of the first aid kit that shall be made readily available to the staffs employed in sewer cleaning at the site.</u>			
<u>S. No.</u>	<u>Checklist</u>	<u>Minimum constituents</u>	<u>Yes</u>
1	Small sterilized dressings.	6	<input type="checkbox"/>
2	Medium size sterilized dressings	3	<input type="checkbox"/>
3	Large size sterilized dressings	3	<input type="checkbox"/>
4	Large sterilized burn dressings	3	<input type="checkbox"/>
5	Bottle (30ml) containing a two percent alcoholic solution iodine	1	<input type="checkbox"/>
6	Bottle (30 ml) containing Salvolatile having the dose & mode of administration indicated on the label..	1	<input type="checkbox"/>
7	Snakebite lancet	1	<input type="checkbox"/>
8	Bottle (30 gm) of potassium permanganate crystals	1	<input type="checkbox"/>
9	Pair scissors	1	<input type="checkbox"/>
10	Copy of the first-aid leaflet issued by the Director General Factory Advice Service and Labour institutes Government of India.	1	<input type="checkbox"/>
11	Bottle containing 100 tablets (each of 5 gm) of aspirin	1	<input type="checkbox"/>
12	Ointment for burns		<input type="checkbox"/>
13	Bottle of suitable surgical antiseptic solution	1	<input type="checkbox"/>

Checklist for Prerequisites

1	Did you barricade the area of work?	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
2	Have you opened upstream and downstream manholes?	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
3	Is there a regular overflow?	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
4	What kind of area is it?	Commercial	<input type="checkbox"/>	Residential	<input type="checkbox"/>
5	Does the worker have the safety equipments?	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
6	Has the worker applied oil?	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
7	Is the sewage cleaning machine available?	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
8	Is the suction of the cleaning machine verified?	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
9	If yes, is it in good condition?	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
10	Has the stagnant sewage water been cleared from the overflowing manhole?	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
11	Is the health condition of the worker acceptable?	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
12	Are the pipelines silted?	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
13	Where is the chockage?	Manhole	<input type="checkbox"/>	Pipeline	<input type="checkbox"/>
14	Is there an Oxygen Cylinder?	Small Cylinder	<input type="checkbox"/>	External Cylinder	<input type="checkbox"/>
	If yes, choose the appropriate option:	Pipe leading to Manhole	<input type="checkbox"/>	No	<input type="checkbox"/>

Checklist for Entering Manhole

1. Personal Safety Kit	
Helmet with headlight	
Gum Boots	
Waterproof Clothing	
Gloves	
Safety Belt	
Oxygen Mask	
Chemical Cartridge Mask	
Oil	
Soap	
Towel	
Oxygen Cylinder	
2. Gang Kit	
Barricade	
Rope Ladder/Tripod with Chain Pulley	
Silt Grabber	
Chromo-flexible Steel Rod	
Bucket with Rope	
Spade with long handle	
Crowbar	
Trolley	
First Aid Kit	
Manhole Key Rod	



PART-B Q & A

Question 1

The main objective of present training is to:

- a. Eliminate hazardous cleaning and promote mechanized cleaning
- b. To avoid the accidents due to improper practice of cleaning
- c. To provide information on protective gears & emergency preparedness
- d. All of the above

Question 2

Which of the following provision(s) is/are correct under the Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013?

- a. Hazardous entry into sewers and septic tanks is prohibited
- b. Whoever engages or employs any person for hazardous cleaning of sewer or septic tank shall be imprisoned up to two years or fined up to two lakh rupees or with both, for the first contravention
- c. Whoever engages or employs any person for hazardous cleaning of sewer or septic tank shall be imprisoned up to five years or fined up to five lakh rupees or with both, from second contravention onwards
- d. All of the above

Question 3

Which of the following is a sewer inspection method?

- a. Scraper Method
- b. Closed Conduit Camera Method
- c. Dredger (Clam-shell)
- d. Rodding method

Question 4

Which of the following is not a mechanical method of sewer cleaning?

- a. Gully Emptier (Suction Units)
- b. Hydraulically Propelled Devices
- c. Manila Rope and Cloth Ball
- d. Sewer Cleaning Bucket Machine

Question 5

Arrange the steps of mechanical cleaning of sewers (from Step 1 to Step 5) in proper sequence:

- A. Identification and isolation of the area
- B. Leaving from the site
- C. Verify the presence of any gases or other Hindrances
- D. Reaching the site
- E. Removal of silt/wax - Mechanical Process

- i. A-C-E-B-D ii. D-E-A-C-B iii. D-A-C-E-B iv. D-C-B-E-A

Question 6

Arrange the steps of mechanical cleaning of Septic Tanks (from Step 1 to Step 5):

- A. Replace & seal the cover with plaster.
- B. Break the mortar seal and inspect the tank for cracks or damage.
- C. Clean up any spillage using proper sorbent materials.
- D. Break up sludge and empty the septic tanks between 90% and 95%.
- E. Connect the hoses from the truck to the tank or pit to be emptied.

- i. A-C-E-B-D
ii. B-E-D-C-A
iii. D-A-C-E-B
iv. D-C-B-E-A

Question 7

While emptying septic tank, how much sludge should be left behind at bottom of the septic tank for seeding by operators?

- a. At least 25 mm in depth
- b. At least 30 mm in depth
- c. At least 40 mm in depth
- d. Nil

Question 8

Identify the advance activities to be undertaken under Emergency Preparedness?

- a. Prepare emergency plan to execute the work before to heading to the site
- b. Put a tripod and harness for retrieving the injured worker.
- c. Soap, skin cream & first aid kit shall be readily available at the site.
- d. All the above

Question 9

During gas emergency, what is the first step to be followed?

- a. Send down the rescue sets and await the men working in sewer to come out
- b. Wait for emergency services to arrive
- c. Everyone should immediately put on breathing apparatus and raise the alarm
- d. Provide first-aid to a gas victim

Question 10

What is/are the precaution(s) to be taken when a sewer or a manhole is required to be entered for cleaning or clearing an obstruction

- a. Wear proper PPE kit
- b. Smoking, open flames and spark shall not be allowed at the site
- c. Erect warning signs
- d. All of the above

Question 11

Which of the following are protective gears and safety devices used while cleaning sewers and septic tanks?

- a. Safety helmet
- b. Breath mask
- c. Safety body harness
- d. Crowbar
- e. Artificial respiration/reticulate
- f. Water bottles/containers

i. a,b,c,d

ii. a,c,d,e

iii. a,b,c,e

iv. b,c,e,f

Answers

Q-1 – a

Q-2 – d

Q-3 – b

Q-4 – c

Q-5 – iii

Q-6 – ii

Q-7 – a

Q-8 – d

Q-9 – c

Q-10 – d

Q-11 – iii



Ministry of Housing and Urban Affairs
Government of India