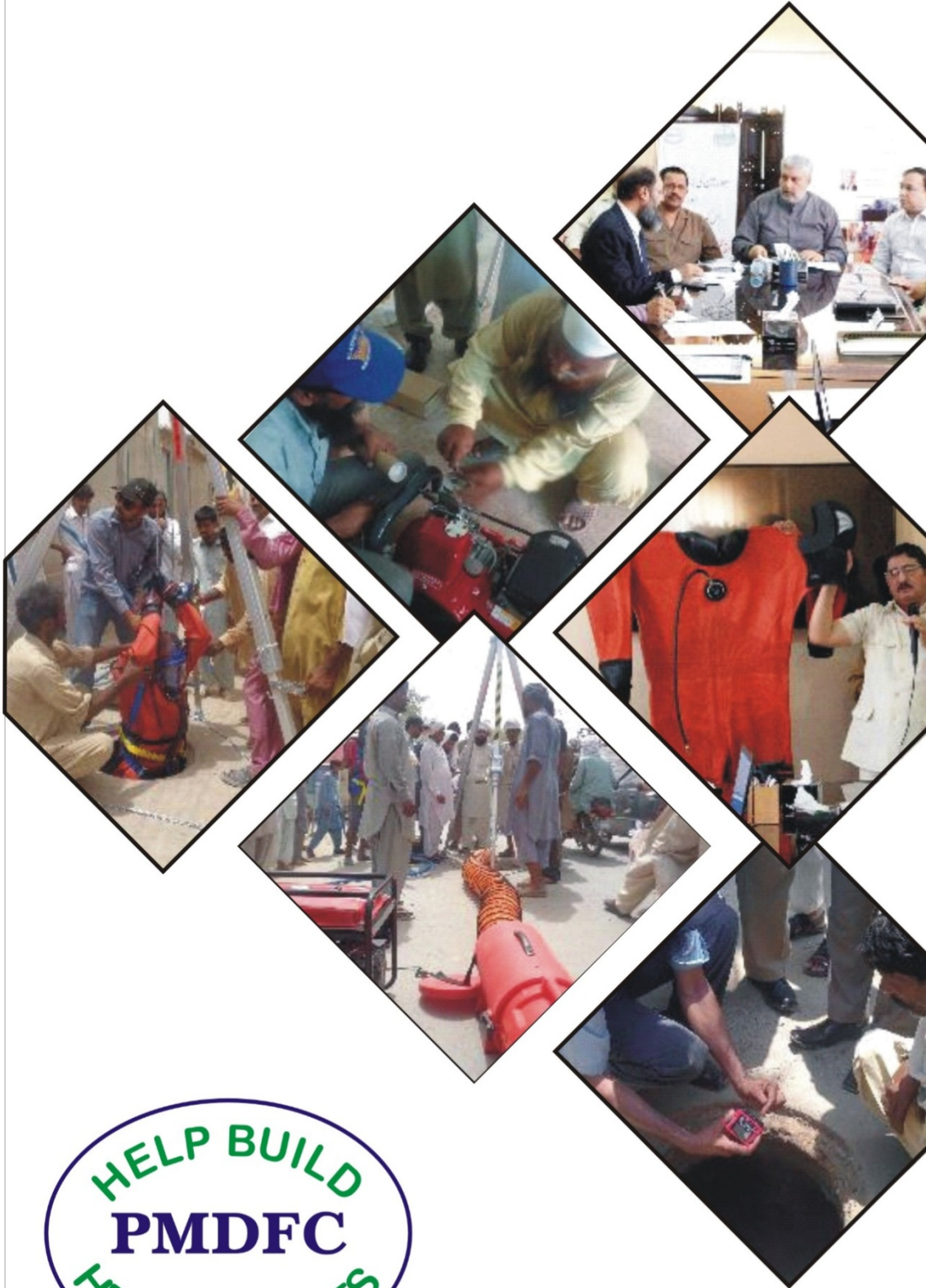


Training Report

Sewer Safety Equipment



Punjab Municipal Development Fund Company

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1. Introduction

1.1 Background

Work in the wastewater field by sewer men is considered the most hazardous, especially due to the frequent casualties caused by negligence and non-use of the safety measures in the province. Hazardous chemicals and gases in the sewer system prove fatal for sewer men during cleaning work.

Inhalation of chemicals and gases during the operations and maintenance of manholes is the major route for chemicals or organisms to enter the body. Some chemicals are air-stripped from wastewater and workers working near weirs, aerated manholes, dewatering processes, and other sludge processes (drying, compacting, and incineration). Aeration and dewatering processes also add droplets and particles to the air which are inhaled by the sewer men. Most of the material inhaled into the throat or bronchial tubes is cleared from the lungs and swallowed. As a result, respiratory and gastrointestinal diseases can occur from inhaled chemicals and organisms. Sewer men are also exposed to chemicals while attempting to remove these substances from treatment plant equipment.

Skin Contact is also a route of entry for both chemicals and diseases. Chemicals can be absorbed through the skin from contact with wastewater or sludge. Disease organisms can also enter the body through cuts or abrasions.

It is noticed that working in a manhole causes potential dangers which may result in serious accidents i.e. falls/slips, fire or explosion, oxygen depletion, gas poisoning, heat stress, drowning, asphyxiation arising from gas, fume, vapors and entrapment by free flowing solid. Amongst which, dangers involving gases are easily overlooked or neglected, leading to casualties. Most of the TMAs are deprived of modern equipment to ensure the safety of its workers while performing sewer cleaning operations.

A reference was submitted in the 2012 by Dr. Muhammad Yousaf (applicant) in Supreme Court of Pakistan regarding the incident of death of three sanitary workers in Hyderabad, Sindh while cleaning a sewer manhole. Unfortunately, the same sort of incident took place when sanitary workers died after inhaling toxic fumes while as many others fell unconscious while working inside a sewerage pipeline at Muzafargarh District in August 2015.

1.2 Government of Punjab's Initiatives: Sewer men Safety

The Punjab Government has always given top priority to the safety of its workers and to provide better municipal services to the local inhabitants. In order to lessen the risk to the lives of workers, the Government of Punjab has planned for precautionary measures and provide equipment result in the safety of its men.

Keeping in view the seriousness of the issue, **Chief Minister Punjab** took a milestone step towards saving lives and health of the sewer men through providing Safety Kits to Tehsil Municipal Administrations and ensuring handholding on use of these kits.

2. Safety Kits and their Distribution

2.1 Procurement by PMDFC

LG&CD Department assigned the responsibility of procurement of 42 sets of equipment / safety kits for 27 TMAs of Punjab to PMDFC. PMDFC (Punjab Municipal Development Fund Company) procured the equipment as per PPRA Rule-38(2)a through open competitive bidding process from M/s Kenwood Ashrafia Complex Lahore (Annex – A). Earlier PMDFC had provided 61 sewer safety equipment to 26 TMAs in two phases (September 2012 – 11 TMAs and March 2013 - 15 TMAs) PMDFC also organized onsite trainings of the concerned staff to eliminate the chances of any fatal incident in future.

2.2 Detail of Equipment

The list of equipment provided is as follows, the specification detail is attached as Annex –A

Sr. No.	Item
1	a. Compressed air line system
	b. Compressor
2	Fresh Air Respirator (Non-Assisted)
3	Multi Body Rescue Harness (Safety Harness)
4	Portable Multiple Gas Detector
5	a. Tripod (Corrosion-resistant finish)
	b. Hand Winch (Corrosion-resistant finish) with Lifting Sling
6	SMD Head Lamp
7	Air Blower & Exhaust (with Air Duct)
8	SMD Flood Light with Stand (Emergency light)
9	Portable Generator 4-KVAC
10	Dry Suit
11	Safety Shoes
12	Safety Helmet
13	Hand Gloves
14	Torch with Dry Cells

2.3 Distribution Ceremony

PMDFC organized Sewer safety Kits distribution ceremony for 27 TMAs on May 12, 2016. Honorable Minister for Zakat and Usher, Government of the Punjab- Malik Nadeem Kamran presided over the event and Additional Secretary LG&CD Department - Mr. Rashid Ahmad Khan, Managing



Director PMDFC - Mr. Muhammad Aamer Nazeer, and Tehsil / Town Municipal Officers (TMOs) from 27 TMAs of Punjab were also present.

It was made clear upon the Tehsil/Town Municipal Officers that the Government would take strict action on failure in adherence to the necessary safety measures for the sewer men during sewer cleaning operations. It was also decided that onsite training sessions on usage of these equipment would start soon after the distribution ceremony.



A demonstration video, prepared by PMDFC, about the specifications and use of equipment was shown to the participants and the same was also uploaded on PMDFC

website. In addition, Mr. Muhammad Ashiq Chaudary, Technical Consultant – PMDFC provided orientation to the participants regarding use of equipment and highlighted the necessary safety measures for sewer men.

Following documents were provided to all TMOs:

- Sewer Safety Equipment User Manual in Urdu language
- Details of Sewer Safety Equipment including snaps and specifications

3 Field Trainings

It was strongly emphasized by the chair that soon after the distribution of the Sewer Safety Kits; PMDFC would start conducting trainings in the TMAs at work places of sewer men so that this initiative helps save the precious lives.

A schedule for trainings at TMAs was shared with TMOs and training was imparted by the experts of M/s Kenwood Ashrafia Complex under the supervision of PMDFC (Annex – B)

It is pertinent to note that PMDFC had previously organized onsite training programs for 26 TMAs in two phases during September 2012 and March 2013. Back then, concerned staff of TMAs was provided training after the distribution ceremony which took place at PMDFC office on September 10, 2012 & March 04, 2013 respectively. (Annex C)

3.1 Training Plan and Methodology

First of all, meeting was arranged with TMO, TO(I&S) and Administrator to sensitize the TMA leadership about importance of training & protection of sewer men while performing cleaning operations of sewer lines. TMO was asked to ensure the availability of all sanitation staff during the training session and to make arrangements for practical demonstration in the field as well. The summary of the tasks undertaken is as follows:

- Organized the event to provide training on assembling and usage of sewer safety equipment to TMO., TO (I&S), CO (HQ) and Sanitation Staff
- Kenwood expert provided hands on training with practical demonstration at site
- Sensitized the TMA staff on protection/safety of human life and the losses of lives which might occur due to non-usage of safety equipment in the field.
- Managed to get snaps of the event and other requisite documents

Key points noted during the training sessions are:

- TMA leadership & officials were fully responsive and helped to organize training on Sewer Safety Equipment.
- TMA provided all relevant support to trainer of Kenwood and PMDFC.
- The attendance and interest of participants was remained highly satisfactory
- TMA staff declared the training useful and satisfactory

3.2 Training Summary

Trainings were started with recitation from the Holy Quran and opening remarks of TMOs/ Administrators. They sensitized the trainees about the importance of this training for usage of the sewer safety equipment in the field. Afterwards, PMDFC Managers briefed the participants about concern of LG&CD Department regarding safety and protection of the sanitation staff to avoid any fatal incident.

Later on the representative of M/s Kenwood (the supplier of the equipment) explained the use of the equipment through practical demonstration of each item in the field. The detail of the training is as follows:

i. Portable Multiple Gas Detector

The trainer elaborated the presence of different harmful gases like methane (CH₄), Hydrogen Sulfide (H₂S) and Carbon Mono Oxide (CO) in the sewer lines. He informed that for checking the level of gases in the manholes Multi-Gas Detector is used. With the help of this detector, we could find the percentage of Oxygen (O₂) present in the manhole.



The quantity of oxygen present in the fresh air is about 20.8% & if this quantity is reduced to 19% the workers will lose consciousness and if it reduced to 13% it may cause death.

Sewer cleaning operations should not be started if the detector shows less oxygen (less than 19%) or more harmful gases. For removal of the gases from the Manhole, air blower is to be used. All the trainees were asked to practically operate the instrument such as the functions of its buttons, checking the quantity of gases by hanging the instrument in manhole and practice necessary steps for protection of the instrument.



ii. Air Blower & Exhaust with Air Duct

Air Blower is used to remove the hazardous gases from the manhole before entry of sewer men. The blower duct is lowered in manholes keeping it above water level.



Fresh air is blown in the manholes by this device and the injurious gases are pushed out. Later, the amount of gases is checked with the Gas Detector again. If the harmful gases have been removed and ample amount of oxygen is present in the manhole then the supervisor should allow the sewer men to enter the manholes.

iii. Compressed Air line System with Compressor

This equipment is used for provision of fresh air to the sewer men working in to the manhole. This system comprises of one trolley, two cylinders and one reel with a feeding pipe which provides fresh air to the sewer men in the manhole through a regulator and breathing pipe. Full

face mask is used to inhale the air which provides wide visibility. Initially, compressed air is filled in the cylinder by air compressor at 300 bar. After filling, these cylinders mounted on trolley are taken in the field and attached with the feeding pipe to provide oxygen to the sewer men. Air pressure is adjusted by worker with regulator according to his



requirements. Each cylinder can work for 2 hours and if pressure is reduced to a certain level, beep is heard by the sewer men & the staff standing outside the manhole should immediately withdraw the worker from the manhole.

iv. Fresh Air Respirator

This respirator comprises of a feeding hose of 30 feet length, a filter on one end whereas the other end is connected to breathing hose which is further coupled with full face mask for breathing with fresh air.



This needs no compressor or any other mechanical device. Sewer man has no problem in breathing up to 30 ft. If the depth of the manhole is more than 30 feet

a small fan is used to compress air. One extra length of pipe is also provided with the system. After using this equipment, it is kept in the provided protection box.

The use of this equipment was practically demonstrated by a sewer man.

v. Tripod with Hand Winch & Multi body Rescue Harness

The top diameter of manhole is 22-24 inch. It is very difficult for the worker to descent or ascent in it. Currently, rope is used for descent and ascent of worker in manhole. However, the method used not only injures them but makes it very difficult during emergency ascents.



Tripod is used along with Hand Winch & Multi body rescue harness for descent and ascent of worker in

manhole. Sewer man smoothly enters and gets out with the help of this system from the manhole by maintaining a balance. It is very easy to operate the winch with small force. The sewer man does not lose his balance and can easily be withdrawn from the manhole. Practical demonstration was given to the trainees at site.

vi. Dry Suit

Skin diseases may affect sewer men by causing infections due to the waste water presenting the manhole which contains hazardous chemicals & gases.

For the protection of the sewer man from the harmful effects of waste water they are provided with specially made full body suit, which is totally water proof and includes water tight shoes & gloves. The

trainees were briefed about 'how to wear the full body suit'. One sewer man wearing the suit entered the manhole for practical demonstration.



vii. Helmet with Emergency LED light

The manhole openings are usually narrow and sewer men get their head injured while entering or coming out. Helmet is used for the safety of head. It has a secondary LED light, which is rechargeable through one battery and two rechargeable cells. These are easily available in the market. However in case of non-availability, ordinary cells can also be used. The light can be adjusted at the required angle, and

sewer man can see easily through the sewer line. In case of emergency, sewer man can give signal to the co-workers standing outside the manhole by using flicker effect of this LED light.



viii. Provision of Training Manual & Video Demonstration

Training manuals and video demonstration (CDs) comprising all necessary precautions that must be ensured by the supervisor before allowing entry of the sewer men into a manhole were provided to TMAs. PMDFC Staff distributed these Training Guides (translated in Urdu language) at the end of each successful training session to facilitate the TMA Staff in future.

This material highlights the importance and optimum use of each and every Gadget / Support to ensure best results during sewer cleaning operations.

4 Conclusion

Occurrence of fatal accidents across the province during cleaning of sewers has been frequent in the past. Non-availability of equipment and lack of adequate training have always been critical limitations of local governments in avoiding casualties and improving service delivery. Therefore, these limitations resulted in the loss of lives while working in sewer lines. In order to avert the casualties, sewer safety kits have been provided to 27 TMAs under a special initiative of the Chief Minister of Punjab. User Manual and on-site trainings have been provided by PMDFC to the concerned staff. The provision of safety kits and required trainings has addressed major capacity constraints in ensuring safety during cleaning of sewer lines. It is expected that the kits will be properly utilized and all the given safety measures will be adhered to by the local governments.

By using the provided modern equipment, we can change the conventional way to avoid threats involved in occupational safety for the workers. Following recommendations are being furnished to ensure safety of sewer men while performing sewer cleaning operations:

1. Entry of the worker in the manhole should not be allowed unless it is ensured that all injurious gases have been blown out of the manhole and that the pressure of oxygen in the manhole is over 20%.
2. It should be made certain that the worker in manhole is equipped with proper fresh air respiratory system which should be in working order.
3. Descent and Ascent of the worker in the manhole needs to be carried out in safe manner using the specified equipment to avoid any injury.
4. Refreshing sewer men occupational knowledge on periodic basis to have best results and to reduce rising death toll associated with sewer management at local bodies
5. All the equipment should be kept in proper working condition in the warehouse

Special initiative by the Punjab Government has addressed the capacity constraints with respect to the safety of sewer men but the role of local governments is very critical in implementation of the envisaged safety regime. Regular maintenance of the safety equipment, adherence to the safety procedures, and monitoring of sewer cleaning work by a senior official need to be mandatory actions at the level of local governments. Non-compliance with any of the implementation requirements will continue to result in loss of precious lives.

5 Annexure

Annex- A: Detail of Sewer Safety Equipment Items provided

Sr. No.	ITEM DESCRIPTION	Country of Origin	Make/ Brand	Model
1	a. Compressed air line system	ITALY	SPASCIANI	RC-2603
	b. Compressor	ITALY	SPASCIANI	P 100
2	Fresh Air Respirator (Non-Assisted)	ITALY	SPASCIANI	DUCT ECO
3	Multi Body Rescue Harness (Safety Harness)	POLAND	PROTEKT	P-05
4	Portable Multiple Gas Detector	USA	RKI	GX-2009
5	a. Tripod (Corrosion-resistant finish)	POLAND	PROTEKT	TM 11-T2
	b. Hand Winch (Corrosion-resistant finish) with Lifting Sling	POLAND	PROTEKT	UP 502-AT
6	SMD Head Lamp	CHINA	BAILONG	BL-T07A
7	Air Blower & Exhaust (with Air Duct)	POLAND	PROTEKT	WP 212
8	SMD Flood Light with Stand (Emergency light)	CHINA	RECO	-
9	Portable Generator 4-KVAC	CHINA	EMEAN	EM5500A
10	Dry Suit	UK	THOR	SPECIALIST SUIT
11	Safety Shoes	CHINA	MAK	-
12	Safety Helmet	CHINA	MSA	-
13	Hand Gloves	PAKISTAN	PAK TIGER	H-18
14	Torch with Dry Cells	CHINA	SWAT	RL-808

Annex- B: Table covering dates of Training, Human Resource Trained (2015-16)

Sr. No.	TMA Name	Training Dates	Training Conducted by	No. of Trainees
1	Khushab	23-May	PMDFC and M/s Kenwood	12
2	Piplan	24-May		8
3	EssaKhel	25-May		20
4	Bhakkar	26-May		22
5	ChakJhumra	30-May		14
6	Tandlianwala	31-May		9
7	Samundri	1-Jun		7
8	Toba Tek Singh	2-Jun		14
9	Riwind, Lahore	20-May		17
10	Deepalpur	23-May		8
11	Arifwala	24-May		11
12	Chichawatni	25-May		12
13	QilaDeedar Singh	3-Jun		10
14	Shahpur	4-Jun		12
15	PindiGheb	6-Jun		7
16	Narowal	7-Jun		23
17	Sangla Hill	6-Jun		8
18	Minchinabad	26-May		26
19	Haroonabad	27-May		36
20	Chishtian	28-Jun		23
21	KotMomin	21-May		22
22	Jatoi	30-May		16
23	Taunsa Sharif	31-May		19
24	RajanPur	1-Jun		17
25	Rojhan	2-Jun		9
26	Jampur	3-Jun		15
27	MianChannu	4-Jun		15

Annex- C: Table covering dates of Training, Human Resource Trained (2012-13)

Sr. No.	TMA	Training Month	Training Conducted by	No. of Trainees	
1	Bahawalpur City	September-2012	PMDFC and M/s Kenwood	30	
2	Sargodha			34	
3	Sheikhupura			27	
4	Sialkot			32	
5	Rahim Yar Khan			25	
6	Jhang			40	
7	Gujrat			35	
8	Kasur			25	
9	Dera Ghazi Khan			20	
11	Okara			25	
13	Sahiwal			25	
10	Muridkee			March-2013	12
12	Sadiqabad				30
14	Chiniot	15			
15	Muzaffargarh	25			
16	Burewala	20			
17	Hafizabad	25			
18	Khanpur	22			
19	Gojra	22			
20	Khanewal	21			
21	Daska	16			
22	Jhelum	18			
23	Pakpattan	20			
24	Bhawalnagar	30			
25	Kallarkhar	12			
26	Choubara	8			
TOTAL				614	

Annex -D: Training on Effective Use of Sewer Safety Equipment (Pictography)

TMA Arifwala



TMA Depalpur



TMA Minchinabad



TMA Haroonabad



TMA Chishtian



TMA Jatoi



TMA Taunsa



TMA RajanPur



TMA Jampur



TMA Mianchunue



Raiwind



TMA KotMoman



TMA Khushab



TMA Piplan



TMA Chichawatni



TMA EssaKhel



TMA Bhakkar



ChakJhumrah



TMA Tandlianwala



TMA Samundari



TMA Rojhan



TMA Toba Tek Singh



TMA QillaDidar Singh



TMA Shahpur



TMA Sanglahill



TMA Narowal



TMA PindiGheb

