



Ministry of Housing and Urban Affairs
Government of India



Technical and managerial
Interventions for Ensuring Safety
during Sewer and Septic Tank
Cleaning

Emergency Response Sanitation Unit (ERSU)

An Advisory



Ministry of Housing
and Urban Affairs
Govt of India

Central Public Health
and Environmental
Engineering Organisation

2019



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हरदीप एस पुरी
HARDEEP S PURI



आवासन और शहरी कार्य राज्य मंत्री (स्वतंत्र प्रभार)
नागर विमानन राज्य मंत्री (स्वतंत्र प्रभार)
वाणिज्य एवं उद्योग राज्य मंत्री
भारत सरकार

Minister of State (I/C), Housing & Urban Affairs
Minister of State (I/C), Civil Aviation
Minister of State, Commerce & Industry
Government of India

Message

Launched in 2014, the Swachh Bharat Mission (Urban) aimed to address the contentious issue of manual scavenging by converting all insanitary toilets into sanitary ones. Simultaneously, various laws and regulatory changes were enacted by the Government of India to ensure that this reprehensible practice is eliminated.

Despite these efforts, it has been found that at times, human intervention and manual entry into sewers/septic tanks is deemed necessary to remove blockages, as mechanical intervention is unfeasible. It is, however, deeply unfortunate that fatal accidents have taken place during the cleaning and maintenance of sewers and septic tanks.

Ministry of Housing and Urban Affairs is taking all the necessary steps to ensure that the dangerous and illegal practice of manual scavenging and hazardous cleaning of sewers and septic tanks is completely eliminated from our system. Investment is being made in technology to ensure human intervention is no longer needed; human capacity is being strengthened and an awareness campaign has been implemented; and most importantly, policy reforms are being put in place along with strict implementation guidelines.

It is in this context that I am pleased to note that this advisory on Emergency Response Sanitation Unit (ERSU) is being published by CPHEEO. It represents an innovative approach to institutionalizing safety practices and putting in place frameworks to mitigate the dangers of this practice. I am confident that this advisory will go a long way in helping achieve our ultimate objective of not just a Swachh India, but also a Safe India.

(Hardeep S Puri)

New Delhi
16 August 2019

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आवासन और शहरी कार्य मंत्रालय
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Foreword

In the last five years, through the combined initiatives taken under Swachh Bharat Mission (Urban) and AMRUT Missions, there has been significant increase in coverage of households connected to septic tanks and / or sewer networks, and overall improvement in the sewage and septage management situation in Urban India.

2. Parallely, many advisories and SOPs have been issued by MoHUA on safe cleaning and maintenance of septic tanks, sewer networks and manholes targeted at eliminating human casualties.

3. Formation of Emergency Response Sanitation Unit (ERSU), on the line of Fire Services Unit as outlined in this book, will complement the earlier advisories by ensuring mechanical cleaning at first and if not possible then human entry into sewers and septic tanks only by a professionally well trained person who is adequately equipped and protected.

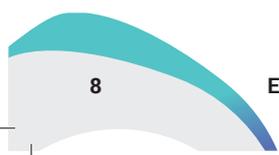
4. The document details out the Organisation and Operation of Emergency Response Sanitation Units, alongwith roles and responsibilities of relevant stakeholders. A handy section on Sewer and Septic Tank Maintenance Equipment available in Indian Market and available on the GeM portal will prove to be a helpful ready –reckoner to ULBs.

5. I hope this advisory will be quite crucial to ULBs to mitigate the (often unavoidable) risks associated with manual entry into sewers / septic tanks in a systematic manner, and help eliminate fatalities.

(Durga Shanker Mishra)

New Delhi
16 August, 2019

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सत्यमेव जयते



भारत सरकार
आवासन और शहरी कार्य मंत्रालय
निर्माण भवन

GOVERNMENT OF INDIA
MINISTRY OF HOUSING AND URBAN AFFAIRS
NIRMAN BHAWAN

नई दिल्ली-110011, तारीख 20

New Delhi-110011, dated the 20

Message

Swachh Bharat Mission has been eminently successful in replacing all insanitary toilets with sanitary latrines in urban India, thus eliminating the very cause for manual scavenging. Sewage from all urban households in the country is now invariably discharged either into a sewer or a septic tank system. However, lax enforcement of provisions of the Act dealing with hazardous entry into sewers and septic tanks, results in continued exploitation of unorganized sector workers who are made to enter such confined structures for cleaning and removal of obstructions.

That the nation continue to observe fatalities among these workers despite availability of all necessary equipment and safety gear in the Indian market, and regular guidance being provided to States/ UTs and local bodies by Central Public Health and Environmental Engineering Organization (CPHEEO), the technical wing of this Ministry through their Manual on Sewerage and Sewage Treatment, 2013 and SOP on Entry into Sewers and Septic Tanks, 2018, had made my Mission Directorate determined to evolve a suitable organizational response to this problem.

Obstruction in sewers and septic tanks cause sewage to overflow into urban public spaces and hence becomes a public hygiene concern. As such, the local administration is duty-bound to provide efficient techno-managerial solutions to their citizens to help keep the septic tanks in optimum working condition at all times and also to ensure safe and quick rectification of any faults in the system.

It is indeed a proud occasion for this Mission Directorate to be rolling out this unique concept of Emergency Response Sanitation Unit to help eliminate the very possibility of any untowardly incident related to cleaning of sewers and septic tanks. The organization, which shall be trained, equipped and staffed to receive sanitation emergency requests from citizens through a dedicated 4 digit toll-free telephone number and be able to respond to any eventuality through resources either held by itself or any public or private sanitation service provider. Singularity of authority and responsibility is being ensured by placing this organization under a single agency termed the Responsible Sanitation Authority (RSA)

It is hoped that all urban local bodies will help to strengthen such infrastructure. We owe this to those who serve us.

(V.K. Jindal)

Place : New Delhi
Date : 16.08.2019

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CHAPTER 1

Need for Entry and Causes for fatalities in sewers and septic tanks

BACKGROUND

1. Recent reports from various parts of the country describing fatal accidents among persons who had been tasked to enter sewers and septic tanks for purpose of their cleaning or removal of blockages has drawn utmost serious attention of the Central Government.
2. An analysis of the situations leading to these accidents invariably shows that the persons who had entered the sewers and septic tanks were not observing laid down safety procedures, lacked training for such tasks, were not wearing proper protective equipment required and supervision was lax or absent altogether.
3. It is an undeniable fact that all structures (pipe lines and holding infrastructure) which facilitate flow of liquids, are susceptible to getting choked at some point of time due to ingress of undesirable material. Sewers and septic tanks are designed to handle liquids which contain a variety of solids of different sizes and density- hair, sand, floating scum, fats and sticky grease from Kitchens. It is however, not
4. Owing to above, sewers and septic tanks need regular maintenance to ensure uninterrupted flow. A variety of maintenance equipment and procedures have evolved over time with ever improving versatility and functionality with regards to monitoring and choke removal. These are sufficient to tackle most eventualities without need for any human entry. Chapter 2 of this Advisory deals with the equipment available in the country. It is noted that the equipment, gear and machinery is almost at par with those available in developed nations.



The Ministry of Housing and Urban Affairs has also developed a directory of Indian vendors and manufacturers who offer such equipment.

5. However still, there are extreme situations when a sewer or septic tank gets blocked and no amount of mechanical equipment can offset human intervention causing overflow of sewage into roads and public spaces and exposing citizens to serious health hazard . As is noted from practices followed across the world, trained sanitation workers (termed as sewer-men) are employed to undertake repairs and physical removal of chokes from public sewers and septic tanks on such rare but critical occasions when to do so lies beyond the capability of machines. These sewer men are always properly equipped and trained to work in a potentially hazardous confined space.
6. A Bureau of Indian Standards publication titled Code of practice for safety precautions to be taken when entering a sewerage system (IS-11972:1987) exists. The above code of practice lays down guidelines for selection of sewer-men and safe system of work in sewerage system. This code was reaffirmed in 2002 and is in line with similar publications in developed western nations.
7. The CPHEEO Manual on Sewerage and Sewage Treatment Systems, published in 2013, contains an entire chapter titled “Occupational Health Hazards and Safety Measures” where the hazards such as disease and accident risks to which sanitation workers are exposed have been discussed in detail along with preventive measures to be taken when working in confined spaces. These suggested measures adhere to the internationally accepted safety standards developed by US OSHA.
8. Ministry of Housing & Urban Affairs has also released the “Standard Operating Procedure (SOP) for Cleaning of Sewers and Septic Tanks”, 2018. This SOP contains mechanical and manual procedures to be followed for cleaning

of sewers and emptying septic tanks. It also provides guidelines to reduce the occupational hazards of the workforce involved in cleaning of sewers and septic tanks thereby reducing any accidents or loss of life to the extent possible. The SOP is meant as a guide to Urban Local Bodies (ULBs), individuals, contractors, cleaning workers and private stakeholders about the cleaning of sewers and septic tanks.

9. Despite above, in India, as has been noted above, a number of incidents are being reported when engagement of mechanical sewer cleaning equipment has been completely bypassed before seeking manual intervention and where the persons so tasked were neither properly equipped nor trained to enter into a hazardous confined space. In almost all cases, it appears that the persons belonged to exploited classes of society. Incidents being reported from various parts of the country have highlighted continued exploitation of poor individuals to take up hazardous entry into sewers and septic tanks without being equipped with proper protective equipment.
10. At this time, it also needs to be made clear that two reprehensible activities related to disposal of human excreta have been often reported in media, viz. practices of manual scavenging and hazardous cleaning of sewers and septic tanks. These activities, as are defined hereunder, are not only illegal under the Prevention of Employment as Manual Scavengers and their Rehabilitation Act (PEMSRA, 2013) but also under various provisions of the Indian Penal Code.

A Manual Scavenger is defined as one who is tasked to empty dry and insanitary latrines and manually carry the excreta to point of disposal. Hazardous Cleaning of Sewers and Septic Tanks is defined as the practice where an individual enters a sewer or a septic tank without being provided with proper protective equipment (PPE).

11. Since Insanitary toilets have been completely eliminated from Urban areas of the country under Swachh Bharat Mission, manual scavenging can be said to be eradicated.
12. This Ministry further supports the view that under no circumstances should any untrained and unequipped person tasked to enter sewers and septic tanks. Machinery and equipment which are needed for periodic operation and maintenance of sewers and septic tanks have been arranged to be listed on the Government e marketplace (GeM). However, at the same time, trained persons who are required to enter septic tanks or sewers after wearing PPE cannot be considered to be undertaking hazardous cleaning.
13. As per IS, 11972: 1987, personnel who are 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 inherent with explosive or noxious vapours or oxygen deficiency. The health and safety of such personnel can be safeguarded to a great extent by use of safety equipment and by taking precautions appropriate for each hazardous condition.

14. These sewer men are covered under provisions of globally accepted



nomenclature- Permit Required Confined Space entry protocol. (US-OSHA Code- 29 CFR 1910.146) which is described below.

A Confined Space is defined as a space that is large enough and so configured that an employee can bodily enter and perform assigned work, has a limited or restricted means for entry or exit (For example: tanks, vessels, silos, pits, vaults, hoppers) and is not designed for continuous employee occupancy.

A Permit Required Confined Space means 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.
- Contains any other serious safety or health hazard.

15. As per a report of United States Fire Administration, only 35.1% of Fire departments can carry out a technical/ Specialised rescue, which includes entry into sewers and such spaces. Thus a large number of government owned as well as private bodies train and maintain confined entry professionals who can undertake such jobs. These organisations are registered with the local bodies.

16. In India, we may expect an even lesser capability from the local fire brigade services. Thus the need to maintain a specialised trained and equipped entity at appropriate level to execute the necessary emergency sewer or septic tank entry cannot be overstated. It is proposed to maintain a lean but responsive organisation at appropriate level, to be called Emergency Response Sanitation Unit (ERSU) as described in the next chapter.

CHAPTER 2

Sewer and Septic Tank Maintenance Equipment available in Indian Market

1.0 Most of the equipment which will help in preventing need for entry into sewers or septic tanks if used for preventive operation and maintenance, are currently listed on the Government e-marketplace (GeM). These are tabulated hereunder:

Sl. No.	Name of the product	No of Models listed	Price Range (Rs)
1	Truck Chassis Mounted Suction Cum Jetting Machine-Heavy	73	43.00 - 174.24 Lakhs
2	Truck Chassis Mounted Suction Cum Jetting Machine (Medium)	40	39.15 - 79.04 Lakhs
3	Truck Chassis Mounted Suction Cum Jetting Machine (Small)	30	28.09 - 56.47 Lakhs
4	Super Sucker Machine	28	47.79 - 374.58 Lakhs
5	Super Sucker With Auxiliary Engine	2	245.00 - 324.00 Lakhs
6	Tractor Trailer Mounted Suction Cum Jetting Machine	109	2.74 - 26.68 Lakhs
7	Truck Mounted Suction Machine (Heavy)	8	23.5 - 85.00 Lakhs
8	Truck Mounted Suction Machine (Medium)	13	15.80 - 53.32 Lakhs
9	Truck Mounted Suction Machine	104	11.56 - 45.00 Lakhs
10	Tractor Trailer Mounted Suction Machine	27	5.40 - 16.55 Lakhs
11	Truck Chassis Mounted Jetting Machine	37	5.98 - 61.61 Lakhs
12	Combined- Suction, Jetting, Rodding and Grabbing	2	51.70- 52.95 Lakhs
13	Precast Manhole Covers	12	1050- 2000
14	Sewage Pumps	2	0.65- 4.90 Lakhs



The above is not an exhaustible list and many other machines and equipment can be procured of the shelf from open market. Efforts are being made to get all such equipment on the GeM portal.

2.0 The actual personal protection equipment needed for making an entry into septic tank or sewer is summarised hereunder and is further described in great detail at annexure-2

2.1 Testing and monitoring equipment The air within the confined space should be tested from outside of the confined space before entering into the confined space. Care should be taken to ensure that air is tested throughout the confined space. A trained worker using detection equipment which has remote probes and sampling lines should do

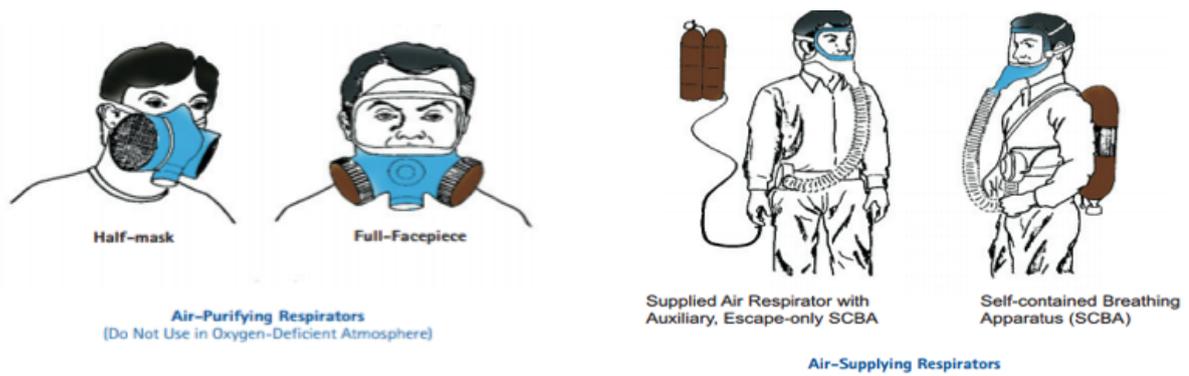
the air quality testing. The sampling should show that-

- a) the oxygen content is within safe limits - not too little and not too much.
 - b) A hazardous atmosphere (toxic gases, flammable atmosphere) is not present.
 - c) Ventilation equipment is operating properly
- Handheld probes/ meters as under are used for testing and monitoring

2.2 Communication devices- In large sewers, the Top man and the authorised entrant need to have assured communications. Hand held communication devices are used.

2.3 Ventilation equipment- The air inside the sewer and septic tank needs to be maintained at correct level for which normal ventilating blowers, vents, and ducts of different length are required.



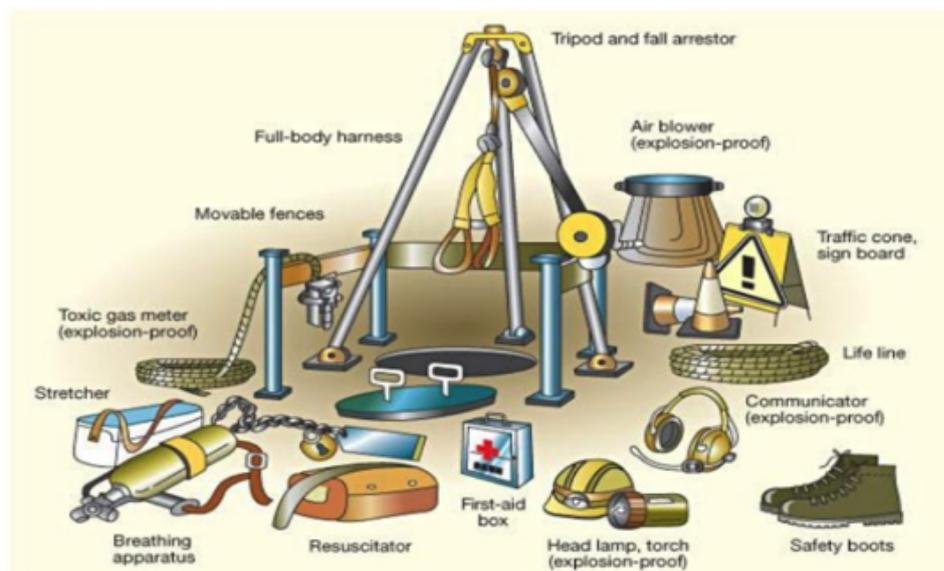


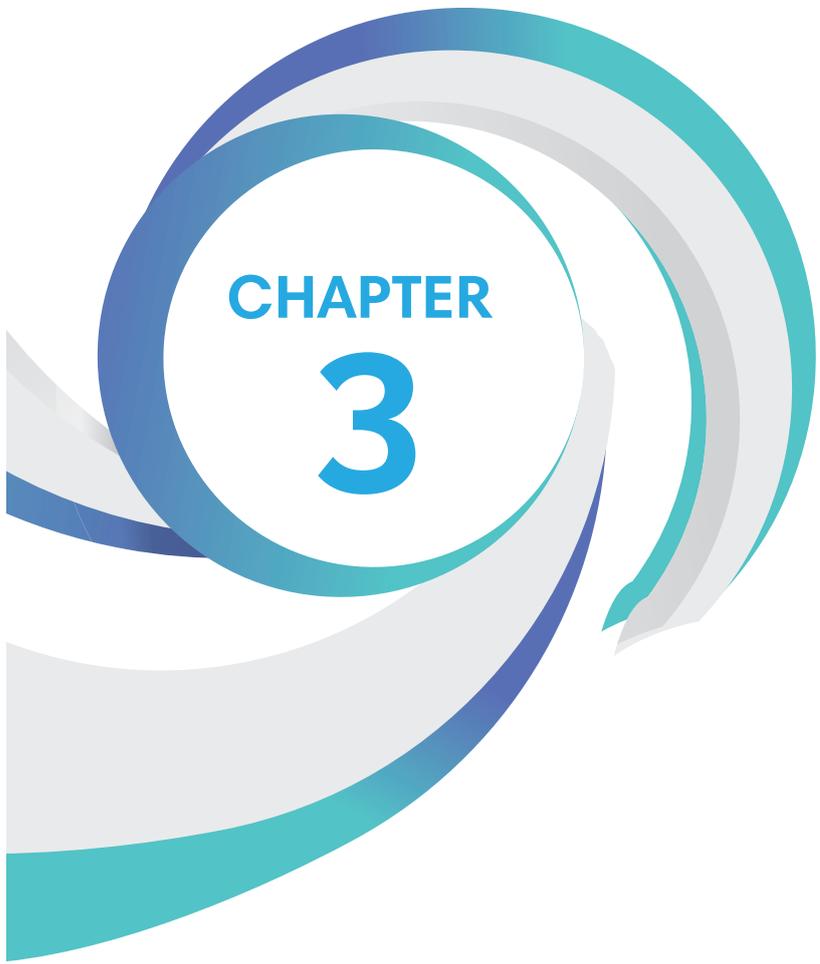
2.4 Personal protective equipment (PPE)- Various PPE components are listed in the IS Code. These can generally be shortlisted as - hard hats, respirators, goggles/face shield, hearing protection, gloves, and other protective clothing

Respirators are devices that can allow workers to safely breathe without inhaling toxic gases or particles. Two basic types are- air-purifiers, which filter dangerous substances from the air, and air-suppliers, which deliver a supply of safe breathing air from a tank or an uncontaminated area nearby. In case of a large sewer entry the later type (air suppliers) are essential.

2.5 Other Equipment/ Rescue Equipment- These are explained in detail at Annexure-2

2.6 Procurement- While it is the responsibility of the local municipal authority and the employer defined under Prohibition of Employment as Manual Scavengers & their Rehabilitation Rules to procure equipment and gear which facilitate elimination of need to enter sewers and septic tanks by way of preventive maintenance or which provide safety to sanitation workers who are required to enter them in an emergency, the Government of India has also introduced Swachhta Uddhami Yojana (SUY) of National Safai Karamcharis Finance & Development Corporation (NSKFDC) to facilitate erstwhile manual scavengers and safai karamcharis to provide soft loans for funding for Procurement and Operation of Sanitation Related Vehicles. This is described in Chapter 3





CHAPTER 3

Funding for Procurement and Operation of Sanitation Related Vehicles

1.0 OBJECTIVE

Most municipal entities are not fully equipped to manage solid and liquid waste being discharged in their jurisdiction despite this being an essential attribute to meet the twin objectives of cleanliness and control to disease among citizens. This municipal responsibility remains unfulfilled due to various reasons including non-availability of the appropriate infrastructure with the local bodies due to consideration of finances. On occasions it is noted that the existing sanitation workers are resistant to introduction of machinery due to concern that it may affect their employment.

In order to offset this situation, Ministry of Social Justice and Empowerment has evolved a scheme to provide soft loans to finance sanitation related vehicles such as Garbage Collection and Disposal Vehicles, Suction and Jetting Machine, Tippers, Vacuum Loaders etc. These loans can be availed through the Swachhta Uddhami Yojana (SUY) of National Safai Karamcharis Finance & Development Corporation (NSKFDC) by sanitation workers including the erstwhile manual scavengers.

2.0 BACKGROUND

National Safai Karamcharis Finance & Development Corporation is a wholly owned Govt. of India Undertaking under the Ministry of Social Justice & Empowerment (Mo SJ&E) was set up on 24th January 1997 as a Company "Not for Profit" under Section 25 of the Companies Act, 1956.

NSKFDC is in operation since October, 1997, as an Apex Corporation for the all round socio-economic upliftment of the Safai Karamcharis, Scavengers and their dependants throughout India.

3.0 MAIN FEATURES OF THE SCHEME

- (i) Liberated manual scavengers/Safai Karamcharis will avail financial assistance from NSKFDC for purchase of sanitation related vehicles.
- (ii) The beneficiaries will enter into contract with municipal bodies
- (iii) This will be a self sustaining model. Due charges will be paid by the respective municipalities to the beneficiaries.
- (iv) The loan will be highly subsidised.
- (v) NSKFDC will also provide skill development training to the beneficiaries, wherever required, along with stipend during the training period.

4.0 PURPOSE OF LOAN

To provide financial assistance for purchase of Garbage Trucks, Suction and Jetting Machine, Vacuum Loader etc. to Manual Scavengers, Safai Karamcharis and their dependents for starting or augmenting income generation activities.

5.0 QUANTUM OF LOAN

Under the Scheme, loan would be given to the SCAs/ Nationalised Banks and RRBs for further disbursement to individual beneficiaries/ self-help groups.

The maximum amount of loan to an individual will be Rs.15 lac (Rupees Fifteen Lac only).

6.0 RATE OF INTEREST

- i) Interest payable by the beneficiaries shall not exceed 4% per annum.
- ii) A rebate of 1% per annum on interest will be admissible to women beneficiaries.
- iii) A rebate of 0.5% will be extended to the beneficiaries for timely repayment.

7.0 REPAYMENT PERIOD

Term loans drawn from NSKFDC will be required to be repaid upto 10 years in quarterly instalments with a moratorium period of six months in addition to implementation period of 3 months.

8.0 SUBSIDY

Subsidy will also be payable under the Self Employment Scheme for Rehabilitation of Manual Scavengers (SRMS), in all such cases when the unit is set up by the manual scavengers identified in accordance with the "Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013. (Maximum eligible subsidy is Rs.3.25 lac).

9.0 GENERAL

a) Security Funds under the Scheme will be disbursed to the beneficiaries by NSKFDC through those SCAs/Nationalized Banks and RRBs, who have executed the General Loan Agreement and provided adequate Guarantee.

b) Utilisation of Loan

- i) SCAs/RRBs/Nationalised Banks, after sanction of loan, can draw funds as per requirement within the credit limit sanctioned, which will be generally for one year.
- ii) The funds made available to SCAs/ Nationalised Banks and RRBs are to be utilised within a period of 90 days from the date of release of funds. The SCAs/Nationalised Bank and RRBs Banks will be required to submit the utilisation of funds in the prescribed format. The funds remaining unutilized due to any reason, will be required to be refunded within a fortnight on expiry of utilisation period indicated in the sanction letter.

c) Liquidated Damages

Defaults in the repayment of NSKFDC dues (principal as well as interest) shall attract liquidated damages @ 2% p.a. over and above the normal rates of interest.

d) Books of Accounts/Inspections

The SCAs/Nationalised Banks and RRBs shall maintain separate accounts in respect of the funds provided by NSKFDC. The SCAs should also inspect the beneficiaries of the NSKFDC under the scheme and submit the quarterly progress report. Any other information required will also have to be submitted, as and when required.

10.0 NSKFCDC SCHEMES AT A GLANCE

SCHEMES AT A GLANCE					
(a) Loan based Schemes					
Sl. No.	Name of the scheme	Maximum Limit	Rate of interest to SCAs Beneficiaries		Repayment period
1	Mahila Samridhi Yojana (MSY)	Upto Rs.50000	1% p.a.	4% p.a	3 years*
2	Mahila Adhikarita Yojana (MAY)	Upto Rs.75000	2% p.a.	5% p.a.	5 years *
3	Micro Credit Finance (MCF)	Upto Rs.50000	2% p.a.	5% p.a.	3 years *
4	General Term Loan (GTL)	Upto Rs. 15 lac	3% p.a.	6% p.a.	10 years *
5.	Education Loan (EL) -For Study in India -For Study abroad	Upto Rs.10 lac Upto Rs.20 lac	1% p.a.	4% p.a.#	5 years after co-termination of course with moratorium period of one year.
6.	Swachhta Udyami Yojana - "Swachhta se Sampantta ki Aur"				
a)	Scheme for "Pay and use" Community toilets	Upto Rs.25 lac	-	4% p.a. @	10 years **
b)	Scheme for procurement of sanitation related vehicles	Upto Rs.15 lac	-	4% p.a. @	10 years *
7.	Sanitary Marts Scheme	Upto Rs.15 lac	-	4% p.a. @	10 years *
8.	Green Business Scheme	Upto Rs.1 lac	1%p.a.	3% p.a.	6 years ***

#0.5% rebate for female beneficiaries.
 * After implementation period of 3 months and moratorium of 6 months
 ** After implementation period of 6 months and moratorium of 6 months
 *** Including moratorium period of 6 months
 @1% rebate for women beneficiaries and 0.5% rebate for timely repayment.

B. Non-loan based schemes

SKILL DEVELOPMENT TRAINING PROGRAMMES

Objective

To provide technical, vocational and entrepreneurial training to the target group -

- To make them self-reliant;
- To enable them to take job employment/self employment or engage in any other income generating activities.
- To upgrade the skills for efficient management of the units set up by the Safai Karamcharis/Scavengers and their dependants.

Eligibility

- Safai Karmacharis/Scavengers and their dependants
- As per the admission requirements of the training institute
- Age group: 17-50 years or as prescribed by the concerned institute.

Financial assistance

- Financial assistance in the form of 100% grant is provided towards actual fee structure, tools and raw material cost and boarding & lodging charges in case of residential programmes, which is considered on actual basis and may vary from Institute to Institute.
- Stipend of Rs. 1500 p.m./per candidate is provided to the trainees during the period of training.

Popular Trades/courses

- | | |
|--|--|
| • Certificate Course in Computer Hardware Maintenance | • Dona Pattal Mfg. |
| • Beauty Parlour | • Agarbatti & Dhoopbatti Mfg. |
| • Cutting & Tailoring/Fashion Designing | • Making of Food Products (Papad, Badi & Pickles etc.) |
| • Plumbing & Sanitary work | • Basic Computer Application |
| • Commercial Motor Driving Training (LMV) with training on Self Defence techniques and Soft Skills | • Embroidery Work |
| • Mobile Phone Repair including hardware & software | • Domestic Appliances Repairing & Maintenance |
| • Welder/Fitter | • Refrigeration and Air Conditioning |
| • Electrical & Motor Winding | • Apparel Pattern Making |
| • Videography / Photography | • Apparel Production & Quality Control |
| | • Garment Construction Techniques |
| | • Plastic Injection and Technology |

11.0 CONTACT INFORMATION FOR FURTHER DETAILS: HAVE BEEN GIVEN AT ANNEXURE-5.

CHAPTER 4

Organisation and Operation of Emergency Response Sanitation Units

1.0 NEED FOR ESTABLISHING EMERGENCY RESPONSE SANITATION UNIT (ERSU)

The Government of India is committed to ensure that no person needs to enter any sewer or septic tank, unless absolutely inescapable in interest of greater public hygiene. The employer implied in the Prohibition of Employment as Manual Scavengers and their Rehabilitation Act/Rules, 2013, who engage the sanitation workers for cleaning of sewers and septic tanks do not have adequate knowledge (particularly the private firms and individuals) and resources to ensure safe entry into the hazardous confined spaces which causes untoward accidents. It is therefore, important to establish and maintain adequately equipped professional entity to ensure quick resolution of maintenance and management issues of sanitation sector.

CPHEEO, the technical wing of MoHUA regularly scans the international horizon to look for improvement in sewer and septic tank management equipment and practices and these developments are included in the Ministry's advisories and reference manuals. To this end, a Global Technology Challenge (GTC) was also

organized by the Ministry in July 2018, with an aim to scope, scale and catalyse technological and business solutions to eliminate human entry into septic tanks and sewers. A reasonable number of potential solutions were received and appraised by a committee of selected international experts.

It is noted that every type of equipment employed for maintenance of sewers and septic tanks by towns in developed nations, is also available in open market in India. It is also a fact that even in developed and progressive nations, professional sanitation workers are required to enter sewers and septic tanks to remove chokes or for major maintenance works. However, this exercise is invariably carried out by well trained and equipped professionals wearing proper protective gear and observing all laid down safety protocols and only when it is not practical to get the desired results without human entry.

From above, the primary reason for occurrence of deaths in sewers and septic tanks in the country is understood to be due to non-use of personal protective equipment (PPE) and poor state of training of the person entering the confined space as well as non-adherence to security protocols by the operators and their supervisors in field.

Since, improvement in the level of urban sanitation in India, will invariably lead to increase in number of sewer manholes and septic tanks and the need for their management, it is need of hour to systemise human entry into sewer/septic

tank through organization of a professional, well trained, motivated and appropriately equipped establishment called Emergency Response Sanitation Unit (ERSU).

1.1 Objectives of ESRU

The main objective of the ERSU is to provide professional, well trained, motivated and appropriately equipped workforce for the maintenance and management of sewers and septic tanks, thereby eliminating the deaths caused by entry of workers into sewers and septic tanks without proper PPEs & training and non-adherence to security protocols.

2.0 OWNERSHIP OF SEWERS AND SEPTIC TANKS BASED ON NATURE OF WASTEWATER COLLECTION SYSTEMS IN URBAN INDIA

Based on the type/ size of sewer/septic tank, the ownership of such structures rests with:

2.1 Sewers

- a) Water Supply and Sewerage Boards, etc.
- b) Urban Local Bodies
- c) Institutions- public or private educational institutes, industrial estates, major office complexes, townships, residential complexes, Resident Welfare Associations (RWAs), , hotels etc.

2.2 Septic Tanks

- a) Urban Local Bodies- for slum clusters etc
- b) Industrial establishments, Institutions, Hotels, Restaurants etc.
- c) Individual households (Generally Septic Tanks with sanitary drains)

3.0 SALIENT FEATURES OF ERSU

- a) Emergency Response Sanitation Units will be set up in major cities which have Municipal Corporation and/or Water & Sewer Board (in whatever local name) and in capital cities of each State/UT. The ERSU shall be responsible to meet sanitation emergency requests from all smaller towns within a cluster say 75 KM radius;

- b) The Emergency Response Sanitation Unit shall be generally based on structure of the Fire Services/ Fire Brigade; It will be provided a dedicated 3 or 4 digit registered telephone number (RTN)/ hotline. This RTN will be common for all ERSUs in the State/ UT.
- c) Normal cleaning/ suction of sewer/ septic tanks which does not require entry of a person into sewers/ septic tanks/ nallahs may be undertaken by contractors/ vendors as well as by the empanelled PSSOs (without any effect on their primary task with ERSUs). For this too, available technology may be deployed and SUY funds made available.

3.1 Roles and responsibilities of ESRU

- a) State/UT may designate the District Magistrate or Municipal Commissioner of a major town (designated as the base town) as Responsible Sanitation Authority (RSA) for his own jurisdiction as well as smaller clustered towns.
 - a. Note- For cities/ towns, where a significant proportion of sewers are to be maintained by any entity other than the municipal authority, such as the Jal Board, the CEO/Regional Head of such authority may be designated as RSA for a particular jurisdiction.
 - b) Staff for ERSU will be arranged by the RSA. It shall consist of a headquarters and a 24x7 response contact number.
 - c) Sewer Entry Professionals (SEPs) may preferably be selected from traditionally employed sanitation workers. They must be comprehensively trained on their job and safety/security measures so that they do not risk their lives in cleaning of sewer/septic tanks;
 - d) It is not necessary to employ all the SEPs on permanent government strength. Professionally trained and equipped Private Sanitation Service Organizations (PSSOs) may also be empanelled by respective ERSUs to provide an assured number of private SEPs (pSEPs) and equipment sets. These PSSOs should also preferably employ those persons who have been traditionally engaged in sewer/ septic tank cleaning in the area;
 - e) RSA should procure adequate full sets of

protective equipment (both personal and institutional) and maintain them at optimal efficiency at all times. Whenever, a SEP Team is tasked to carry out the job, they may be issued the protective gear and other equipment and should be allowed to do the job under Supervision of a trained officer of RSA;

- f) Entry of any individual other than member of a trained SEP Team specifically deputed from ERSU into sewers or septic tanks without permission of ERSU shall be deemed contravention of the PEMSRA Act, 2013, such individuals and the entity/ person allowing such entry directly or indirectly, will be held criminally liable under the Act. RSA will be empowered take necessary action in this regard;
- g) The RSA will notify charges/ fees for services provided by ERSU from time to time, which shall be binding on the smaller cluster towns dependent on the ERSU;

3.2 Organogram



3.3 Training and Equipment

The RSA will arrange to provide periodic upgradation, and necessary equipment, vehicles, other logistics and proper functioning of ERSU.

RSA will also prescribe conditions and eligibility of PSSOs, procedure for empanelment, guidelines and protocols to be followed by PSSOs in carrying out assignment, equipment and safety gears to be kept, training of PSEPs and procedure for de-empanelment, etc. PSSOs who provide such services may be permitted to buy such equipment under various subsidised schemes of the government;

The RSA will arrange for adequate training to the employees involved in sewer and septic tank maintenance and management. State Government / Local Government will provide necessary funds for this purpose.

3.4 Norms of ESRU for different categories of cities.

- a) Necessary number of Sewer Entry Professionals (SEPs), roughly scaled at one SEP Team per 500 septic tanks or 50 KM of Sewers should be maintained by each ERSU;

4.0 MECHANISM FOR DECISION MAKING FOR CLEARING OF SEWAGE OVERFLOW FROM SEWER MANHOLES

- a) When Human Entry is not needed-
In case of an overflowing sewer, an informed decision will be taken by the owner (Sewerage Board/ULB/others) to get the blockage cleared by any of the measures mentioned below-
 - (i) Through engagement of self-owned equipment used by trained sanitation workers- if held by the owner - parastatal agencies, municipal body, institutions or industries;
 - (ii) Clearing of the blockage by way of engaging registered private sanitation services providers, when necessary equipment and trained personnel are not held by the owner itself.

- b) When Human Entry is required
Communication will invariably be made with ERSU to undertake the task.

5.0 OUTLINE MECHANISM FOR DECISION MAKING FOR CLEARING OF BLOCKAGE/ EMPTYING OF SEPTIC TANKS

- a) When Human Entry is not needed
 - (i) If the Septic Tank is owned by the Parastatal or municipal body, they may undertake to clear the blockage by self-owned equipment engaging their sanitation workers or that from registered private sanitation services providers.
 - (ii) If the Septic Tank is owned by any other entity, they shall perform inform ERSU on the RTN, notwithstanding the fact whether manual entry is needed or not. It will be the responsibility of Municipality to clear/emptying of private septic tanks on request by their sanitation workers or from registered private sanitation service providers.
- b) When Human Entry is required
A request to undertake the task will invariably be made to ERSU on the RTN .

6.0 COMPOSITION OF ERSU

- a) Nominated Responsible Sanitation Authority (RSA)
- b) Telephone Operators- to receive the emergency call... as needed
- c) Duty Supervisor – May be in rotation from among Sanitary Inspector/ Jr Engineer (PHED) in the ULB
- d) Sewer Entry Professionals- Dedicated Teams of at least two trained persons. One SEP team to be maintained per 500 septic tanks/ 50 KM of Sewer length.
- (i) Authorised Entrants- individuals who are authorized by the employer to enter a sewer or Septic tank
- (ii) Attendent/ Top Man - an individual stationed outside who monitors the authorized entrant and performs all attendant's duties assigned in the SOP for Sewer

These persons may be –

- a) private individuals available on contract or
- b) specifically trained employees of a registered private sanitation service organisation (PSSO)
- c) selected employees of municipal body.

- d) On priority Call- Paramedic team with ambulance, police constable.

7.0 DUTIES AND RESPONSIBILITIES OF VARIOUS PERSONNEL OF ERSU

7.1 RSA

The RSA may be provided powers under relevant Acts to be a single authority in his jurisdiction, for ensuring safe and successful sewer/ septic tank entry.

7.2 Telephone Operator

- a) To receive call
- b) To inform Duty Supervisor
- c) To maintain record
- d) To inform On priority Call paramedics, ambulance and police personnel and the SEP Team members on directions by duty supervisors
- e) In case of a privately owned Septic tank where the request has been received on RTN, the operator will inform the appropriate local body/ private sanitation services providers to address non-entry removal of the choke.

7.3 Duty Supervisor.

- a) To immediately reach site of sewer/ septic tank overflow
- b) Collect information from owner/ officials of Sewerage board/ Municipal board who were already carrying out the non-entry procedures.
- c) Evaluate and identify hazards before entry.
- d) Request permission from RSA (in writing) to arrange the sewer entry procedure
- e) Instruct the telephone operator to arrange the SEP team and other on priority call personnel.
- f) To arrange release of necessary protective gear and site equipment from the ERSU store, if not held by the SEP Team and ensure availability at site in proper working condition.
- g) Verify conditions are safe for entry.
- h) To oversee the entire sewer/ septic tank entry process
- i) Ensure acceptable entry conditions are maintained

- j) To call off the sewer/ septic entry if he feels any danger to the authorized entrant
- k) To report completion of task to RSA

responsible to ensure their availability at time and place of need in terms of the quantity, quality and state of serviceability.

7.4 Authorised Entrant

- a) Trained to know the hazards associated with confined space entry, and in particular, the hazards associated with sewer and septic tank entry.
- b) Should be trained to use all required equipment.
- c) Know the procedures for communication with the top man/attendant.
- d) Know how to alert the attendant of hazardous or prohibited conditions.
- e) Know how to exit the space if necessary (that is, self rescue).

Based on the type of requisition received, ERSU may further delegate the non-entry type work to either the ULB or registered private vendor or use their own equipment/resources. However, as and when requirement of human entry is deemed unavoidable, the RSA shall assume full authority and responsibility at the site of the entry till the action is deemed complete.

7.5 Top Man/ Attendant

- a) Knows the hazards that may be faced during entry
- b) Remains outside the sewer/ septic tank during entry operations until relieved by another attendant;
- c) Is aware of possible behavioral effects of hazard exposure in authorized entrants
- d) Monitors activities inside and outside the space
- e) Only the Top man should communicate with authorized entrants
- f) Summons rescue and other emergency services
- g) Performs non-entry rescues as specified by the employer's rescue procedure
- h) Performs no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants.

8.0 MANAGEMENT OF ERSU

ERSU may not physically bear any dedicated person on its staff, if it can arrange the number and type of trained persons from the rolls of municipal authority, parastatals, private sanitation organisations, NGOs etc. Similarly, the equipment required by ERSU may be actually maintained and serviced by the local municipal body or parastatal. However, the RSA is solely

ANNEXURE-1

Indian Standard Code of practice for safety precautions to be taken when entering a sewerage system (IS-11972:1987) (Reaffirmed 2002)

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 inherent 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 sewer men of the equipments being used by them. This standard has been prepared with a view to provide some basic guidance for selection of sewer men 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.

1. SCOPE

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

2. SELECTION OF SEWER MEN

- 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 Sewer men - General guidance for selecting sewer men 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 exit 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 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;
- 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 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.

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 sewer men 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 topman calls to the man working in the sewer. Every message shall be acknowledged.

STEP 5 - Completion of Work

- a) Top man informed and ready;
- b) Ganger (normally last man 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 available, 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-I. REQUIREMENTS FOR DUTIES NOT REQUIRING ENTRY INTO CONFINED SPACE

A-I.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) Claustrophobia 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.



ANNEXURE-2

EXTRACT FROM MANUAL ON SEWERAGE AND SEWAGE TREATMENT SYSTEMS Chapter 9 of Vol-2

CONFINED SPACE HAZARDS

The potential for build-up of toxic or combustible gas mixture and/or oxygen deficiency exists in all confined spaces. The entry into confined space should not be permitted until it is ensured to be safe as in Table below.

Substance	Concentration
Oxygen	19.5% and more
Hydrogen Sulphide	Less than 10 parts per million
Combustible gases	Less than 10%

Measurement should be done at three locations – top, middle and bottom of the confined space – since the oxygen concentration differs according to the position.



PERSONAL PROTECTION AND PROTECTIVE DEVICES

Head Protection

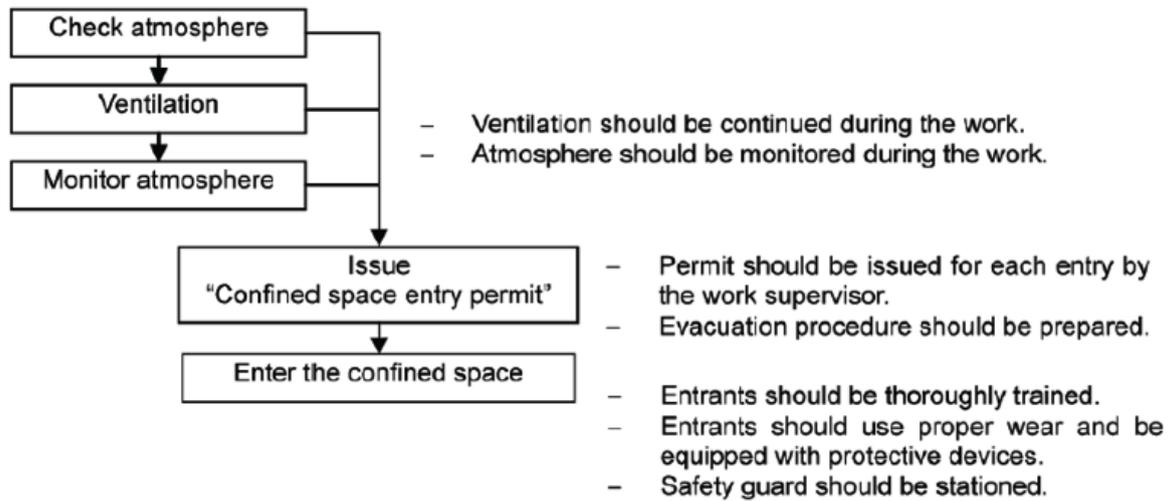
- All personnel working in any areas where there may be danger from falling, flying tools or other objects must wear approved hard hats. Such hats should be according to the relevant BIS. Specially insulated hard hats must be worn when working around high voltage to protect the personnel from electrical shock.

- It is advisable to have detachable cradle and sweat bands for two reasons (1) to permit easy replacement of cradles and sweat bands and (2) to make possible assignment of one helmet to several workers each with its own cradle and sweat band for sanitary reasons.
- Once broken, the crown of a hard hat cannot be effectively repaired. It must be replaced.

Face and Eye Protection

- Impact goggles must be worn mandatorily to protect against flying objects. They can be spectacle or cup goggles.
- Spectacle goggles must have rigid frame to hold lenses in proper position before the eyes. Frames must be corrosion resistant and simple in design for cleaning and disinfection.
- Cup goggles should have cups large enough to protect the eye socket and to distribute impact over a wide area of facial bones.
- Chemical goggles and acid hoods should be used for protection against splashes of corrosive chemicals. A hood treated with chemical-resistance material having a glass or plastic window gives good protection. There should be a secure joint between the window (glass or plastic) and hood material.
- Face shields can be used against light impact. Plastic shields should be non- inflammable and free from scratches or other flaws, which introduce distortions.
- Welding masks must be used for protection from splashes and radiation produced by welding.
- Protective creams are used to protect the skin from contamination and penetration by oils, greases, paints, dust etc.

Confined Space Entry Procedure given below must be adopted



Hands and Lower Arms

- Protective sleeves, gloves and finger pads are used for different types of hazards and jobs.
- Rubber and asbestos gloves should be long enough to come well above the wrist, leaving no gap between the glove and coat or shirtsleeve.
- Gloves or mittens having metal parts should never be used around electrical equipment.
- Linemen and electricians working on energized or high voltage electrical equipment require specially made and tested rubber gloves.

Body Protection

- A good quality diver suit should be provided to the diver whose services are very necessary while plugging the sewer line or removal of some hard blockage due to stone etc. at the mouth of the pipe in the manholes. Depending upon the site condition, the suit should have a provision to connect to an air-line with compressor or oxygen cylinder.
- Always use rubber aprons when working with chemicals.

Legs and Feet

- Leggings are provided where leg protection is necessary and are in the same category as coats, frocks and aprons. Kneepads made of cloth, padding, rubber, cork are used on jobs where kneeling is required.
- Ordinary work shoes are acceptable. They should have non-skid soles to prevent slips.

- Safety shoes are required where there is danger of dropping tools or materials on the feet. Toe guards have been designed for the men to wear when operating machines like air hammers, concrete breakers etc.
- For working on electrical equipment suitable safety shoes must be used.

Masks

A. Gas Mask- General purpose gas masks are used for respiratory protection from low and moderately high concentrations of all types of toxic gases and vapours present in the atmosphere in which there is sufficient oxygen to support life. The masks afford necessary respiratory protection under many circumstances but it is most important to know the limitations of the various types available and to be familiar with their use.

Even when masks are used properly, other precautions such as never using open flames or creating sparks in the presence of inflammable gases must be taken.

The general purpose gas masks afford protection against organic vapours, acid gases, carbon monoxide up to 2 % concentration, toxic dusts, fumes and



smoke. The gas mask consists of a face piece, a canister containing purifying chemicals, a timer for showing duration of service and a harness for support. Protection against specific contaminants can be achieved by the selection of appropriate canisters.

Persons using gas masks should practice regularly with them in order to become proficient in putting them on quickly and breathing through them. Gas masks should not be used in oxygen deficient atmospheres, in unventilated locations or areas where large concentrations of poisonous gases may exist.

B. Dust Protection Mask- This mask consists of a fine particle filter due to which suspended fine particles in the air are not allowed to enter into the respiratory system of the user. This protects the user from inhaling toxic fine particles laden ambient air and hence, protects the health of workers using this mask.

C. Respiratory Equipment- In all dusty areas, effective filter masks should be used to guard against specific hazards. Hose mask should be used by men entering tanks or pits where there may be dangerous concentrations of dust, vapour, gases or insufficient oxygen. Hose mask with blower and the airline respirator are used where the hazard is immediate, that is, hasty escape would be impossible or cannot be made without serious injury if there is failure of the equipment.

Oxygen or air breathing apparatus, that is, self-contained oxygen breathing equipment using cylinders or bottles of compressed oxygen or air is used where required. This is a must when the length of the hose pipe in on-line supply of oxygen exceeds more than 45 m.

Gas masks: Canisters consist of a face piece connected by a tube to a canister. Chemicals in the canister purify contaminated air. No single chemical has been found to remove all gaseous contaminants. It does not supply oxygen and can be used where there is sufficient oxygen.

Various types of respirators and their suitability are as follows:

Self-contained breathing apparatus- This apparatus is equipped with a cylinder containing compressed oxygen or air, which can be strapped on to the body of the user or with a canister, which produces oxygen chemically when a reaction is triggered.



This type of equipment is suitable for an oxygen deficient atmosphere. It is also suitable for spaces having high concentration of chlorine.

Air-line respirator: Air-line length 90 m (maximum)

It is suitable in any atmosphere, regardless of the degree of contamination or oxygen deficiency, provided that clean, breathable air can be reached. This device is suitable for high concentrations of chlorine, provided conditions permit safe escape if the air supply fails.

Ear Protection- Where noise levels are high and exceed specified limits, effective ear-pads or earplugs to be used.

Safety Belt- When you work on ladders or scaffolding, use extreme caution to prevent falls. Safety belt should be used to prevent falls.

Portable Lighting Equipment- The equipment normally used is portable electric hand lamps of permissible types, electric cap lamps and explosion-proof flashlights.

Portable Blowers / Ventilating Fan- Replace the air in oxygen deficient and hazardous spaces with fresh air using exhaust fan and exhaust ducts. Ventilation also includes exhausting the air, but generally blowing in air is more effective.



ANNEXURE-3

Standard Operating Procedure for Cleaning of Sewers and Septic Tanks

CLEANING OF SEWERS

Mechanical means of cleaning of sewers is most preferred method and shall be employed to the extent possible. Manual entry for hazardous cleaning of sewers is completely ban as per the Act & Rules, 2013. To operate and maintain a sewer collection system to function as intended, the maintenance engineer should try to strive towards the objectives to minimize the number of blockages per unit length of sewer, and to minimize the number of odour complaints. For this purpose, sewer-cleaning using hydraulic or mechanical cleaning methods needs to be done on a scheduled basis to remove accumulated debris in the pipe such as sand, silt, grease, roots and rocks.

Cleaning Frequency

The frequency of cleaning of sewers is based on the prevailing local conditions and determined through field inspections & complaints received from the residents of the area. However, it is desirable to clean the sewer at least once in every 6 months (ideally once just before monsoon season). Inspections and examinations of the sewers and septic tanks shall be made before to start the cleaning which are explained in SOP.

Procedures for Cleaning of Sewers

MECHANICAL

Step 1: Reaching the site

- i. Selection of prospective employees for the sewage and septic tank disposal functions should take into account the duties they will be expected to perform;
- ii. The complete hazard involved in the cleaning activity should be explained clearly to the employees by the supervisor and should get their consent in written before to start cleaning activities;

- iii. A supervisor along with adequate machinery and staff shall reach the designated site, preferably during lean period of sewage flow in sewers;
- iv. The supervisor shall have the names, address and emergency contact information of the staff involved in cleaning the sewers; and
- v. Appropriate protective gears and safety devices shall be worn by the staff before beginning the work of cleaning the sewers.

Step 2: Identification and isolation of the area

- i. Identify the stretch to be cleaned and identify the manholes associated with the stretch;
- ii. Barricade the area where cleaning is to be carried out; and
- iii. A flag man shall be stationed at least 15 m ahead of the site and should be visible to incoming traffic for at least 150 m.

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

- i. Ventilate the sewer line by opening 2-3 manholes on both sides of the working stretch for at least 1 hour before to start the work to ensure escape of toxic gases;
- ii. Use gas monitor, detector lamp, wet acetate paper or gas detector masks to detect any residues of poisonous gases like hydrogen sulphide, carbon monoxide, methane and gasoline vapours;
- iii. If gases are detected, extend waiting period to allow residual gases to escape and to avoid the chance of explosion, in case. Repeat the procedure many times for checking the escape of toxic gases;
- iv. Before to start the cleaning operation, employees shall check for hindrances that may delay the cleaning process; and
- v. Dummy covers with welded fabric or wire net shall be used to cover the manhole, if required.

Step 4: Removal of silt/wax - Mechanical Process

- i. Appropriate machines, at least to the extent specified in this SOP are to be used to remove the silt/wax;
- ii. The operating procedures of these machines shall be strictly followed for cleaning; and
- iii. Lid shall be closed tightly after cleaning.

Step 5: Departing from the site

- i. All the equipment/machineries along with the protective gears and safety devices that had any direct contact with the sewage shall be cleaned properly as per the cleaning procedure specified by the manufacturer;
- ii. All the equipment, safety gears, barricades etc shall be removed from the working area and the crew shall move to the base or to the next site; and
- iii. The entire operation shall be monitored and documented by the supervisor.

MANUAL

Step 1: Reaching the site

- i. Selection of prospective employees for the sewage and septic tank disposal functions should take into account the duties they will be expected to perform;
- ii. The complete hazard involved in the cleaning activity should be explained clearly to the employees by the supervisor and should get their consent in written before to start cleaning activities;
- iii. A supervisor along with adequate machinery and staff shall reach the designated site, preferably during lean period of sewage flow in sewers;
- iv. The supervisor shall have the names, address and emergency contact information of the staff involved in cleaning the sewers; and
- v. Appropriate protective gears and safety devices shall be worn by the staff before to start the work on cleaning the sewers.

Step 2: Identification and isolation of the area

- i. Identify the stretch to be cleaned and identify the manholes associated with the stretch;

- ii. Barricade the area where cleaning is to be carried out; and
- iii. A flag man shall be stationed at least 15 m ahead of the site and should be visible to incoming traffic for at least 150 m.

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

- i. Ventilate the sewer line by opening 2-3 manholes on both sides of the working stretch for at least 1 hour before to start the work to ensure escape of toxic gases;
- ii. Use gas monitor, detector lamp, wet acetate paper or gas detector masks to detect any residues of poisonous gases like hydrogen sulphide, carbon monoxide, methane and gasoline vapours;
- iii. If gases are detected, extend waiting period to allow residual gases to escape and to avoid the chance of casualty, in case. Repeat the procedure many times for checking the escape of toxic gases;
- iv. Before to start the cleaning operation, employees shall check for hindrances that may delay the cleaning process; and
- v. Dummy covers with welded fabric or wire net shall be used to cover the manhole, if required.

Step 4: Removal of silt/clogs/rocks

- i. Identify and close off or re-route the inlet sewage of the identified stretch, if possible;
- ii. Check the oxygen level in the manhole. If it is less than 19.5% or greater than 21% at any of the three levels (i.e., bottom, middle and top), the staffs shall not be allowed to enter the manhole;
- iii. Air should be supplied into the manholes or to make provision of ventilation to achieve the desired oxygen level;
- iv. The staff shall wear full bodysuit if entering manholes of more than 5 ft. depth or partial fishing wade suits if entering manholes of less than 5 ft. depth;
- v. All the staffs entering the sewer shall wear helmet attached with head lamp;
- vi. The staff entering the sewer shall preferably wear full-face mask having escape breathing

- apparatus with at least 10-minute air supply along with other appropriate protective gears and safety devices;
- vii. Safety belt shall be fastened tightly onto their suit;
 - viii. The staff shall have extra flashlights and communication devices such as two-way radios;
 - ix. The staff shall check for the stability of the manhole walls and the strength of the rope ladder and descend into the manhole carefully after getting the permission of the supervisor;
 - x. The persons entering the manhole shall be monitored by CCTV cameras or any other suitable mechanism at the ground;
 - xi. Clogs/silt/rocks shall be removed by using appropriate machineries/equipment and dump it in designated areas;
 - xii. Pull the staff out of the manhole after completion of cleaning activities;
 - xiii. Manhole lid shall be closed tightly after cleaning; and
 - xiv. At a stretch, a duration not exceeding 90 minute shall be taken for cleaning the sewers and a mandatory interval of 30 minute shall be given to the staff involved in cleaning between two intervals.

Step 5: Departing from the site

- i. All the equipment/machineries along with the protective gears and safety devices that had any direct contact with the sewage shall be cleaned properly as per the cleaning procedure specified by the manufacturer;
- ii. All the equipment, safety gears, barricades etc. shall be removed from the working area and the crew shall move to the base or to the next site; and
- iii. The entire operation shall be monitored and documented by the supervisor.

CLEANING OF SEPTIC TANKS

Cleaning Frequency

Regular cleaning of septic tanks through a systematic extraction and collection procedure is essential to check environmental pollution. The frequency of cleaning is determined by the

local conditions including loading rate and performance of septic tanks. However, it is ideal to clean the septic tanks once in one year or two years based on its design criteria. But in no case the cleaning frequency shall exceed two years.

Procedures followed for Cleaning of Septic Tanks

- (i) Inform the occupant of the pending service and note any concerns or issues;
- (ii) Inspect the site for possible hazards, such as clearing the area of people, or identifying high groundwater that could cause a tank to 'float', if emptied;
- (iii) Park the truck as close to the system as possible. The maximum distance is determined by the length of hose and elevation rise from the bottom of the pit or septic tank to the vacuum truck. This should typically be not more than 25 meters in linear distance and 4 meters in elevation gain. In case, the length and elevation is more than the specified, intermediate pumping may be required;
- (iv) Break the mortar seal of the septic tank lid. Inspect the tank for cracks or damage before and after the cleaning of tank;
- (v) Lay out and connect the hoses from the truck to the tank or pit to be emptied and secure the truck using wheel chocks;
- (vi) It is essential to ensure that the hose is in sound condition, and that the hose connections are locked into place prior to using this method;
- (vii) Follow the safety instruction as prescribed in above section of mechanical cleaning of sewers;
- (viii) Open the tank or pit by removing the access ports or covers over the storage system;
- (ix) Engage the vacuum equipment by using a power take-off from the truck's transmission;
- (x) Increase the vacuum to the proper level with the valve closed by watching the vacuum gauge, then lowering the end of the hose into the storage system, and open the valve sufficiently such that the faecal sludge is drawn out of the tank or pit;

- (xi) Break up faecal sludge that has agglomerated into a solid mass, either by making use of a long handle shovel and adding water when necessary;
- (xii) Operators should empty the septic tanks between 90% and 95% of its contents. It is recommended that this is verified by management through periodic spot checks;
- (xiii) Identify any abnormal conditions, such as high concentration of non-biodegradable materials, oils and grease before taking to the treatment plant for final disposal;
- (xiv) If the cover of the tank has been removed, it should be replaced and sealed with plaster. If desludging has been carried out through a desludging hatch, the cover of the hatch should be replaced and sealed with plaster;
- (xv) Clean up any spillage using proper sorbent materials. The top of the cover and the area around the septic tank is sprayed with 1 % chlorine solution;
- (xvi) Two sets of working clothes will be provided for each worker, which should be dedicated to be used only during the desludging process. Clothes worn during the desludging process should be removed before the workers return home;
- (xvii) Prepare a written report indicating: how much waste was removed; the condition of the tank or pit; any recommendations for repairs or maintenance; any recommendations for proper use of the system;
- (xviii) Inform the client that the work is complete, and give them the final report along with recommendations, if any; and
- (xix) Remove the wheel chocks and drive the truck to the next site or to the nearest approved disposal Site.

EMERGENCY PREPAREDNESS

- i. Emergency plan to execute the work shall be prepared before arriving the site
- ii. The supervisor and all the crew members involved in sewer cleaning should be familiarized with the emergency plan;
- iii. A tripod attached with rope & pulley and

- harness or some other suitable system shall be put in place for retrieving the injured worker.
- iv. A first aid kit distinctly marked with a red cross on white back ground shall be readily available at the site which should at least have the items listed in Annexure-I.
- iv. Wash-up material like soap & skin cream for applying on the body shall be adequately available at the site.
- v. A list of medical care centres available near the site may be prepared and made readily available;
- vi. Vehicle preferably an ambulance shall be available at the site for carrying the injured worker(s) to the hospital, in case of any emergency.

GAS EMERGENCY

- i. If a gas emergency occurs everyone should immediately put on their escape sets (breathing apparatus) and alarm raised.
- ii. 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.
- iii. 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.
- iv. 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 available, apply mouth to mouth breathing; and
 - c. Keep him lying down and wait for an ambulance.

PRECAUTIONS

Precautions against Gas Hazards (as mentioned in IS 11972:1987)

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:

- i. Allow no smoking or open flames and guard against spark.
- ii. Erect warning signs.
- iii. Use only safety gas-proof electric lighting equipment or mirror for reflection of light.
- iv. 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.
- v. 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.
- vi. 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 exit 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.
- vii. 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.
- viii. 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

- ix. 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 2m 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.

Precautions against Infection(as mentioned in IS 11972:1987) w

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

- i. 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.
- ii. 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 and to keep fingers out of nose, mouth and eyes, because the hands carry most infection.
- iii. 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.
- iv. 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.

- v. When the work is completed, thoroughly wash all contaminated parts of the body.

Precautions to be taken while working near Vehicular Traffic

- i. Workers (on foot) exposed to vehicular traffic must wear fluorescent flagging garments.
- ii. Workers shall not wear any type of headgear that can interfere with hearing back up alarms, warnings, etc.
- iii. When hazards to workers exist because of vehicular traffic, use traffic controls in conformance with the Local Transport Authority.
- iv. Additionally, controls such as detours, warning

signs, or barricades shall be used when necessary. Flagmen is required where these controls are ineffective.

- v. Wherever mobile equipment operation encroaches upon a public thoroughfare, a system of traffic controls must be used.

PROTECTIVE GEARS AND SAFETY DEVICES

All the protective gears and safety devices shall be checked once in every six months and repaired/replaced as necessary. Proper inventory of all the protective and safety gears to be maintained. The following are the protective gears and safety devices, but not limited to, as prescribed by Prohibition of Employment as Manual Scavengers and their Rehabilitation Rules, 2013 to prevent any hazardous entry of humans into the sewers.

S. No.	Protective gears and safety devices	S. No.	Protective gears and safety devices
1	Air compressor for blower	2	Airline breathing apparatus
3	Airline respirator with manually operated air blower	4	Air purifier gas mask/chin cortege
5	Artificial respiration/reticulate	6	Barrier caution tape
7	Barrier cream	8	Barrier cone
9	Blower	10	Breath mask
11	Breathing apparatus	12	Caution board
13	Chlorine mask	14	Emergency medical oxygen resuscitator kit
15	First aid box	16	Face mask
17	Gas monitor (4 gases)	18	Guide pipe set
19	Full body wader suit	20	Fishing wader suit attached with boots
21	Hand gloves	22	Head lamps
23	Helmet	24	Helmet demolishing
25	Lead acetate paper	26	Life guard pad
27	Modular airlines supply trolley system	28	Normal face mask
29	Nylon rope ladder - 5 m	30	Nylon safety belt
31	Pocket book	32	Port oxy
33	Raincoat	34	Reflecting jacket
35	Safety belt	36	Safety body clothing
37	Safety body harness	38	Safety goggles
39	Safety gumboots	40	Safety helmets
41	Safety showers	42	Safety torch
43	Safety tripod set	44	Search light

TYPE OF INSPECTIONS AND EXAMINATIONS OF SEWERS

Inspection and examination are the techniques used to gather information to develop operation and maintenance programmes to ensure that new and existing collection systems serve their intended purposes on a continuing basis. Inspection and testing are necessary to do the identify existing or potential problem areas in the collection system, evaluate the seriousness of detected problems, locate the position of problems, and provide clear, concise, and meaningful reports to supervisors regarding problems. There are two basic types of inspection and examination which are direct and indirect described below

Direct Method

Direct method is performed through direct visual inspection by the inspector who enters into the manhole with proper safety gear as prescribed. This shall never be done once a sewer has been put into service.

Indirect Method

CPHEEO's Manual on Sewerage and Sewage Treatment Systems, 2013 prescribes various methods of indirect inspection of sewer lines. Sewer system inspection technologies that are considered applicable to Indian conditions by the Manual are as follows:

S. No.	Technology	Applicability	
		Sewer size	Sewer condition
1	Light and Mirror	Up to 300 mm	Empty
2	Closed Circuit Camera	Any Size	Empty
3	Sonar Systems	Any Size	Full Flowing

Light and Mirror Method

Two successive manholes are opened and vented sufficiently for about an hour. Thereafter, a long hand-held mirror secured at 45 degrees to the

handle is lowered into the bottom of the manhole and a torch light is focused on the mirror from above so that the light beam is deflected by 90 degrees to travel horizontally through the sewer pipe and the light is seen in the opposite manhole. This is easier at dusk. This can tell whether the bore of the pipe is choked or clear or laid straight.

Closed Conduit Camera Method

The closed circuit camera is propelled through the sewer by a remote controlled wired power supply from a van and travels through the sewer and relays the picture of the inside to a TV in the van. The CCTV inspection can be used for sewer lines

as small as 100 mm. Above 900 mm diameter there are limitations due to lighting problems and camera line angles. The traction of the cameras is provided either by pulling winches, by pushing or self-traction. The former two are not used much at present. However, self-traction is suitable for use in sewers above 225 mm diameter.

Sonar System

The sonar system is similar. A robot is sent through the sewer and it emits high frequency sound waves, which impinge on the pipe surfaces and returns to the emitter as a reflection. By knowing the material of construction of the sewer pipe walls, this can be programmed to verify the structural condition of the wall of the sewers.

METHODS OF CLEANING SEWERS AND SEPTIC TANKS

Mechanical means of cleaning sewers is most preferred method and shall be employed wherever possible. Manual entry into the sewers shall be avoided as far as possible and shall be employed only in inevitable cases, that too with proper protective gears & other cleaning devices and ensuring observance of safety precautions. In no case hazardous cleaning of sewers shall be entertained by the ULBs or by private contractors as Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013 completely ban of hazardous cleaning of sewers.

Most often de-silting machines and jetting/ suction machines are employed by larger ULBs in the Country for cleaning their sewers. Various sewers cleaning methods are described in the CPHEEO's Manual on Sewerage and Sewage Treatment Systems, 2013. Some of them are described below. However, the Manual may be referred for further information in this regard.

MANUAL METHODS

Manila Rope and Cloth Ball

The most common way of cleaning small diameter sewers up to 300mm diameter is by the use of a manila rope and cloth ball. Flexible bamboo strips tied together are inserted in the sewer line by a person on top. If necessary, another person inside the manhole with full safety gears, precautionary measures and safety equipment help in pushing the rod through the sewer line. When the front end of the bamboo strip reaches the next manhole, a thick manila rope, with cloth ball at one end, is tied to the rear end of the bamboo splits. The bamboo splits are then pulled by another person in the downstream manhole and pushed through the sewer line. As the rope is pulled, the ball sweeps the sewer line and the accumulated grit is carried to the next manhole where it is removed out by means of buckets. This operation is repeated between the next manholes until the stretch of sewer line is cleaned. This action requires careful supervision.

Sectional Sewer Rods

These rods are used for cleaning small sewers. The sewer rods may be of bamboo or teak wood or light metal usually about one-meter-long at the end of which is a coupling, which remains intact in the sewer but can be easily disjuncted in the manhole. Sections of the rods are pushed down the sewer.

The front or the advancing end of the sewer rod is generally fitted with a brush, a rubber ring for cleaning or a cutting edge to cut and dislodge the obstructions. These rods are also useful to locate the obstruction from either manhole in case a particular portion of the sewer has to be

exposed for attending to the problem.

Scraper

The scraper is an assembly of wooden planks of slightly smaller size than the sewer to be cleaned. The scraper chains, attached to a control chain in the manhole into which it is lowered, are then connected to a winch in the next downstream manhole by means of chains. The winch is then operated to push the debris ahead of the scraper. The upward flow behind the scraper and the water dropping from the top of the scraper will also assist in pushing it in the forward direction. This ensures that the bottom and the sides of the sewer are cleaned thoroughly. The scraped debris are removed manually.

MECHANICAL METHODS

Sewer Cleaning Bucket Machine

The bucket machine consists of two powered winches with cables in between. For cleaning a section of sewer; the winches are centered over two adjacent manholes. To get the cable from one winch to the other, it is necessary to thread the cable through the sewer line by means of sewer rods or flexible split-bamboo rods. The cable from the drum of each winch is fastened to the barrel on each end of an expansion sewer bucket fitted with closing device, so that the bucket can be pulled in either direction by the machine on the appropriate end. The bucket is pulled into the loosened material to clean the sewer.

Rodding Machine with Flexible Sewer Rods

This consists of a machine, which rotates a flexible rod to which is attached a cleaning tool such as auger, corkscrew or hedgehog and sand cups. The flexible rod is guided through the manhole by a bent pipe. The machine propels the rod with the tool attached to one end, the other end being fixed to the machine. The rod is pulled in and out in quick succession when the tool is engaging the obstruction, so as to dislodge or loosen it. When the obstruction is cleared, the rod is pulled out by means of clamps keeping the rod propelled to facilitate quick and easy removal.

Hydraulically Propelled Devices

The hydraulically propelled devices take advantage of the force of impounded water to effectively clear sewers. The efficiency depends on the hydraulic principle that an increase in velocity in a moving stream is accompanied by a greatly increased ability to move entrained material. The transporting capacity of water varies as the sixth power of its velocity. The common hydraulically propelled devices are as follows:

- (i) Flush Bags
- (ii) Sewer Balls
- (iii) Sewer Scooters

Velocity Cleaners (Jetting Machines)

The high velocity sewer-cleaner makes use of high velocity water-jets to remove and dislodge obstructions. It combines the functions of a rodding machine and gully emptier machine. It includes a high-pressure hydraulic pump capable of delivering water at variable pressure up to about 8 MPa through a flexible hose to a sewer cleaning nozzle. The nozzle has one forward facing jet and a number of peripheral rearward facing jets. The high-pressure water coming out of the holes with a high velocity, breaks up, dislodges the obstructions and flushes the materials down the sewer. Moreover, by varying the pressure suitably, the nozzle itself acts as a jack-hammer and breaks up stubborn obstructions. A separate suction pump or airflow device may also be used to suck the dislodged material. The entire equipment is usually mounted on a heavy truck chassis with either a separate prime mover or a power take off for the suction device. The truck carries secondary treated sewage, if available, and if not untreated fresh water for the hydraulic jet. The truck also has a tank for the removed sludge and various controls grouped together for easy operation during sewer cleaning.

Now-a-days, Mini jetting machines are also available in the market which can travel into narrow lanes and clean the sewer lines up to a length of 200 feet (60 meters).

Dredger (Clam-shell) - for manhole cleaning

It consists of a grab bucket on a wire rope, which is lowered into the manhole in an open condition with the help of a crane and pulley. On reaching the bottom of the manhole, the segments are closed, and the accumulated silt is picked up. The bucket can be closed by wire ropes or by a pneumatically operated cylinder.

Gully Emptier (Suction Units)

Suction units create the vacuum required for siphoning of mud, slurry, grit and other materials. The vacuum elevated is such as to siphon the materials from the deep manholes catch-pits etc, having depth ranging from 1m to 8m in normal cases with an option to suck an additional 4m with the help of special accessories for the purpose. The unit can be vehicle or trolley mounted. Silt and heavy particles settled at the bottom can be agitated and loosened by pressurized air with the help of the pump and then sucked in a tank.

ANNEXURE-4

Relevant provisions of

- a) The Prohibition of Employment as Manual Scavengers and Their Rehabilitation Act, 2013 (25 of 2013), and
- b) The Prohibition of Employment as Manual Scavengers and their Rehabilitation Rules, 2013

The PEMSR Act of 2013, covers the matter of Hazardous Cleaning of Sewers in a perfunctorily manner as it is principally focused on eliminating the socially unacceptable practice of Manual Scavenging through-

- a) Time bound demolition/ conversion of insanitary toilets into sanitary toilets so that the very need of manual scavenging gets eliminated, and
- b) Rehabilitating Manual Scavengers without adverse effect on their livelihood.

Resultantly, the Act refers to the term “Hazardous Cleaning” only at Sec 2(d)- definition and at Sec 7 and Sec 9 which describes the punishment to be imposed in case of breach.

CHAPTER I PRELIMINARY

Sec 2(d) “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;

CHAPTER III PROHIBITION OF INSANITARY LATRINES AND EMPLOYMENT AND ENGAGEMENT AS MANUAL SCAVENGER

Sec 7. No person, local authority or any agency shall, from such date as the State Government may notify, which shall not be later than one year from the date of commencement of this Act, engage or

employ, either directly or indirectly, any person for hazardous cleaning of a sewer or a septic tank.

Sec 9. Whoever contravenes the provisions of section 7 shall for the first contravention be punishable with imprisonment for a term which may extend to two years or with fine which may extend to two lakh rupees or with both, and for any subsequent contravention with imprisonment which may extend to five years or with fine which may extend to five lakh rupees, or with both.

CHAPTER VIII MISCELLANEOUS

Sec 33. (1) It shall be the duty of every local authority and other agency to use appropriate technological appliances for cleaning of sewers, septic tanks and other spaces within their control with a view to eliminating the need for the manual handling of-excreta in the process of their cleaning.

(2) It shall be the duty of the appropriate Government to promote, through financial assistance, incentives and otherwise, the use of modern technology, as mentioned in subsection (1).

The PEMSR Rules, 2013 provide a more comprehensive chapter titled “Obligations of employer towards employees engaged in the cleaning of sewer or septic tank”. The same is reproduced verbatim, in the box below.

CHAPTER-II OBLIGATIONS OF EMPLOYER TOWARDS EM-

PLOYEES ENGAGED IN THE CLEANING OF SEWER OR SEPTIC TANK

3. (I) No person shall be allowed to clean a sewer manually. with the protective gear and safety devices under these rules except:-

(a) for the removal of concrete or FRP (Fibre Reinforced Plastic) or damaged manhole door where mechanical equipments cannot be put into operation.

(b) 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.

(c) for removal of submersible pump sets fixed at the bottom of the suction wells.

(d) for the reconstruction of the manhole or rectification of the sewer main.

(e) Any circumstance, when it is absolutely necessary to have manual sewage 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.

(2) For the purposes of clauses (c) and (d) of sub-rule "(I), before allowing entry of a person in the sewer, sewage shall be totally emptied.

Rule 4. Any person engaged to clean a sewer or a septic tank shall be provided by his employer, protective gear and safety devices including, but not limited to the following: -

- (i) Air compressor for blower
- (ii) Air line breathing apparatus
- (iii) Air line respirator with manually operated air blower
- (iv) Air Purifier, Gas mask/ chin cortege
- (v) Artificial respiration/Reticulate
- (vi) Barrier caution tape
- (vii) Barrier cream
- (viii) Barrier cone
- (ix) Blower
- (x) Breath mask
- (xi) Breathing Apparatus
- (xii) Caution board
- (xiii) Chlorine mask
- (xiv) Emergency medical oxygen resuscitator Kit
- (xv) First Aid Box

- (xvi) Face Mask
- (xvii) Gas Monitor (4 gases)
- (xviii) Guide Pipe Set
- (xix) Full body wader suit
- (xx) Fishing wader suit attached with boots
- (xxi) Hand gloves
- (xxii) Head Lamp
- (xxiii) Helmet
- (xxiv) Helmet demolishing
- (xxv) Lead acetate paper
- (xxvi) Life guard pad
- (xxvii) Modular Airlines Supply Trolley System
- (xxviii) Normal face mask
- (xxix) Nylon rope ladder 5 metres
- (xxx) Nylon safety belt
- (xxxi) Pocketbook
- (xxxii) Port oxy
- (xxxiii) Raincoat
- (xxxiv) Reflecting Jacket
- (xxxv) Safety belt
- (xxxvi) Safety body clothing
- (xxxvii) Safety body harness
- (xxxviii) Safety goggles
- (xxxix) Safety Gumboots
- (xl) Safety helmet
- (xli) Safety showers
- (xlii) Safety torch
- (xliii) Safety Tripod Set
- (xliv) Search light

Rule 5. The local authority shall ensure that the following cleaning devices are used by persons engaged in cleaning sewer or septic tanks, including but not limited to the following:

- (i) Sewer Line Cleaning Bucketing Machine
- (ii) Jetting Machine
- (iii) Suction Machine (Gulley Emptier)
- (iv) Combined Machine (Jetting cum Suction)
- (v) Deep Suction Combined Machine (Jetting cum Suction Machine)
- (vi) Manual Hand Operated Grab Bucket
- (vii) Hydraulic Operated Trolley Mounted Grab Bucket
- (viii) Truck Mounted Motor & Winch Operated Grab Bucket Machine
- (ix) Fixed Structure Mounted Motor & Winch Operated Grab Bucket Machine

- (x) Rickshaw Mounted Winch & Motor Operated Desilting Machine for Wet well
- (xi) Rickshaw Mounted Winch & Auxilliary Engine Operated Desilting Machine for Manhole
- (xii) Escort Hydra Crane Mounted Hydraulic Winch Operated Grab Bucket Desilting Machine
- (xiii) Manual rods, shovels, spades, drainage cleaning machines and steel scrapers with handles
- (xiv) Hoses and washing instruments

Rule 6.

- (1) All protective gear and safety devices under these rules shall be checked every six months and necessary repair or replacements shall be made by the employer who engages a person for cleaning a sewer or a septic tank.
- (2) Comfortable bodysuits shall be made available to the worker who has to enter sewers or septic tanks for their cleaning. The employer shall provide full body suits to workers entering manholes of depth more than five feet and alternatively, partial fishing wader body suits to those entering manholes of depth less than five feet.
- (3) The employer shall also ensure the following safety precautions before a person is engaged in the cleaning of a sewer or a septic tank, namely:-
 - (a) There shall be a minimum of three employees present all the time, one of whom shall be a supervisor.
 - (b) The atmosphere within the confined space shall be tested for oxygen deficiency and toxic and combustible gases including but not limited to poisonous gases like Hydrogen Sulphide, Carbon Monoxide, Methane, and gasoline vapours, through detection tests including the following: -
 - (i) lowering a detector lamp into the manhole,
 - (ii) inserting wet lead acetate paper which changes colour in the presence of hazardous gases,
 - (iii) detection of gases through gas detector masks.
- (c) Before starting the cleaning under sub-rule (1) the supervisor referred to in clause (a) of sub-rule (3) has inspected and determined if the sewer serves any industries nearby to anticipate any hazardous atmosphere that may be encountered,
- (d) The condition of metal-rung ladders and the side walls of the manhole shall be checked to see if there is any danger of collapse.
- (e) Traffic and pedestrian barricades are provided all the times.
- (f) A flag man should be stationed at least 50 feet ahead or a site and should be visible to incoming traffic for at least 500 feet.
- (g) Regular medical check-up of sewage workers which shall include the examination of respiratory organs, skin injuries, and other occupational diseases and injuries for their treatment to ensure that sewage workers afflicted with such diseases or injuries do not enter sewers for cleaning.
- (h) Regular vaccination against respiratory and skin diseases and other occupational diseases to which these workers are prone due to exposure to harmful substances and gases in sewers.
- (i) All employees who are present on-site during cleaning work are given training and adequately familiarised with the knowledge to operate all equipment involved in cleaning work to avoid injuries or diseases associated with such work and to take necessary steps in case of emergency arising at the place of work and the training shall be conducted every two years and the employees shall be familiarised with any changes in method and technique with respect to the above.
- (j) The supervisor possesses and keeps handy the names, addresses and telephone numbers of the nearest hospitals or clinics.
- (k) Cleaning of a sewer or a septic tank shall be done:-
 - (i) only in day-light; and
 - (ii) for a duration not exceeding 90 minutes, at a stretch. There shall be a mandatory interval of 30 minutes between two stretches.

- (l) Identify and close off or reroute any lines that might carry harmful substances to, or through, the work area.
 - (m) Ensure that written operating and rescue procedures are displayed at the entry site.
 - (n) If the entry is made through a top opening, use a housing device with a harness that suspends a person in an upright position and a mechanical device shall be available to retrieve personnel from vertical spaces more than five feet deep.
 - (o) At least one person trained in first aid and cardiopulmonary resuscitation should be immediately available during any confined space job.
 - (p) Oxygen content in the manhole must be at least 19.5% in the confined space of the manhole measures at all levels (bottom, middle and top) and no person enters the manhole if oxygen level is below 19.5% and more than 21 %.
 - (q) Ventilate the sewer line by opening at least two or three manholes on both sides where work is to be carried out.
 - (r) Manhole shall be opened at least one hour before the start of operation.
 - (s) The opened manhole shall be properly fenced or barricaded to prevent any person, specially children, from accidentally falling into the sewer. Dummy cover with welded fabric or wire-net may be used.
 - (t) All workers use the safety gear and safety devices before entering the sewer line.
 - (u) The person entering the manhole or sewer line must be monitored using signal or camera or CCTV etc., throughout the operation period.
 - (v) Structural safety of manhole rungs or steps must be tested before entering the manhole.
 - (w) Portable aluminium ladder is available during the work period where necessary and the portable ladder is properly seated or fixed during use.
 - (x) No material or tools are located near the edge which can fall into the manhole and injure the workman.
 - (y) Equipments used during sewer cleaning are explosion and fire-proof.
 - (z) Smoking, open flames are prohibited inside the manhole as well as in the immediate vicinity of open manholes.
 - (za) In the event of a sudden or unpredictable atmospheric change, an emergency escape breathing apparatus with at least a 10 minute air supply is worn.
- Rule 7. The employer shall ensure the following safety precautions at the time when the person is engaged in the cleaning of a sewer or a septic tank;-
- (i) Portable fans and air blowers with batteries, in good working condition with a back up capacity of more than the estimated duration of the entry of the person in the sewer shall be carried into sewers for ventilation and a ventilation source shall be installed at the mouth of the manhole.
 - (ii) Flashlights and communication devices such as two-way radios shall be carried into sewers.
 - (iii) Presence of the following rescue equipment at the site:-
 - (a) A tripod and harness system. or some other method ensuring manoeuvring of an injured worker to the surface.
 - (b) A basket stretcher. or similar device. shall be available for moving the injured worker to emergency transportation.
 - (c) First aid equipment as given in Annexure-I, and trained personnel shall be immediately available.
 - (iv) The employer shall ensure availability of ambulance and follow-up in close proximity.
 - (v) The employer shall ensure that the assigned person has life insurance policy of at least ten lakh rupees and the premium for which shall be paid by the employer.
- Rule 8. The employer shall ensure the following post cleaning safety precautions after an person engaged in the cleaning of a sewer or a septic tank comes out of the sewer or septic tank after a session of cleaning:-
- (i) Provide facilities for removal of contaminated clothing and for wash-up as well as cleaning Dry clothing.

- (ii) Wash-up material shall include but not be limited to water, soaps, hand sanitizers and adequate and medically authenticated skin cream for applying on the body for post cleaning safety.
- (iii) Any cuts/bruises on the skin or problems with a respiratory organ suffered on account of cleaning of sewer shall be immediately cured.
- (8) On finding that a local authority, person or agency is engaging in or employing a person in hazardous cleaning, the inspector shall instruct such authority, person or agency to stop such undertaking of cleaning immediately and shall serve a notice in writing in this regard in Form annexed as annexure III to these rules.

CHAPTER -IV

POWERS OF THE INSPECTOR

Rule 13. If an inspector has reason to believe that an offence under the Act as defined under sections 5, sub-section (2) of Section 6 or 7 of the Act has, or is, or is likely to take place, he shall conduct inspection, investigation or enquiry.

- (1) XX
- (2) XX
- (3) XX
- (4) If it appears to the inspector that hazardous cleaning of sewer or septic tanks is being resorted to, the inspector shall order to stop such hazardous cleaning forthwith and shall report the matter to the local authority.
- (5) The inspector may examine any structure, site, place or premises within his jurisdiction. when there are reasons to believe that any such premises is being used or has been used or about to be used for hazardous cleaning of sewer or septic tank.
- (6) The inspector may take on the spot or otherwise such evidence of any person which he may consider necessary for the purpose of any examination or enquiry connected with insanitary latrines or hazardous cleaning of sewer or septic tank.

Provided that such person shall not be compelled to answer any question or give any such evidence tending to incriminate him.

- (7) The inspector may take or caused to be taken any photograph, video clip, sample, record or make any sketch by using any device including electronic device as he may consider necessary for the purpose of any examination or enquiry under these rules.

ANNEXURE-5

Contact details of Offices of National Safai Karamcharis Finance and Development Corporation

NATIONAL SAFAI KARAMCHARIS FINANCE AND DEVELOPMENT CORPORATION

B-2, Ground Floor & First Floor,
Greater Kailash Enclave Part-II New Delhi-110048
Telephone Nos- 011-29216330 & 29221331
Fax- 011-29222708
E-mail : nskfdc-msje@nic.in
Website : www.nskfdc.nic.in

Telephone : 0172-2701449;
Fax : 0172-2700105
Email : social_welfare@rediffmail.com

A. STATE CHANNELIZING AGENCIES

1) The Managing Director

Andhra Pradesh Scheduled Castes,
Co-Operative Finance Ltd,
5th Floor, Telgu Samkshema Bhawan, Masab Tank,
Hyderabad- 500 028 (Andhra Pradesh)
Telephone : 040-23315970, 23321141;
Fax : 040-23301402
Email : md_apscfc@ap.gov.in

5) The Managing Director

Chattisgarh State Coop. Antyavasyaee
Finance & Development Corporation,
B-9, Sector-5, Devendar Nagar, Raipur-492 001
(Chattisgarh)
Telephone : 0771-4248605, 4248601;
Telefax : 0771-4248617
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2) The Managing Director

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Swahid Delip Hozori Path, Sarumotria Dispur,
Guwahati-781 006 (Assam)
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Fax : 0361-2261617

6) The Managing Director

Delhi SC, ST, OBC, Minorities, Physical
Handicapped Finance and Development
Corporation,
Ambedkar Bhawan, Institutional Area,
Sector, 16, Rohini-110 085 (Delhi)
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Fax : 27572662, 27572704
Email : secy.scst.delhi@nic.in

3) The Managing Director

Bihar State Scheduled Castes
Co-operative Devp. Corp.
Malyanil Buddya Colony, Patna- 800 001 (Bihar)
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Email : bssccdc@yahoo.com

7) The Managing Director

Dadra & Nagar Haveli SCs/STs OBC & Minorities
Finance & Development Corporation Ltd.,
2nd Floor, Right Wing Old, DIC Office,
PWD Complex, Silvassa-396 230
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4) The Managing Director

Chandigarh SCs, BCs and Minorities Financial &
Development Corporation Limited,
Addl. Town Hall Building, Sector 17-C, 3rd Floor,
Near D. C. Office, Chandigarh-160 017

8) The Managing Director

Daman & Diu SCs/STs/OBCs
Minorities Finance &
Development Corporation Limited,
2nd Floor, Right Wing, Old DIC Office,
PWD Complex, Silvassa-396 230
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9) The Managing Director

Goa State SCs and Backward Classes Finance & Devp. Corporation,
4th Floor , Patto Center, EDC Complex ,
Near Kadamba Bus Stand, Panaji -403 001 (Goa)
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Fax : 0832-2438178
Email : goaobc@gmail.com

10) The Managing Director

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Gandhinagar -382010 (Gujarat)
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Fax : 079-23259378
Email : gskvn@gujrat.gov.in

11) The Managing Director

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12) The Managing Director

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13) The Managing Director

J & K Scheduled Castes & Backward Classes Devp. Corporation,
Ramesh Market, Shastri Nagar,
Jammu -180 004 (J&K)
Telephone : 0191-2433229, 2452009
Email : contact@jksctdc.corp.in

14) The Managing Director

Jharkhand State SC Cooperative Development Corporation Ltd.,
Holding No. 232, Kusai Colony, Dorenda,
Ranchi-834002 (Jharkhand)

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Telefax : 0651-2490672
Email : jsscscdc.ranchi@yahoo.in

15) The Managing Director

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9th & 10th Floor, Vishweshwari Mini Tower,
Dr. Ambedkar Veedhi, Bangalore 560 001
(Karnataka)
Telephone : 080-22868870, 22867097;
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16) The Managing Director

Kerala State Development Corporation for SC & ST Ltd.,
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17) The Managing Director

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18) The Managing Director

Mahatma Phule Backward Class Devp. Corp. Ltd.,
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Gulmohar Cross Road No. 9,
J.V.P.D. Scheme, Juhu,
Mumbai- 400 049 (Maharashtra)
Telephone : 022-26200351, 26702586;
Fax : 022-26705173
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19) The Managing Director

Manipur Tribal Devp. Corp. Ltd.,
Lamaphelpat, Imphal-795 004 (Manipur)
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20) The Managing Director

Meghalaya Urban Devp. Agency,
Raitiong Building, Shillong, (Meghalaya)
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21) The Managing Director

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22) The Managing Director

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23) The Managing Director

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24) The Managing Director

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25) The Managing Director

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26) The Managing Director

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Other Backward Classes Devp. Corporation Ltd
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27) The Managing Director

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28) The Managing Director

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29) The Managing Director

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30) The Managing Director

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31) The Managing Director

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32) The Managing Director

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NOTES

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Government of India