ZAMBIA QUALIFICATIONS FRAMEWORK (ZQF)

SYLLABUS FOR

SKILLS AWARD IN VACUUM TANKER OPERATIONS AND MAINTENANCE

CHART NO. 406

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Developed November 2018

TABLE OF CONTENTS

ACRONYMS

FSM : Faecal Sludge Management

GFA : GFA Consulting Group, Germany

GIZ : German Agency for International Cooperation

MAPET : Manual Pit Emptying Technology

OSS : On-site Sanitation

SOP : Standard Operating Procedure

TEVETA : Technical Education, Vocational and Entrepreneurship Training Authority

ZEMA : Zambia Environmental Management Agency

ZNQF : Zambia National Qualifications Authority

ABOUT TEVETA

The Technical Education, Vocational and Entrepreneurship Training Authority (TEVETA) is an institution established under TEVETA Act No. 13 of 1998, read together with the Amendment Act No. 11 of 2005. Its functions include, to regulate, coordinate and monitor education, vocational and entrepreneurship training in consultation with stakeholders.

TEVETA executes its regulatory function through the provision of services, among others, the development, review and approval of TEVETA Curricula in consultation with industry, employers, employees and other stakeholders.

1.0 ACKNOWLEDGEMENTS

The Technical Education, Vocational and Entrepreneurship Training Authority (TEVETA) wishes to express sincere appreciation to the following persons who participated in the development of the Skills Award in Vacuum Tanker Operations.

S/N	Name	POSITION	ORGANISATION
1.		Senior Inspector	ZEMA
2.	Focus group discussions	Vacuum Tanker Operators	Manchinchi Sewerage and Waste Water Treatment Plant
3.	Engineer/Supervisor		Manchinchi Sewerage and Waste Water Treatment Plant
4.	Focus group discussion	Vacuum Tanker Operators	
5.	George C. Mwila	Director	Geochi Sewerage and Sanitary Services
6.	Sankwe Michael Kambole	FSM Advisor	GFA/GIZ

2.0 RATIONALE

The development and implementation of this training programme in Vacuum Tanker Operations (VTO) is part of the general strategy by the Zambian Government to strengthened the sanitation sector by supporting the development of the faecal sludge management (FSM) service provision. The goal is to have an effective and efficient service provision anchored by professionally qualified service providers.

Trained vacuum tanker operators will contribute to improved sanitation management and protection of public and environmental health by developing the required skills mongst the VTO service providers.

3.0 PROGRAMME PURPOSE

The purpose of the training programme is to equip trainees with skills, knowledge and attitudes in the effective and efficient operations of VTOs so as to contribute to the general improvement of the public and environmental health.

4.0 PROGRAMME OUTCOMES

On completion of the programme the trainee will be able to:

4.1 Operate a vacuum tanker effectively
4.2 Perform routine preventive maintenance on a vacuum tanker
4.3 Load, transport and unload faecal sludge

5.0 PROGRAM DURATION

4 weeks or 160 notional learning hours.

6.0 COURSE OUTLINE

MODULE NO.	TITLE	NO. OF HOURS
406-01-A	OPERATION AND MAINTAINANCE OF A VACUUM TANKER	80
406-02-A	TRANSPORTATION OF FAECAL SLUDGE	40
TOTAL		**120 HOURS**

7.0 TEACHING AND LEARNING STRATEGIES

- Action learning
- Interactive lectures
- Group discussions
- Role plays
- Simulations
- Case studies
- Site visits
- Practical exercises
- Theory exercises
- Self-assessment
- Continuous/formative assessment and provision of immediate feedback

8.0 PROGRAMME EVALUATION

TEVETA shall evaluate the programme as follows:

8.1 Formative evaluation

8.1.1 Purpose

To determine, on an on-going basis, whether the programme is being implemented as planned, and to provide advice on improvements.

8.1.2 Major Areas of Evaluation

Course aims and objectives, trainees' entry requirements, course contents, teaching and learning activities, learning resources, qualification of trainers, accreditation of training organisations and institutes.

8.1.3 Evaluation Instruments

Questionnaires, structured interviews, observations, checklists, examinations/test records, participation and attendance of training sessions.

8.1.4 Sources of Information

Trainees, trainers, administrators, trainees' records, training organisations and institutes.

8.2 Summative Evaluation

8.2.1 Major Areas of Evaluation

Course aims, trainees' entry requirements, course content, learning resources, teaching/learning activities, qualification of trainers, assessors, examiners, accreditation of training organisations and institutes, and graduates' performance in employment in accordance with qualification descriptions.

8.2.2 Evaluation Instruments

Questionnaires, structured interviews, observations, checklists, records, final integrated examinations.

8.2.3 Sources of Information

Trainees, trainers, assessors, examiners, administrators, sponsors, graduates' employers, training organisations and institutes, union officials and the general public.

9.0 TRAINEE ENTRY REQUIREMENTS

9.1 Direct entry: Candidates shall be possess a minimum of a Grade 9 General Certificate of Education or equivalent.

9.2 Mature entry: candadites with at least two (2) years work experience as a vacuum tanker operator can be exempted from having a Grade 9 Certificate of Education. They should however have a high level of literacy and numeracy skills.

9.2 Class C Driver's Licence.

10.0 TRAINEE ASSESSMENT

10.1	Final Examination	100%
10.2	Pass Mark	75%

11.0 ATTENDANCE

The trainee must have a minimum attendance of 85% to be eligible for the final examinations.

12.0 STAFFING

12.1 Minimum of a relevant Craft Certificate and a minimum of three (3) years relevant working experience or Skills Award in Vacuum Tanker Operations and Maintenance and three (3) years relevant work experience in

vacuum tanker operations.

12.2 A teaching qualification from an accredited and registered institution.

12.3 All trainers must be accredited by TEVETA.

13.0 CERTIFICATION

Successful candidates will be awarded a Skills Award in Vacuum Tanker Operations and Maintenance by the Technical Education Vocational and Entrepreneurship Training Authority (TEVETA).

MODULE 406-1-A : VACUUM TANKER OPERATIONS AND MAINTAINANCE

MODULE PURPOSE:

To equip the trainee with knowledge, skills and attitudes to plan and organise the operation and maintenance of vacuum tankers for faecal sludge management.

NOMINAL DURATION: 80 HOURS **CREDITS: 8.0**

LEARNING OUTCOMES:

1. Describe the vacuum tanker operator
2. Operate a vacuum tanker vehicle
3. Perform routine and scheduled maintenance on the vacuum tanker vehicle

UNIT A1.1 DESCRIBING THE VACUUM TANKER OPERATOR

UNIT DURATION: 20 HOURS **CREDITS: 2**

SPECIFIC LEARNING OUTCOME	LEARNING ACTIVITIES	ASSESSMENT CRITERIA	ASSESSMENT METHODS	CONDITIONS
1.1.1 Define sanitation and faecal sludge management (FSM)	• Definition of sanitation • Definition of faecal sludge • FSM and the sanitation chain • Distinction between on-site and off-site sanitation	• Sanitation and faecal sludge are defined properly • Importance of sanitation and FSM is explained correctly • On-site and off-site	• Questioning: written and/or oral tests • Reports of visits to on-site and off-site sanitation	The trainee must have access to: • Trainee manual • On-site and off-site sanitation facilities • Sewage treatment plants

		sanitation are distinguished correctly	facilities and treatment facilities	• Library/resource centre • Internet • Handouts from trainer
1.1.2 Explain negative effects of poor sanitation and FSM on public and environmental health	• Negative effects of poor sanitation and FSM − Spread of diseases such as typhoid, cholera, diarrhoea, eye and skin diseases − Threat to environment though contamination of water bodies, air pollution − Effects on natural aesthetic beauty of area (cities and villages) − Threat to economic development (cleaner cities attract private investments and tourists)	• Common negative effects of poor sanitation and FSM are understood correctly	• Questioning: written and/or oral tests • Reports on visits to on-site sanitation facilities and sewage treatment plants • Reports of site visits to observe the contamination of environment	The trainee must have access to: • Trainee manual • Sites for observation of the contamination of environment • On-site sanitation facilities • Sewage treatment plants • Library/resource centre • Internet • Handouts from trainer
1.1.3 Describe the vacuum tanker	• Purpose and uses of a vacuum tanker	• Purpose and uses of a vacuum tanker are	• Questioning: written and/or	The trainee must have access to:

	• Loading, transporting and unloading of faecal sludge at a treatment facility • Major components of a vacuum tanker and their uses, to include: − Vacuum/suction pump − Suction hose − Tank − Auxiliary motor − Valves • Operating principles of a vacuum tanker for loading and unloading sludge • Maximum capacities of vacuum tankers − Manufacturers' specifications: maximum volume and load, materials used to construct the tank − Advantages and disadvantages of different materials used to construct the tank	understood correctly • Major components and operation principles of a vacuum tanker are understood correctly	oral tests • Reports of visits to on-site sanitation facilities and sewage treatment plants to observe vacuum tankers in operation • Practical assessment: identification of the different components and their uses on a real vacuum tanker	• Trainee manual • Vacuum tanker • On-site sanitation facilities • Sewage treatment plants • Library/resource centre • Internet • Handouts from trainer
1.1.4 Discuss the	• Duties/responsibilities of a	• Duties and	• Questioning:	The trainee must have

duties and responsibilities of a vacuum tanker operator	vacuum tanker operator in relation to FSM outlined	responsibilities of a vacuum tanker operator, in FSM, are understood correctly	written and/or oral tests • Reports of visits to on-site sanitation facilities and sewage treatment plants • Reports on visits to sites to observe the contamination of environment	access to: • Trainee manual • On-site and off-site sanitation facilities • Sewage treatment plants • Library/resource centre • Internet • Handouts from trainer • Sites for observation of the contamination of environment
UNIT A1.2 OPERATE A VACUUM TANKER **UNIT DURATION: 10 HOURS** **CREDITS: 1**				
SPECIFIC LEARNING OUTCOME	**LEARNING ACTIVITIES**	**ASSESSMENT CRITERIA**	**ASSESSMENT METHODS**	**CONDITIONS**
1.2.1 Discuss preparations	Preparations required to implement work tasks with a vacuum tanker	• Plans and work schedules understood	• Questioning: Written/oral	The trainee must have access to:

required to implement work tasks	• Obtaining and interpreting plans and work schedules • Obtain required personal protective and safety equipment • Preparing first aid kit, spill kit, emergency response equipment and placarding • Preparation of tools, equipment and materials for cleaning up after completion of work tasks • Requisitioning for supplies	correctly • Personal protective and safety equipment identified correctly	tests • Class exercises • Observation: practical tasks on performing preparations for the implementation of work tasks	• Trainee manual • Different types of work instructions • Safety and emergency response equipment to include PPE, first aid kit, spill kit, placarding • Requisition form • Tools, equipment and materials • Library/resource centre • Internet • Handouts from trainer
1.2.2 Explain the sequence of steps required for carrying out routine checks on a vacuum tanker	Sequence of steps for carrying out routine checks on the vacuum tanker • Operation checks on a vacuum tanker vehicle, i.e. oil and fluid levels; breaks; lights; horn, etc • Operation checks on a vacuum system, i.e. vacuum pressure; lubrication and cooling system, i.e. importance of lubrication and cooling systems of vacuum pump;	• Sequence of steps for routine check on a vacuum tanker described correctly • Operational checks on a vacuum system are carried effectively and correctly • Procedure for checking and topping	• Questioning: written and/or oral test • Class exercises	The trainee must have access to: • Trainee manual • Work instructions • Manufacturers' specifications • Library/resource centre • Internet • Handouts from trainer • Plant, tools, equipment

	causes of common faults on lubrication and cooling systems of vacuum pump; demonstration of procedure for basic troubleshooting lubrication and cooling systems, etc • Checking pump for overheating, i.e. checking condition and tension of drive belts • Checking cleanliness of pump and pump components • Maintain the fluid levels of a vacuum pump − Checking the type and level of lubricant and coolant − Topping up lubricant and coolant	up lubricants and coolants in a vacuum pump understood and demonstrated correctly •		and materials
1.2.3 Discuss vehicle road worthness	• Importance of vehicle road worthness − Vehicles to have a current Certification of Fitness and Vehicle Licence − Drivers to have driving licence and certified by TEVETA to	• Importance of vehicle road worthness understood correctly	• Questioning: written and/or oral test • Class exercises • Observation: practical	The trainee must have access to: • Trainee manual • Samples of the required documents • Library/resource centre

	operate a vacuum tanker − Propoper signage and dangerous goods declaration − Appropriate external truck identification information		tasks interpretation of the different documents	• Internet • Handouts from trainer
1.2.4 Discuss operations ofvacuum tanker vehicle emergency equipment	• Vacuum tanker vehicle emergency equipment and uses − Fire extinguishers − Red flags − Flares − Electric lanterns − Fuses − First aid kit − PPE • Operation of vacuum tanker vehicle emergency equipment	• Vacuum tanker vehicle emergence equipment and operations understood correctly	• Questioning: Written/oral tests • Class exercises • Prcatical tasks on the checking of the operation of vehicle emergency equipment	The trainee must have access to: • Trainee manual • Vehicle emergency equipment • Library/resource centre • Internet • Handouts from trainer
UNIT A1.3 PERFORM ROUTINE AND GENERAL PREVENTIVE MAINTENANCE ON A VACUUM TANKER UNIT DURATION : 40 HOURS CREDITS: 4				
SPECIFIC LEARNING OUTCOMES	**LEARNING ACTIVITIES**	**ASSESSMENT CRITERIA**	**ASSESSMENT METHODS**	**CONDITIONS**

1.3.1 Explain principles of routine and general preventive maintenance	• Principles of routine and general preventive maintenance	• Vehicle maintenance principles understood correctly	• Questioning: written and/or oral test • Class exercises	The trainee must have access to: • Trainee manual • Library/resource centre • Internet • Handouts from trainer
1.3.2 Discuss the different types of maintenance and their application	• Types of maintenance and their applications − Preventive or routine maintenance − Predictive/ corrective maintenance − Reactive maintenance • Advantages and disadvantages of the different types of maintenance	• The different types of maintenance and their applications are understood corectly	• Questioning: written and/or oral test • Class exercises	The trainee must have access to: • Trainee manual • Library/resource centre • Internet • Handouts from trainer
1.3.3 Discuss objectives for servicing the vacuum tanker vehicle	• Servicing of vacuum tanker vehicle as per manufacturer's specifications: − Objectives − Procedures	• Vacuum tanker servicing objectives and procedures understood correctly	• Questioning: written and/or oral test • Class exercises • Observation: practical	The trainee must have access to: • Trainee manual • Vacuum tanker • Different fluids • Tools, equipment and materials

			exercises on the servicing of the vacuum tanker vehicle	• Cleaning tools, equipment and materials • Library/resource centre • Internet • Handouts from trainer
1.3.4 Discuss record keeping of vacuum tanker vehicle maintenance service work	• Keeping the records of vacuum tanker vehicle maintenance service works • Recording of vacuum tanker vehicle maintenance service work	• Vacuum tanker vehicle maintence service record keeping skillset demonstrated correctly	• Questioning: written and/or oral test • Class exercises • Observation: practical tasks on the recording of maintenance work	The trainee must have access to: • Trainee manual • Sample records of maintenance work • Library/resource centre • Internet • Handouts from trainer
1.3.5 Explain the uses and applications of common types of suction pumps	• Common types of suction pumps − Lobe blower pump − Piston pump − Rotary silidng vane pump − Liquid ring pump	• Common types of suction pumps in use in vacuum tanker vehicles understood correctly	• Questioning: written and/or oral test • Class exercises	The trainee must have access to: • Trainee manual • Manufacturers' specifications for

	• Uses and applications of the different pumps • Advantages and disadvantages of the different pumps		• Observation: practical exercise on the identification of different suction pumps	different pumps • Vacuum tankers • Library/resource centre • Internet • Handouts from trainer
1.3.6 Discuss factors that affect pump lift	• Factors affecting lifting of the pump − Air leakages − Viscocity of the sludge − Length of suction hose	• Factors which affect pump lift understood correctly	• Questioning: written and/or oral test • Class exercises	The trainee must have access to: • Trainee manual • Library/resource centre • Internet • Handouts from trainer
1.3.7 Operate the vacuum system	• Procedure for the operation of the vacuum system • Demonstration of procedure for the • Operation of the vacuum system	• Operation of the vacuum system is correctly understood	• Questioning: written and/or oral test • Class exercises • Observation: practical exercise on the operation	The trainee must have access to: • Trainee manual • Manufacturers' specifications for different components of the vacuum system • Vacuum tankers • Library/resource centre

			of the vacuum system	• Internet • Handouts from trainer
1.3.8 Apply first line preventive maintenance of a vacuum pump	• Importance of first line preventive maintenance of a vacuum pump • First line preventive maintenance procedures − Re-oil pump − Relieve vacuum pressure if not within safe limits − Cear suction line before the shutting down and disconnection of the pump − Re-tension drive belts − Replace drive belts − Drain oil catch muffler and secondary scrubber − Shut down and disconnect pump − Flush and clean pump after use − Clean components of a vacuum pump including filters and valves	• First line preventive maintenance procedures for a vacuum pump are are understood and applied correctly	• Questioning: written and/or oral test • Class exercises • Observation: practical tasks on the conducting of the different first line preventive maintenance procedures	• The trainee must have access to: • Trainee manual • Vacuum tanker with vacuum pump with drive belt mechanism • Oil for oiling pump • Manufacturers' specifications • Cleaning tools, equipment and materials • Tools, equipment and materials • Library/resource centre • Internet • Handouts from trainer

	• Demonstration of first line preventive maintenance procedures			
REFERENCE MATERIALS				

MODULE 407-2-A: TRANSPORTATION OF FAECAL SLUDGE
MODULE PURPOSE: To equip the trainee with knowledge, skills and attitudes to effectively and effieciently load, transport and unload faecal sludge.
NOMINAL DURATION: 40 HOURS **CREDITS: 4.0**

LEARNING OUTCOMES:

1. Plan the route and schedule the collection
2. Load faecal sludge
3. Transport faecal sludge
4. Unload faecal sludge at a treatment facility
5. Communicate good maintenance of sceptic tank

UNIT A3.1 LOADING, TRANSPORTATION AND UNLOADING OF FAECAL SLUDGE
UNIT DURATION: 10 HOURS CREDITS: 1

SPECIFIC LEARNING OUTCOME	LEARNING ACTIVITIES	ASSESSMENT CRITERIA	ASSESSMENT METHODS	CONDITIONS
3.1.1 Discuss delivery schedules planning and routing	• Verification of delivery instructions in job instructions in the manifest • Planning and scheduling of routes and delivery schedules based on the manifest	• Planning of route delivery schedule understood corre	• Questioning: Written/oral tests • Class exercises	The trainee must have access to: • Trainee manual • Manifest • Library/resource centre • Internet • Handouts from trainer
3.1.2 Discuss site work service report	• Content of the service report includes the following: − Date and time of the job − Contact name, address and	• Content of the service report understood and the report	• Questioning: written and/or oral test • Class exercises	The trainee must have access to: • Trainee manual • Samples of service

	phone number of the customer – GPS coordintates – Volume of faecal sludge collected – Type of facility, i.e. domestic, industrial, commercial, etc – Destination of the faecal sludge • Recording of site work in a service report and the signing of the service docket by the customer and treatment facility	completed correctly	• Observation: practical tasks on the recording of information in a service docket	dockets • Library/resource centre • Internet • Handouts from trainer
3.1.3 Describe loading of faecal sludge into a vacuum tanker	• Basic science of vacuum and pressurization • Procedure for loading faecal sludge - vacuum tanker driver/operator to be in attendance during loading - positioning vehicle relative to intended operation - tank is vented before using any external pump for loading - wand released and suction hose(s) made ready - power source engaged - suction pump engaged	• The basic science of vacuum and pressurisation is explained and understood correctly • The procedure for loading faecal sludge using a vacuum tanker is described	• Questioning: written and/or oral tests • Observation: practical tasks on the demonstration of the procedure for loading faecal sludge	The trainee must have access to: • Trainee manual • On-site sanitation facilities • Vacuum tanker • Library/resource centre • Internet • Handouts from trainer

	- opening septic tank: manhole(s) removed - water blaster made ready if required to break up waste - opening of valve(s) - checking vacuum pump for proper operation before beginning the pump out - activation of vacuum pump to create negative air pressure - confirming suction - connecting vacuum hoses to pumper truck - operator uses line to empty sludge - checking normal vacuum levels in the system during pumping - listening for the jamming of the vacuum pump during pumping - monitoring waste tank during loading to ensure load conforms to legal and organisational requirements • Venting the tank before using an	and demonstrated correctly • Negative effects of overloading vacuum tanker vehicle correctly understood		

	external pump for loading • Discuss the effects of overloading a vacuum tanker - increase of maintenance costs - threat to public security and safety - contribution to deterioration of streets and roads			
3.1.4 Explain communicating the good scepitic tank mamangement practices	• Communicting the good management practices for sceptic tanks - Regular inspection of the septic tank, i.e. every 3 years - Regular emptying of the septic tank, i.e. every 3-5 years - Use water efficiently - Watch your drain, i.e. avoid flushing down the toilets, kitchen and bathroom items that can clog and potentially damage septic system components if they become trapped (e.g. dental floss, feminine hygiene products, condoms, diapers, cotton swabs,	• Good sceptic tank management practices are understood and communicsted to clients correctly	• Questioning: written and/or oral tests • Observation: practical tasks on the demonstration of the procedure for loading faecal sludge	The trainee must have access to: • Trainee manual • On-site sanitation facilities • Library/resource centre • Internet • Handouts from trainer

	cigarette butts, coffee grounds, paper towels, etc)			
3.1.5 Discuss safety declarations for the vacuum tanker transporting faecal sludge	• Dangerous goods declaration documentation - Meaning of 'dangerous goods' and 'non-dangerous goods' - Importance of the declaration of dangerous goods • Information in dangerous goods declaration documentation - Type and quantity of the dangerous goods - Dangers and hazards the dangerous goods present to people, property and environment • Placarde the vehicles carrying faecal sludge - Placardetype for a vehicle transporting faecal sludge • Identification of information on placards of vehicles carrying dangerous goods	• Safety declarations for a vacuum tanker transporting faecal sludge are understood correctly • The type of placard for a vacuum tanker transporting faecal sludge understood correctly	• Questioning: written and/or oral tests • Class exercises • Observation: practical tasks on the completetion of documentation on the declaration of dangerous goods	The trainee must have access to: • Trainee manual • Samples of dangerous goods declaration documentation • Library/resource centre • Internet Handouts from trainer
3.1.6 Discuss procedures for	• Procedures for safe transportation of faecal sludge	• Procedures for the	• Questioning: written/oral tests	The trainee must have access to:

safe transportation of faecal sludge	- Ddefensive driving - Safe driving and parking: safe parking to minimise risks of accidental spilling or loss of load - Reducing time of parking: faecal sludge will change condition and settle or become more odorous and difficult to unload if it remains in the tanker for too long • Demonstration of transportation procedure	transportation of waste are identified and followed	• Class exercises • Observation: practical tasks on following procedures for the transportation of faecal sludge	• Trainee manual • Manifest • Vacuum tanker • Library/resource centre • Internet • Handouts from trainer
3.1.7 Discuss challenges of transporting faecal sludge	• Challenges of the transportation of faecal sludge - Mmanoeuvring trucks and vacuum tankers through narrow lanes and bad roads - Sometimes transportation of faecal sludge at night in poorly lit neighbourhoods - Sometimes disposal sites/transfer centres are not nearby resulting in illegal dumping or some pits not being emptied resulting in them overflowing and becoming	• Challenges associated with transporting the faecal sludge are identified correctly	• Questioning: written and/or oral test • Class exercises	The trainee must have access to: • Trainee manual • Library/resource centre • Internet • Handouts from trainer

	unusable			
3.1.8 Discuss unloading of faecal sludge from a vacuum tanker	• Setting up vacuum tanker equipment for the unloading of faecal sludge • Procedure for the unloading of waste • Demonstration of procedure for unloading faecal sludge	• Vacuum tanker procedure for the unloading of faecal sludge is demonstrated correctly	• Questioning: written and/or oral test • Class exercises • Observation: practical tasks on the setting up of vacuum tanker equipment for the unloading of faecal sludge, and the demonstration of the procedure for the unloading of faecal sludge	The trainee must have access to: • Trainee manual • Work instructions • Vacuum tanker • Treatment facility • Library/resource centre • Internet Handouts from trainer
3.1.9 Discuss the negative effects of discharging faecal sludge in an open environment	• Effects of discharging faecal sludge to the environment	• Negative effects of discharging faecal sludge in an open environment understood correctly	• Questioning: written and/or oral test • Class exercises	The trainee must have access to: • Trainee manual • Work instructions • Sites for observation of environmental contamination

				• Library/resource centre • Internet • Handouts from trainer
3.1.10 Discuss the importance of cleaning the tank between the loadings	• Reasons for cleaning tank between the loadings • Procedure for cleaning tank between the loads - cleaning in area where there is no contact with natural ground - cleaning in area where environmental pollution will not occur - cleaning using least-harmful cleaning agent: preferably water under pressure with no added chemicals - cleaning of internal surfaces (including hoses and fittings) - treatment and disposal of waste water and facecal sludge cleaned from the tank	• Importance of cleaning the tank between the loadings and the cleaning procedure understood and demonstrated correctly •	• Questioning: written and/or oral test • Class exercises • Observation: demonstration of procedure for cleaning tank	The trainee must have access to: • Trainee manual • Work instructions • Vacuum tanker • Tools, equipment and materials • Library/resource centre • Internet • Handouts from trainer

REFERENCE MATERIALS				

Job Profile

Part A:

Job Title: Vacuum Tanker Operator TEVETA Code: …….

CSO Occupational Std. Code, if any: ……...

Target Curriculum and Qualification:

Skills Award Certificate in Vacuum Tanker Operations and Maintenance

Economic Sector(s) in which the job is mainly practiced

- Water Supply and Sanitation
- Energy, Water Resources and Environment
- Town and Municipal Governments
- Food Processing and Manufacturing
- Construction Industry
- Petroleum Industry
- Commercial Aviation Industry
- Medicine and Pharmaceutical Industry

Part B:

1.0 Job Purpose

Vacuum tanker operators contribute to the improvement of sanitation and public health by operating vacuum tankers to empty septage from septic tanks, pit latrines and communal latrines; transferring the faecal sludge to a treatment facility; and discharging the waste at the treatment facility.

2.0 Main Duties / Responsibilities and Task / Activities for a Vacuum Tanker Operator

2.1 Comply with occupational and environmental health and safety requirements

2.1.1 Wear appropriate personal protective equipment (PPEs)

2.1.2 Manage risks associated with faecal sludge collection, transportation and discharge.

2.1.3 Conform with the obligations of the operator on health and safety issues, spills and site contamination

2.1.4 Check for vacuum tanker vehicle for good road worthiness

2.1.5 Clean and disinfect spillage

2.1.6 Meet load security requirements

2.1.7 Ensure good health and personal hygiene at all times

2.1.8 Clean and sanitize vehicle and tank after each load

2.1.9 Comply with necessary occupational, safety and health precautions at all times

2.1.10 Check safe operation vehicle and equipment

2.1.11 Maintain the cleanliness of the workplace

2.1.12 Comply with legislation on the placarding of vehicles and packaged waste

2.1.13 Comply with legislation on the declaration of dangerous goods

2.2 Plan and organize work

2.2.1 Understand work context of a vacuum tanker operator

2.2.2 Interpret work instructions

2.2.3 Determine safety and environmental protection requirements

2.2.4 Follow manufacturers' specifications on the use of a vacuum tanker and related equipment

2.2.5 Comply with organizational standards and codes of practice

2.2.6 Prepare tools, equipment and materials

2.2.7 Sequence work

2.3 Operate vacuum tanker

2.3.1 Understand the operations of a vacuum tanker

2.3.2 Operate the vacuum system

2.3.3 Observe the parameters of vacuum tankers including typical volumes

2.3.4 Understand daily routine checks to be carried on the vacuum tanker vehicle before each morning

2.3.5 Follow vehicle documentation requirements

2.3.6 Maintain vehicle log book

2.4 Perform routine and general preventive maintenance on a vacuum tanker

2.4.1 Clean vehicle

2.4.2 Clean trailers and hoses between all loads

2.4.3 Check operation of vacuum system

2.4.4 Clear blockages in suction hose

2.4.5 Perform routine maintenance works on a vacuum tanker

2.4.6 Perform general maintenance works on a vacuum tanker vehicle

2.4.7 Source and store spare parts and materials

2.5 Load waste

2.5.1 Prepare vacuum tanker for loading

2.5.2 Prepare site for loading and set out spill kit

2.5.3 Vent tank before using any external pump for loading

2.5.4 Follow the standard loading procedures for a vacuum tanker

2.5.5 Empty on-site sanitation facilities, i.e. septic tank, cesspit, etc

2.5.6 Monitor volume level on the tank during loading operations

2.5.7 Fill-up the work report form

2.6 Transport waste using vacuum tankers and trucks

2.6.1 Verify delivery instructions

2.6.2 Comply with statutory rules and regulations on the transportation of waste

2.6.3 Comply with company policies and procedures on the transportation of waste

2.6.4 Log work and rest periods

2.6.5 Log mileage

2.6.6 Maintain fuel and other receipts

2.6.7 Manage the load in the vacuum tanker

2.6.8 Complete documentation

2.7 Unload waste

2.7.1 Operate vacuum tanker equipment for the unloading of waste

2.7.2 Vent tank to be unloaded at designated disposal point

2.7.3 Dispose waste

2.7.4 Clean vacuum tanker vehicle tank

2.8 Provide customer service

2.8.1 Advise customers on requirements and payment for services

2.8.2 Receive and record payments in accordance with company policies and procedures

2.8.3 Clean customer premises after work

2.8.4 Advise customers on good sanitation practices

2.9 Complete work and clean up

2.9.1 Clean vehicle and equipment after use

2.9.2 Pack up equipment and spill kit

2.9.3 Complete work completion documentation

2.9.4 Report on work conducted, problems encountered and recommendations for improvements

2.9.5 Clean and store PPE

2.9.6 Wash hands with soap

3.0 Equipment, Tools and Consumable Materials

3.1 Equipment

- PPE:
  - Gloves
  - Goggles

- Helmet
- Footwear
- Breathing apparatus
- Nose and mouth mask
- Visibility vest
- Vehicle placards
- First aid kit
- Fire extinguishers
- Spill kit

- Vacuum tanker with externally mounted vacuum pump and motor
- Fire extinguishers
- Tie-down equipment for bulky and packaged loads
- Tire inflator
- Tape measure

3.2 Tools

- Cleaning tools and equipment
- Socket set
- Wrenches (torque wrench, adjustable, angle, box end)

- Drain plug
- Flarenut
- Combination set
- Allen keys
- Lubrication and grease guns
- Hammers
- Measuring tools
- Pliers
- Bench vices
- Clamps
- Hand power tools
- Hand pneumatic tools
- Feeler gauge
- Vacuum tester
- Spark plug tools
- Ratchets
- Screwdrivers
- Battery cell tester
- Battery hydrometer
- Battery filler

- Self-adjusting oil filter pliers

3.3 Consumables

- Disinfectants
- Sanitizers
- Cleaning materials including rags and mops
- Hand washing soap
- Engine oil for vacuum tanker engine
- Coolant for vacuum tanker engine
- Lubricants for vacuum pump and motor
- Battery fluid
- Brake fluid
- Coolants for vacuum pump and motor
- Suction hoses
- Containers
- Labels for containers
- Tape

4.0 Quality of Process and Product/Service

4.1 Quality of process

- Complying with waste management and occupational and environmental health and safety legislation, regulations, guidelines and procedures
- Complying with legislation and regulations on the transportation and discharge of waste including obtaining a licence for the transportation and discharge of waste, placarding of vehicles and packaged waste, declaration of dangerous goods and load security requirements
- Consistent and correct use of PPEs
- Consistent and correct use of appropriate containers and transportation vehicles
- Maintenance of vehicles to ensure safe operation of vehicles and equipment
- Proper and safe operation of vacuum tanker control equipment
- Cleaning and disinfection of spillage at customer's premises, during transportation and at treatment facility
- Cleaning and sanitizing vehicle and tank between loads
- Maintenance of a clean, hygienic and environmentally friendly work environment
- Washing hands with soap after each work activity
- Training of vacuum tanker operators

4.2 Quality of Product / Service

- Since this is a service occupation, the quality of the service depends on the quality of the process described above. All indicators of the quality of the process determine the quality of the service.
- Adherence to collection schedules agreed with the customer and the treatment facility.
- Customer care

- Charging fair market prices for the provision of services
- Effective communication and liaison with customers, personnel at the treatment facility and ZEMA
- Prevention of leaks and cleaning and disinfecting leaks

5.0 Dilemmas/Challenges and complexities for the job holder (what are the complicating issues for effective performance?)

5.1 Dilemmas/Challenges and complexities (that the job holder faces in his/her work)

- Difficulty of accessing some collection points due to narrow or bad roads
- High risk of health hazards: emptying of full single pit latrines which have freshly deposited sludge at the top of the pit which will contain many faecal organisms that may be pathogenic; risk of collapse; trips and falls; toxic fumes and exposure to hazardous sludge which can cause disease such as cholera, diarrhea
- Depending on the technology used, material in septic tank or pit can sometimes become so compacted that it cannot be pumped easily
- Clogging in suction hose and tank
- The job is regarded as unpleasant and dirty work by the public and there is a negative social stigma attached to it
- Sometimes work at night in crowded and unlit neighbourhoods
- High capital costs: buying a vacuum tanker and equipment
- High operating costs for vacuum tanker: maintenance, fuel, oil

5.1.1 Many vacuum tanker operators have inadequate skills and knowledge

5.2 Alternative Choices (Solutions) to dilemmas and complexities

- Risk assessment
- Following of occupational health, safety and environmental protection legislation, regulations and precautions
- Cleaning and disinfecting spillages
- Use of new technologies including new models of vacuum tankers like Juggler trucks
- Educating public on the critical importance of sanitation and people working in the sanitation value chain
- Use of new technologies to reduce operating costs and increase efficiency
- Training of vacuum tanker operators

6.0 Parties involved/interacting with the Job holder

6.1 Internal

- Supervisor
- Manager
- Other vacuum tanker operators
- Co-workers
- Helpers
- Auto Mechanics

6.2 External

- Environmental Inspectors (Zambia Environmental Management Agency)

- LCC
- Workers at treatment facility
- Customers
- Community Environmental Health Committees
- Lusaka Water and Sewerage Company

7.0 Working Conditions / Environment

The work is carried out in domestic and commercial locations. The work requires good customer service skills to keep the customers satisfied. This includes educating customers on how to care for their on-site sanitation facilities including septic tanks.

The work is performed in a high risk and highly regulated environment which requires strict adherence to occupational safety, health, hygiene and environmental protection legislation, rules, regulations and guidelines in order to prevent operators, customers and the public from contact with hazardous waste which can cause diseases. The working environment is characterized by strong unpleasant odours.

The risks include involvement in a traffic accident.

8.0 Physical demands on the body

The job can sometimes be physically-demanding and strenuous with heavy lifting, digging, bending and stooping.

The work includes travelling regularly and driving for long hours. The work is sometimes performed at night in poorly lit neighbourhoods.

9.0 Required abilities for job holder

The job holder should be able to:

9.1 Provide sanitation services
9.2 Demonstrate the preparations required to implement work tasks
9.3 Apply information in different documents
9.4 Sequence work tasks
9.5 Clean up after completing work tasks
9.6 Apply knowledge of the operating principles of a vacuum tanker
9.7 Operate the direct belt drive and hydraulic drive system configurations of a vacuum tanker
9.8 Operate the vacuum system of a vacuum tanker
9.9 Perform general preventive maintenance on a vacuum tanker
9.10 Maintain the auxiliary motor and vacuum pump of a vacuum tanker
9.11 Apply different documents on the loading, transportation and discharge of sludge
9.12 Empty septage from on-site sanitation facilities
9.13 Transport waste using vacuum tankers and trucks
9.14 Discharge sludge at treatment facility
9.15 Provide basic customer care

10.0 Required knowledge for job holder

10.1 Occupational and environmental health and safety rules, regulations and precautions

10.2 Definition of sanitation

10.3 Importance and reasons for good sanitation and FSM

10.4 Purposes and uses of a vacuum tanker

10.5 Contributions of vacuum tanker operators to good sanitation

10.6 Different types of waste, their sources and characteristics

10.7 Methods of disposing of different types of waste

10.8 Requirements of different documents which should be applied by vacuum tanker operators

10.9 Work planning and organisation

10.10 Basic constructional features of on-site sanitation facilities

10.11 Reasons and procedures for cleaning work area, plant, tools and equipment

10.12 Constructional features and operating principles of a vacuum tanker

10.13 Different types of suction pumps and their applications

10.14 Components of the vacuum system and their uses

10.15 Different types of maintenance

10.16 Procedures for the first line maintenance of a vacuum tanker and its components

10.17 Procedures for emptying, transportation and discharge of waste

10.18 Hazards of mixing incompatible waste

10.19 Different methods of transporting waste

10.20 Challenges of the manual and motorized emptying of sludge

10.21 Reusing and recycling materials

10.22 Basic customer care

11.0 Important Values/Attitudes

- Initiative
- Self-motivated
- Caring
- Cooperative
- Flexible and open-minded
- Focused
- Hard working
- Honest
- Reliable
- Tolerant

12.0 Practicing licence requirements (if any)

- Driver's licence

- Certificate for training in vacuum tanker operations
- ZEMA: Licence to operate
- LCC: business permits

13.0 Employment patterns

The term 'operator' includes: helpers, drivers, supervisors and owner-operators. Helpers, drivers and supervisors are employed by owner-operators.

One can progress from helper to driver to supervisor.

13.1 Entrepreneur/Self-Employed Career Pathway

Trained helpers, drivers and supervisors can start their own businesses and become owner-operators

14.0 National Employment Outlook and related Policy/Investment Trends

14.1 Salaried Employment Career Pathway

14.1.1 On-site Sanitation Regulatory Framework

14.1.2 Public Health Act

14.1.3 Environmental Management Act

14.1.4 On-site Sanitation standards and service indicators

14.1.5 On-site Sanitation By-law

14.1.6 On-site Sanitation catalogue

14.1.7 Sustainable Development Goals (No. 6 on safe water and adequate sanitation for all and No. on sustainable and resilient cities)

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