UAC
UNION ASSESSMENT & CERTIFICATION

مجلس أبوظبي للجودة والمطابقة
Abu Dhabi Quality & Conformity Council

Trainee Handbook

Water Tank Cleaner

2024/2025

Contents

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About This Book

This book is designed for upgrading the knowledge and basic skills to take up the job of drinking water tank cleaner in residential and commercial buildings. Upon successful completion of this course the candidate will be eligible to be assessed as certified water tank cleaning technician.

Key Learning Objectives for the specific Abu Dhabi Occupational Term mark the beginning of the module.

- Learning Objectives as per the ADOT

1- Learners will be able to understand when and why cleaning and disinfection are undertaken and how they are to be carried out.
2- Learners will be able to know the importance of cleaning and disinfection in systems such as domestic hot and cold-water systems.
3- Learners will understand importance of, and actual production of, a work-based risk assessment prior to carrying out the work.
4- Learners will be instructed on how to calculate volume of different shaped tanks, and amount of different strength chemicals required for dosing and neutralization.
5- Learners will be able to understand and apply sampling, testing and the safe handling and disposal of chemicals.

Symbols Used in This Book

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Table of Content

Key Learning Outcomes

- **Develop Awareness:** About ADQCC guidelines for water tank cleaning jobs.
- **Identification of Hazard:** Identify the common hazards involving water tank cleaning jobs.
- **Develop Understanding of Common Terms:** Develop understanding of common terms used in water tank cleaning jobs.
- **Identify Common Signs of Contamination:** To develop understanding about common signs of contamination in water tanks.
- **Water Sampling & Testing Frequency:** Understand the frequency and water sampling.
- **Understand Water Tank Cleaning Procedure:** Develop a thorough understanding about water tank cleaning procedure.

Terms & Definitions

Accredited Laboratory or Accredited Testing Company – A laboratory or water testing company or organization that operates under ISO 17025 and is licensed in the Emirate of Abu Dhabi to conduct testing of drinking water samples and is accredited by the relevant authorities to conduct such operations.

ADQCC – Abu Dhabi Quality and Conformity Council (QCC) is a government entity established to ensure the provision of quality infrastructure in line with global standards.

Cleaning – The act of removing dirt, sediment, Sludge, algae or any other contaminants from a Customer Water Storage Tank for the purpose of restoring or maintaining hygienic conditions.

Cleaning Chemicals – Any detergents or cleaning agents used for the Cleaning of Customer Water Storage Tanks.

Customer – The Person to whom the Distribution Company supplies water for domestic, industrial, agricultural and commercial purposes.

Confined Space – A confined space is any space that offers limited entry and exit points, and is generally not designed to accommodate humans.

Customer Water Storage Tank or Tank – Means any receiving tank after the point of delivery to the Customer from the Distribution System for storing water for subsequent use.

Disinfectant – Any chemical used for the purpose of disinfecting or sterilizing micro-biological agents or bacteria.

Disinfection – The act of applying disinfectant to Customer Water Storage Tanks for the purpose of inactivating bacterial and micro-biological agents.

EHS – Environment, Health and Safety.

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Inspection – The act of visually evaluating the external and internal condition of a Customer Water Storage Tank for the purpose of establishing the likely quality or wholesomeness of stored water and any likely sources of contamination.

Man Entry Tank – Means a Customer Water Storage Tank which is large enough to allow a man to enter and work inside.

Non-Man Entry Tank – Means a Customer Water Storage Tank which is not large enough to allow a man to enter and work inside.

pH Balance Testing – Ensuring water has a neutral pH after cleaning to prevent corrosion or microbial growth.

Responsible Company – Means a company or organization that is licensed to conduct any operations or activities that relate to Customer Water Storage Tank Inspection, Sampling, Cleaning or Disinfection within the Emirate of Abu Dhabi.

Responsible Person – Means the owner or the person who assumes responsibility for the installation of the Customer Water Storage Tank or Water Fitting including Registered Building Owners, Managers or Agents.

Sampling – The act of collecting a small amount of water from a Customer Water Storage Tank for the purpose of representing the whole.

Scrubbing – Manual cleaning of tank surfaces using brushes or scrubbing pads.

Sludge – Any sediment or dense material that has settled inside the Customer Water Storage Tank.

Testing – The act of analyzing a water sample taken from a Customer Water Storage Tank for the purpose of determining the level of specified contaminants or parameters.

Wastewater – The water-borne waste generated by the process of cleaning and disinfection of any Customer Water Storage Tank.

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Module 1. Introduction to Water Tank Cleaning

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- Unit 1.1. Water Tank Cleaner's Roles and Responsibilities
- Unit 1.2. Types of Customer Water Storage Tanks

Key Learning Outcomes

- **Introduction:** To develop awareness about the water tank cleaning jobs.
- **Overview of Customer Water Storage Tank:** To know different types of customer water storage tanks.
- **Overview of the Cleaner Role:** To know about the role and responsibilities of water tank cleaner.
- **Safe Use of Cleaning Equipment:** To understand about the selection and safe use of cleaning equipment.
- **Understand Emergency Procedure:** Develop understanding about emergency planning and response.

Unit 1.1. Roles and Responsibilities of Water Tank Cleaner

Unit Objectives

At the end of the unit, you will:

1. Gain an understanding of the roles and responsibilities of water tank cleaners.

Theory Content — 20 Minutes

1.1.1. Overview of Water Tank Cleaner's Job

Water storage tanks are prone to contamination due to various factors such as dust, dirt, debris, algae, and various micro-organisms. This contamination can affect the quality of the stored water, making it unsafe for consumption. Therefore, cleaning water tanks regularly is essential to remove these contaminations and ensure the stored water is clean and safe.

To clean water tanks, specialized personnel are required to perform this critical task in a safe and professional manner.

1.1.2. Understanding the Role of Water Tank Cleaner

Apply best practices for cleaning and disinfection procedures & techniques.

The water tank cleaner must be able to:

1. Understand and apply all (Safety, Health & Hygiene) requirements in line with ADOSH-SF and section 9.2 of the Code of Practice for the inspection and cleaning of customer water storage tanks issued by the Department of Energy.
2. Conduct gas testing inside tanks without entering the tank using gas tester prior to entry/access to tanks, this should be continued at periodic intervals during the cleaning process.
3. Understand the hazards and risks associated with the activity and apply proper control measures.
4. Apply a suitable method for ventilation prior to entering the water tank.
5. Conduct pre-checks of cleaning machines and safe use of electrically operated cleaning equipment/machinery for tank cleaning.

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6. Understand and apply Safe access and egress methods for tank cleaning.
7. Inspect and report defects on cables and safely connect cables to power sources used for temporary electrical lighting inside or outside the tanks.
8. Use suitable Personal Protective Equipment (PPE) in accordance with manufacturers' specifications and OHS, local and international standards, and company requirements.
9. Scrape and scrubs walls, using detergents, solvents, scrapers, and brushes to remove incrustations, scale, or any deposits. As per section 9.2 of the Code of Practice for the inspection and cleaning of customer water storage tanks, issued by the Department of Energy.
10. Remove chemical residues and other liquids from tank bottoms with squeegees or pump and suction hoses.
11. Understand the entry requirements including the following:
    - Report any health-related issues and/or including injuries, cuts or abrasions which may get exposed or pose hazard during the cleaning activities.
    - Use of communication equipment.
    - Use of emergency communication voice or hand signals during an emergency.
    - Use approved chemicals to clean water tanks.

1.1.3. Understand the Basic Knowledge of Cleaning & Disinfection Equipment and its Use

1. Undertake work in line with the requirements of local safety and health legislation (ADOSH SF).
2. Demonstrate knowledge and awareness of cleaning & disinfecting equipment used in the process of water tank cleaning.
3. Demonstrate knowledge and awareness of hazard identification, risk assessment and emergency response requirements.
4. Follow the procedure and use the required dilution in accordance with label instructions and be in possession of the material safety data sheet (MSDS) for all chemicals used.
5. Read and follow the product labels and other information such as e.g. user manuals.
6. Use equipment correctly in accordance with the manufacturer’s instructions and have the tools to repair in case of need.
7. Apply the chemicals in a way which minimizes and prevents risks to the humans, and the environment in line with the MSDS.

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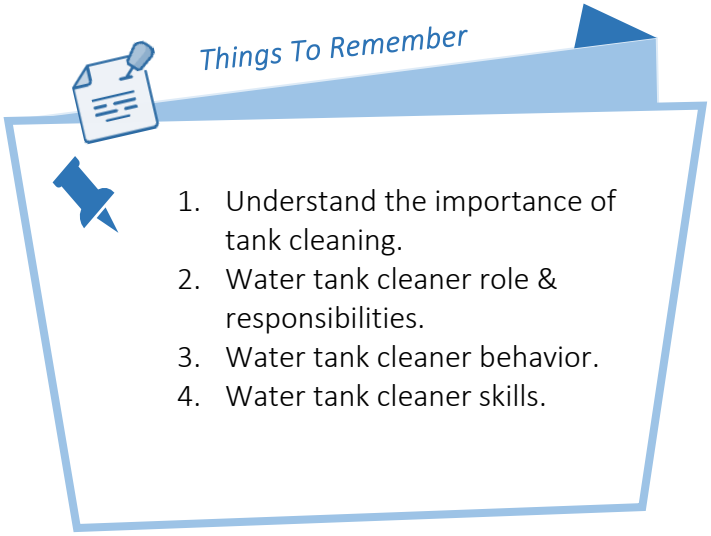
8. Take the appropriate action without delay when problems arise during work and request the supervisor's assistance for clarification as required.
9. Demonstrate knowledge and adherence to the use of the related equipment to ensure longevity of all the equipment.
10. If necessary, clearly inform the customer about the location of materials and equipment left on site for continuing cleaning and maintenance purposes and any relevant handling and safety instructions. Give the emergency phone number of the company to attend to any customer services required.
11. Control those health and safety risks with job responsibility.
12. Eliminate hazards prior to handover in accordance with environmental, legislative, OHS and company requirements.
13. Clean and decontaminate equipment in accordance with manufacturers' specifications and environmental, OHS and company requirements.
14. Dispose of all collected waste in accordance with work order and manufacturers' specifications and environmental, legislative, OHS and company requirements.
15. Ensure pre-plan washing and tank entry activities are in place.
16. Maintain effective communication with supervisors/operators.
17. Ensure tank cleaning operations are completed in accordance with tank entry requirements.



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Unit 1.2. Overview of Customer Water Storage Tanks

Unit Objectives

1. To know different types of customer water storage tanks.
2. To develop knowledge about the construction material of water storage tanks.

Theory Content — 20 Minutes

1.2.1. Overview of Customer Water Storage Tanks

Water storage tanks are essential infrastructure for storing water for a variety of purposes, including domestic use, agricultural irrigation, industrial applications, and emergency water supply.

1.2.2. Types of Water Storage Tanks

1. Overhead Water Tanks
   a. **Purpose:** Commonly used for domestic and commercial water storage, these tanks are placed on rooftops or elevated platforms to use gravity for water distribution.
   b. **Material:** Typically made of plastic (Fig WTC_M.1.3), fiberglass (Fig. WTC_M.1.2), or concrete (Fig. WTC_M.1.1).
   c. **Capacity:** Usually small to medium, ranging from 500 to 5,000 Gallons.

Concrete Overhead Water Tanks

Fig. WTC_M.1.1

Fiberglass Overhead Water Tanks

Fig. WTC_M.1.2

Plastic Overhead Water Tanks

Fig. WTC_M.1.3

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2. Underground Water Tanks
   a. **Purpose:** These are used where space is limited, or aesthetic concerns require hidden water storage. They store water below ground and are useful for rainwater harvesting or backup water supply.
   b. **Material:** Concrete (Fig. WTC_M.1.4), plastic (Fig. WTC_M.1.6), or fiberglass (Fig. WTC_M.1.5)
   c. **Capacity:** Varies widely, from small residential tanks to large commercial or industrial tanks holding tens of thousands of liters.

Concrete Underground Water Tanks

Fig. WTC_M.1.4

Fiber Glass Underground Water Tanks

Fig. WTC_M.1.5

Plastic Underground Water Tanks

Fig. WTC_M.1.6

Things To Remember

1. Overview of water tanks.
2. Understand types of water tanks.
3. Know the construction material of water tanks.

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Knowledge Test

1. Who is authorized to perform tank cleaning?
    a. Anyone
    b. Only trained and competent person
    c. The watchman
    d. None of the above

2. Is it safe to work alone in the water tank?
    a. Always
    b. Sometimes if we don't have manpower
    c. No, it's not allowed to work alone
    d. Only if you have the PPE

3. Tank cleaner should have a good understanding of which of the following?
    a. The hazard associated with the job
    b. Emergency procedure
    c. PPE and equipment safety
    d. All the above

4. Which of the following skills are required to be a tank cleaner?
    a. Reading and writing
    b. Speaking and listening
    c. Safe behavior
    d. All the above

5. What should the tank cleaner do in case of an emergency?
    a. Stop the work, exit the tank and report
    b. Finish the work then call supervisor or emergency services
    c. Continue to finish the work
    d. Stop the work, and stay inside the tank

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Module 2. Hygiene Practices in Water Tank Cleaning

Unit 2.1. Personal Hygiene of Technicians
Unit 2.2. Cleaning Tools and Hygiene
Unit 2.3. Wastewater and Sludge Disposal Hygiene

Key Learning Outcomes

- **Importance of Personal Hygiene:** To know the concept of maintaining personal hygiene.
- **Personal Hygiene for the Cleaning Technicians:** To develop understanding about hand hygiene, PPEs, prevention of contamination etc.
- **Maintaining Clean Clothing:** To understand the importance of personal hygiene including use of clean clothing.
- **Use of Appropriate PPEs:** To develop understanding about the proper use of personal protective equipment including respiratory protection equipment.

Unit 2.1 Personal Hygiene of Technicians & Cleaning Tools Hygiene

Unit Objectives

At the end of the unit, you will be able to:

1. Familiarize with personal hygiene of technicians
2. Familiarize with cleaning tools and equipment hygiene

Theory Content — 20 Minutes

Introduction

Maintaining hygiene during water tank cleaning is critical to ensure that stored water remains safe and free from contaminants. Proper hygiene practices help prevent the growth of bacteria, algae, and other harmful microorganisms that can compromise water quality. Below are key hygiene practices to follow during the cleaning process:

2.1.1. Personal Hygiene of Technicians

1. **Wear Clean, Proper PPE:** Ensure that all technicians involved in the cleaning process wear clean personal protective equipment (PPE) such as gloves, face masks, coveralls, and boots to avoid direct contact with contaminants.

2. **Hand Hygiene:** Technicians must wash their hands thoroughly before and after handling cleaning equipments or entering the water tank area. Use alcohol-based hand sanitizer when soap and water are unavailable.

3. **Avoid Contaminating the Tank:** Prevent cross-contamination by ensuring technicians do not introduce foreign materials (e.g., dirt from shoes or unwashed hands) into the tank during cleaning.

4. **Maintain Clean Clothing:** Use clean and sanitized clothing when entering the tank. If any contaminants are introduced, it can compromise the cleanliness of the water.

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2.1.2. Cleaning Tools and Equipment Hygiene

1. **Disinfect Cleaning Equipment:** All tools, including brushes, hoses, pressure washers, and containers, should be properly cleaned and disinfected before and after each cleaning session.

2. **Dedicated Tools for Water Tank Cleaning:** Avoid using the same tools for other tasks (e.g., wastewater or sewage cleaning) to prevent contamination. Keep dedicated tools specifically for water tank cleaning.

3. **Proper Storage of Tools:** After use, store all tools in a clean, dry place to prevent microbial growth on the equipment.

4. **Sanitize Pumps and Hoses:** Submersible pumps and hoses used to drain the tank should be disinfected before use, especially if they have been used in other tanks or areas.

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Case Study 1:

Scenario: A team used brushes and hoses that had been previously used for cleaning wastewater tanks without properly disinfecting them. As a result, the drinking water tank was contaminated with harmful microorganisms. Water samples after cleaning revealed elevated bacterial counts, leading to customer complaints and additional cleaning rounds.

Learning Points:

- Importance of using dedicated equipment for drinking water tanks.
- Ensuring thorough disinfection of all tools and equipment before use.
- Consequences of cross-contamination on public health and customer trust.

Discussion: What steps should be taken to prevent contamination when cleaning drinking water tanks?

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Unit 2.2 Water Tank Cleaning Process & Hygiene

Unit Objectives

At the end of the unit, you will be able to:

1. Familiarize with hygiene practices in water tank cleaning.
2. Familiarize with water quality testing

Theory Content — 20 Minutes

2.2.1. Water Tank Cleaning Process Hygiene

1. **Drain All Water Completely:** Before cleaning, make sure to fully drain the tank to avoid standing water that can harbor bacteria and pathogens. The water can drain through outlet valve, tap or sump pumps.

   Note: To avoid wastage of water, start cleaning when there is minimum water level.

2. **Scrub Away Sediments and Biofilm:** Manually scrub the tank walls, floors, and ceilings to remove all visible dirt, algae, and sediment. Pressure washers should be used to eliminate biofilm and other stubborn contaminants.

3. **Use Approved Cleaning Agents:** Use only ADQCC certified and approved cleaning agents, such as chlorine-based disinfectants, in recommended concentrations (e.g., 50-100 ppm chlorine solution). Follow the manufacturer's recommendation for dosage.

4. **Avoid Overuse of Chemicals:** Follow the manufacturer's instructions when mixing disinfectants, ensuring that the correct amount is used to prevent chemical contamination. Also follow the manufacturer's safety precautions while dealing with the cleaning agents.

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5. **Soak and Rinse Thoroughly:** After applying cleaning agents, allow sufficient soaking time (at least 30 minutes) for proper disinfection. Then, rinse the tank thoroughly with clean water to remove any residual chemicals. Clean and rinse all surface including the built-in access ladder etc.

2.2.2. Water Quality Testing

1. **PPE:** Wear the required PPE such as Hard Hat, Gumboots, Chemical safety gloves, Safety goggles and Safety harness before conducting the water testing.

2. **Shutdown:** Shutdown the inlet before water testing.

3. **Test Before and After Cleaning:** Perform water quality testing both before and after the cleaning process to ensure water safety. Key tests include pH levels, chlorine residuals, turbidity, and bacteria (e.g., coliform bacteria, E. coli or other pathogens).

4. **Drain water:** Drain out the water if the water is not appropriate and the test results are not satisfactory.

5. **Only Refill When Safe:** Do not refill the tank until tests confirm that the water is free from harmful micro-organisms and chemical residues.

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Unit 2.3. Wastewater & Sludge Disposal Hygiene

Unit Objectives

At the end of the unit, you will be able to:

1. Familiarize with wastewater & sludge disposal hygiene
2. Understand prevention of recontamination
3. Know the documentation and certification

Theory Content   20 Minutes

2.3.1. Wastewater and Sludge Disposal Hygiene

1. **Dispose of Waste Safely:** Collect and dispose of sludge, sediments, and wastewater in compliance with environmental and health regulations. Contaminated water should never be discharged into natural water bodies or drainage systems.

2. **Avoid Cross-Contamination:** Use dedicated containers for transporting and disposing of sludges and debris to prevent contamination of clean areas or tanks.

3. **Use Licensed Disposal Services:** Where necessary, work with certified waste disposal services to ensure that all waste materials are handled and disposed of in accordance with local regulations.

2.3.2. Prevention of Recontamination

1. **Sealing and Securing the Tank:** After cleaning, ensure the tank is properly sealed to prevent contamination from external sources such as dust, insects, or rodents.

2. **Check Vent Filters:** Ensure that vents and overflow pipes are covered with mesh or filters to prevent the entry of insects or small animals that could contaminate the water.

3. **Regular Cleaning Schedule:** Implement a regular cleaning and maintenance schedule (every 6-12 months) to prevent the buildup of contaminants over time.

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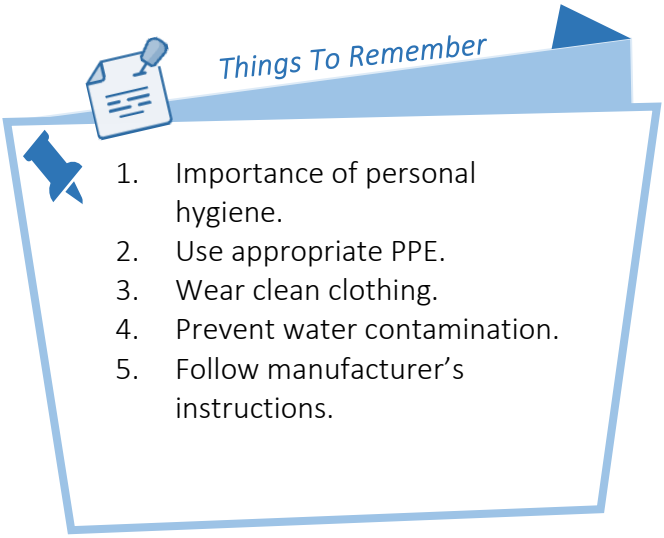
4. **Avoid Stagnant Water:** Use the water stored in the tank regularly, as stagnant water can become a breeding ground for bacteria and algae.

2.3.3. Documentation and Certification

1. **Record Cleaning Procedures:** Document the entire cleaning process, including the date, names of technicians, cleaning methods used, and disinfectants applied.
2. **Issue Cleaning Certificates:** After cleaning, provide a cleaning certificate that verifies the tank that was cleaned and disinfected according to hygiene standards.
3. **Regular Inspections:** Conduct routine inspections and document the condition of the tank, identifying any potential risks to the integrity of water storage tank such as cracks or structural issues.

2.3.4. Training and Awareness

1. **Train Technicians on Hygiene Standards:** Ensure that all personnel involved in water tank cleaning are trained in hygiene practices, safety protocols, and the proper use of cleaning agents and equipment. Educate customers or facility managers on the importance of maintaining clean water tanks and scheduling regular cleaning to ensure safe water supply.



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Knowledge Test

1. Why do water tank technicians need to maintain good personal hygiene?
    a. To look smart
    b. To avoid the risk of infection and cross contamination
    c. To save medical charges
    d. It's not mandatory to maintain personal hygiene

2. How does technician maintain good personal hygiene?
    a. Cleaning hands and body
    b. Wearing clean clothing
    c. Wearing all personal protective equipment
    d. All the above

3. How to avoid water contamination with the use of water tank cleaning equipments?
    a. Using clean and disinfected equipment
    b. Using poorly maintained equipment
    c. Ensure equipments are insulated
    d. None of the above

4. What are the hazards associated with unhygienic equipments?
    a. It can cause water contamination
    b. The equipment may cause injury
    c. It may improve work performance
    d. There is no hazard associated with unhygienic equipment

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Module 3. Water Tank Inspection, Cleaning and Disinfection Procedures

- Unit 3.1 Water Tank Inspection
- Unit 3.2 Preparation
- Unit 3.3 Water Tank Cleaning
- Unit 3.4 Water Tank Disinfection
- Unit 3.5 Wastewater & Sludge Disposable & Water Sampling

Key Learning Outcomes

- **Purpose of Tank Inspection:** To check the integrity of the tank and to ensure the suitability of water.
- **Tank Cleaning & Disinfection Techniques:** To know and understand the common specialized tank cleaning and disinfection techniques.
- **Wastewater & Sludge Removal Procedures:** To develop understanding about step-by-step procedures and protocols for tank cleaning.
- **Water Tank Sampling:** To develop awareness about the importance of tank sampling.

Unit 3.1 Water Storage Tank Inspection

Unit Objectives

At the end of the unit, you will be able to:

1. Understand the standard procedures and protocols for water tank inspection
2. Understand the safety requirements during inspection of water tank

Theory Content

20 Minutes

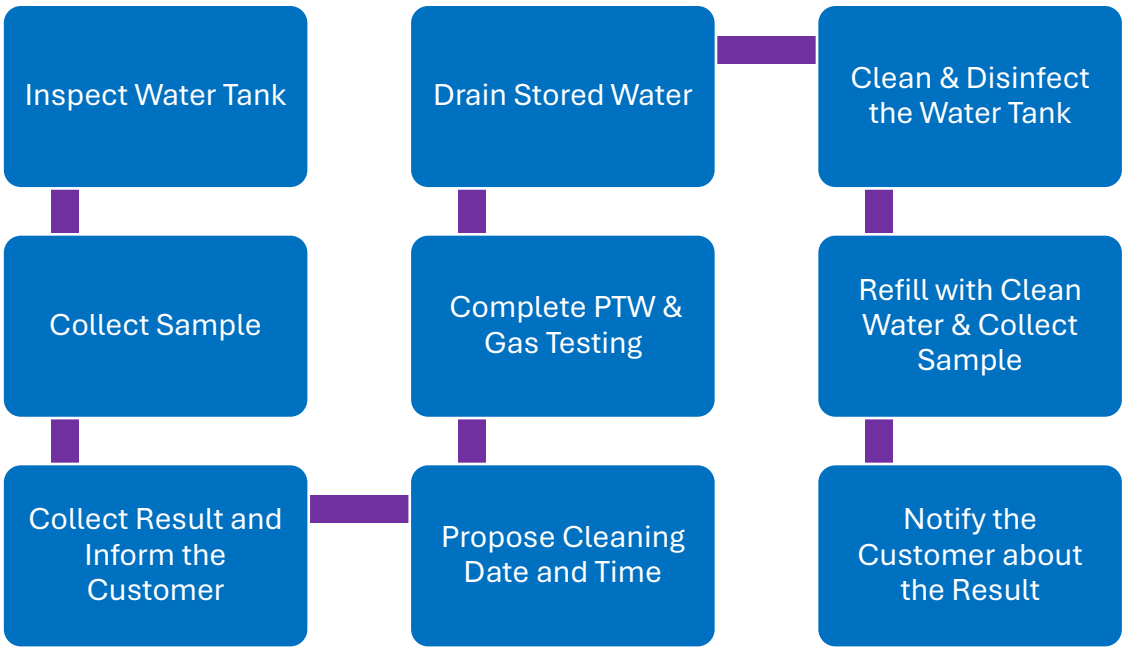

Fig. WTC_M.3.1 Water Tank Cleaning Flowchart

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Introduction to Water Tank Inspection

Water is extremely important for our lives, and we might not realize how valuable it is. One key aspect of taking care of water is using water tanks. These tanks, found in homes or industries, play a crucial role in safeguarding our water supply. Unclean water tanks serve as a breeding ground for a variety of bacteria, exposing the environment of water tanks to contamination. Furthermore, dirt, mold, and silt deposits build up in the water tank, rendering the water unsafe for drinking as well as daily use. Contaminated water can cause water-borne diseases such as diarrhea, cholera, legionaries, typhoid, and lead poisoning. Therefore, it is critical that the water we drink, or use is completely clean and pure. As a result, it's critical to clean the water tanks in our homes and workplaces on a regular basis.

3.1.1. Requirements for Responsible Companies EHS Risk Assessment

The Responsible Company shall, prior conducting any inspection, water sampling, or cleaning and disinfection of any water storage tank, ensure the completion of an Environment, Health & Safety (EHS) Risk Assessment in accordance with the Risk Management Guidelines outlined in the Abu Dhabi Occupational Safety and Health (ADOSH SF) System Framework.

3.1.2. Common Hazards Associated with Tank Cleaning

- Overhead hazards
- Slip & Fall
- Working from heights
- Confined Space
- Temperature & Lighting
- Noise
- Chemicals

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Risk Assessment Sample

RISK ASSESSMENT FORM			
Company	Group 1	**Conducted By (Date)**	10/5/2006
Task	**Water Tank Cleaning**		
Approved By (Date)		**Next Review Date**	

1. Hazard Identification				2. Risk Evaluation				3. Risk Control		Reference
No.	**Task Step**	**Hazard**	**Possible Accident/Ill Health & Persons-at-risk**	**Existing Risk Control**	**Severity**	**Likelihood**	**Risk Level**	**Additional Risk Control Measure**	**Action Officer Follow-up Date)**	**Document for Reference**
1	Pre-Inspection by supervisor	Mis-communication	Invalid permit application	-Highlight in VSCC meeting -Ensure valid PTW tank entry	1	1	L	3 point contact Buddy System	Immediate Supervisor	
		Lack of oxygen	Asphyxiation	-Sufficient ventilation -Equip with portable gas detector (working condition)	5	1	M			
		Slip & Fall	Bodily injury	-Sufficient lighting ensure carry torchlight -Barrication -PPE (Safety boot) & hand glove	3	2	M			
		Falling of person	Bodily injury		3	2	M			
		Lack of illumination	Bodily injury		1	1	L			

Fig. WTC_M.3.2 Risk Assessment Sample

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3.1.3. Steps for Water Tank Inspection

1. **Arrival on Site:** On arrival the cleaning team supervisor should obtain Permit to Work from the customer/owner (EHS Officer or any other authorized person) for tank inspection and cleaning.
2. **Wear PPE:** Prior to inspecting the water tank, wear all the required PPEs.
3. **Inspection of Accessible Water Tank:** Inspect the tank from inside to check for any contamination such as sediments, algae, dead insects and animals, biofilm, rust including odor and taste of the water. Check the tank structure for any cracks or physical damage.
4. **Inspection of Non-Accessible Water Tank:** Inform the customer/owner to ensure proper access to inspect and clean the tank. Once the tank is deemed accessible, conduct the inspection.

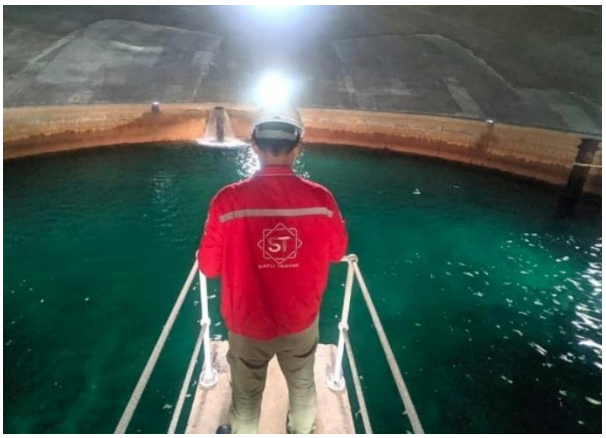

Fig. WTC_M.3.3 Water Tank Inspection

Fig. WTC_M.3.4 Sign of Contamination

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Case Study 2:

Scenario: During inspection of a drinking water tank, the team failed to notice contamination signs like algae growth and biofilm on the tank walls. They proceeded with cleaning without thorough scrubbing. Post-cleaning water samples still showed contamination, leading to a second cleaning session.

Learning Points:

- The critical role of thorough inspections in identifying contamination sources.
- Techniques for detecting biofilm, algae, and other hidden contaminants.
- How missed inspection details can compromise the effectiveness of cleaning.

Discussion: What best practices should be followed during inspections of drinking water tanks?

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5. **Sample Collection:** Collect sample and send to ADQCC Accredited laboratory for analysis.

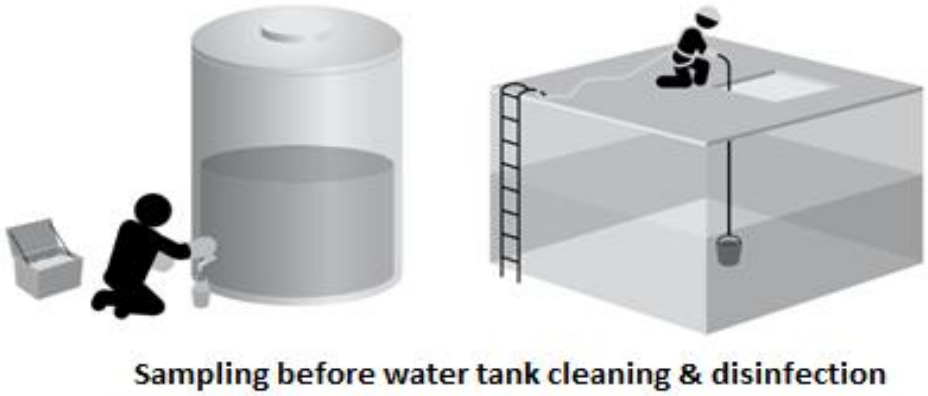

Fig. WTC_M.3.5 Water Sample Collection

6. **Inspection Report:** Upon completion of inspection, provide the inspection report to the customer/owner and discuss any signs of contamination to confirm cleaning.

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Example of water test sample report that is **not compliant** (fig WTC_M.3.6)

Analytical Laboratory Report

Client: Client's Name
Collected by: KM
Project: Analytical Laboratory Services
Project Number: CL000001
Date Collected: 05/28/98
Time Collected: 7:35 a.m.
Sample Identification: Kitchen tap
Lab Number: 01000

Analysis	Results	Units
Total Coliform Bacteria	50	#/100ml
Nitrate-Nitrogen	4.55	mg/L
pH	7.50	
Iron	0.55	mg/L
Hardness as CaCo3	280	mg/L
Sulfate Sulfur	32.0	mg/L
Chloride	25.4	mg/L
Specific Conductance	344	umhos/cc

On the basis of the above test result(s), this water sample DOES NOT MEET EPA Drinking Water Standards.

The following notes apply to this sample:

The Total Coliform Bacteria exceeded the max.lev. of 1 colony/100ml.
The Iron level exceeded the limit of 0.3 mg/L.

Fig. WTC_M.3.6 Water Sample Analytical Report

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Unit 3.2 Preparation for Water Tank Cleaning

Unit Objectives

At the end of the unit, you will be able to:

1. Understand water tank cleaning preparation
2. Understand the safety requirements for water tank cleaning work
3. Identify PPE and cleaning equipment for water tank cleaning

Theory Content — 20 minutes

3.2.1. Accessible Water Tank Cleaning Preparation

Accessible water tanks are those tanks where the worker can get inside the tank for cleaning such as underground concrete tanks, above the ground concrete and steel tanks. Plastic tanks that can be accessed through proper means. All necessary arrangements must be made before entering the tank, such as obtaining a permit to work, gas test, employee training, risk assessment, equipment selection and inspection and emergency procedure etc.

1. **Notify the Customer:** Notify the customer/owner at least 48 hours in advance to ensure proper coordination of the water tank cleaning activity. Place tank cleaning & disinfection notice (Arabic & English languages) at prominent location to inform the tenants/residents.

2. **Drain the Water:** Drain the stored water using outlet valve for roof tank and sump pumps for underground tank. Shut inlet valve at least 24 hours prior cleaning to allow maximum water to be used (to ensure less wastage of water).

Note: *Cleaning should be started when water level is minimum inside the tank.*

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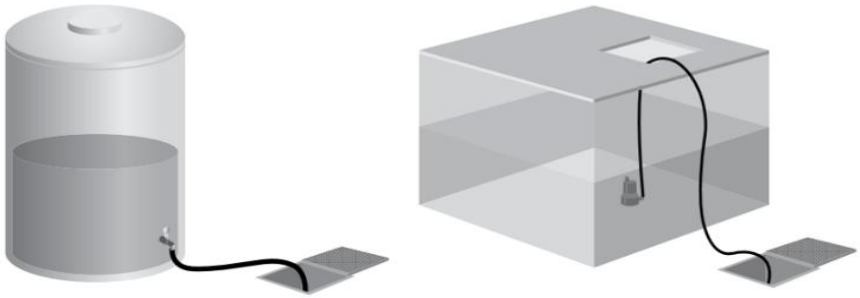

Fig. WTC_M.3.7 Draining Stored Water

3. **Ventilate the Water Tank:** Install an exhaust fan to ventilate the space before entry. Ensure continuous ventilation throughout the work where required.

Fig. WTC_M.3.8 Monitoring

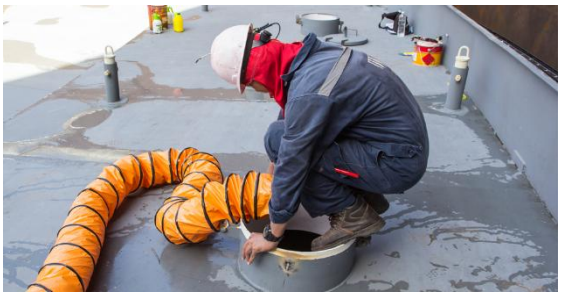

Fig. WTC_M.3.9 Ventilation System

4. **Permit to Work & Gas Testing:** Upon site arrival, obtain an entry permit. Ensure the tank is tested by an Authorized Gas Tester (AGT) for atmospheric hazards such Oxygen Deficiency, Carbon Monoxide, Hydrogen Sulfide and Methane etc. (Fig WTC_M.3.10)

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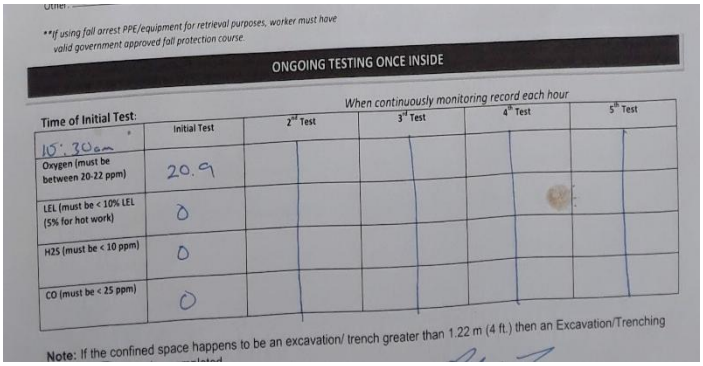
Fig. WTC_M.3.10 Gas Detector



**if using fall arrest PPE/equipment for retrieval purposes, worker must have valid government approved fall protection course.

ONGOING TESTING ONCE INSIDE

When continuously monitoring record each hour

Time of Initial Test: 10:30am	Initial Test	2nd Test	3rd Test	4th Test	5th Test
Oxygen (must be between 20-22 ppm)	20.9				
LEL (must be < 10% LEL (5% for hot work)	0				
H2S (must be < 10 ppm)	0				
CO (must be < 25 ppm)	0				

Note: If the confined space happens to be an excavation/ trench greater than 1.22 m (4 ft.) then an Excavation/Trenching

Fig. WTC_M.3.11 PTW

5. **Ensure Safe Access:** The company responsible needs to ensure safe access to the water tank such as a ladder.

6. **Lock Out – Tag Out:** Ensure proper Lockout Tagout before entering the water tank to prevent the risk of electric shock and sudden release of water.

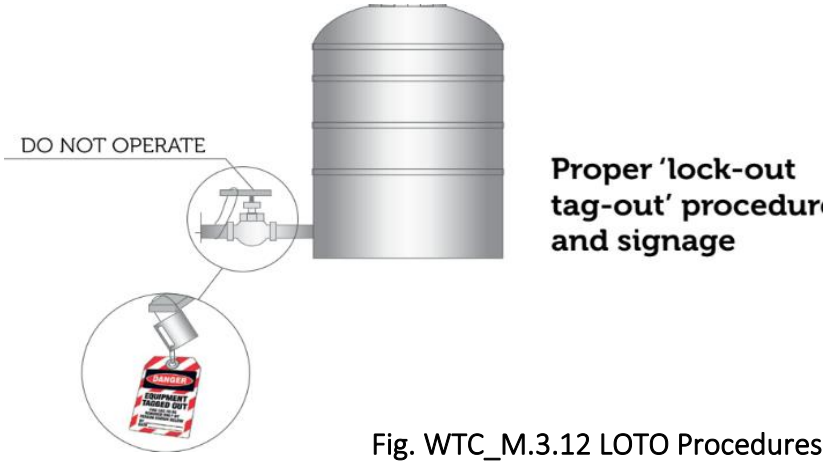


Fig. WTC_M.3.12 LOTO Procedures

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7. **Personal Protective Equipment:** All personnel involved in water tank cleaning and disinfection must wear the required PPEs such as:

    1) **Helmets** protect the head against injury.
    2) **Goggles** are used when chemicals are applied, and cleaning is in process so that cleaning agents do not splash into the eye.
    3) **Safety Harnesses** are worn when employees work at height.
    4) **Ventilation Fans** circulate and replenish fresh air into the water tank.
    5) **First Aid Kit** is used for treating minor abrasions and cuts.
    6) A **Gas Monitor** is used to make sure that large tanks are free from hazardous gases before employees enter the tank.
    7) **Boots** are used for protection of feet from debris while inside the tank.
    8) **Gloves** will protect the hands when chemicals are being applied, and walls are scrubbed.

Fig. WTC_M.3.13 PPE

Fig. WTC_M.3.14 PPE

8. **Toolbox Talk:** Toolbox talk to be conducted by entry supervisor. All personnel involved must attend the meeting and sign off the TBT record sheet.

9. **Work Equipment:** All work equipment such as ladders, a sump pump, pressure washer machine, exhaust fan, spray machine and vacuum cleaner shall be inspected before use.

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Typical water tank cleaning equipment may comprise the following.

Fig. WTC_M.3.15 Water Tank Cleaning Equipment

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Case Study 3:

Scenario: A drinking water tank had a small crack in its wall, which the inspection team overlooked. Post-cleaning, contaminants from the surrounding environment seeped into the tank through the crack, leading to unsafe drinking water. This caused an outbreak of waterborne illnesses in the community.

Learning Points:

- Importance of identifying and reporting structural issues during inspections.
- Risks of contamination from external sources through structural defects.
- Collaboration with tank owners to repair and maintain drinking water tanks.

Discussion: How can inspection protocols be improved to identify structural issues that compromise drinking water safety?

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Unit 3.3 Steps for Water Tank Cleaning

Unit Objectives

At the end of the unit, you will be able to:

1. Understand water tank cleaning steps
2. Know about scrubbing and dirt cleaning

Theory Content — 20 Minutes

3.3.1. Determine the Work Team Members

- ✓ Determine the number of personnel to clean inside.
- ✓ One person at the entrance monitoring.
- ✓ Vacuum pump operator.
- ✓ Supervisor onsite.

Fig. WTC_M.3.16 Cleaning Team

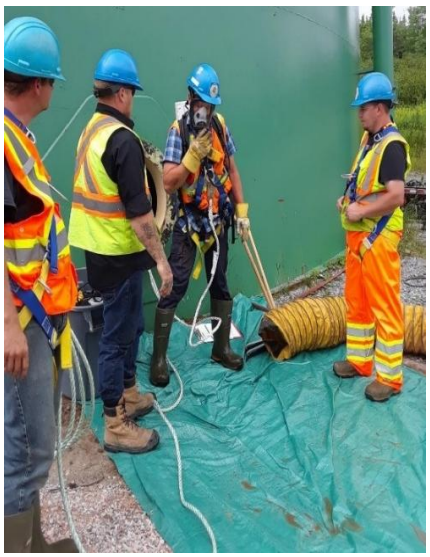

Fig. WTC_M.3.17 Entry Team

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3.3.2. Cleaning the Tank Inner Surfaces

a. Make sure the ladder or scaffold is in good condition and safe for use.

b. Ensure standing by person is available.

c. Remove dirt and contamination with brush and scraper.

d. Scrub or use pressure hose to clean dirt and grime from tank surfaces, including tank cover and entry points. Use approved cleaning chemicals.

Fig. WTC_M.3.18 Pressure Washing

Fig. WTC_M.3.19 Cleaning Dirt

e. Rinse the tank with clean water and drain the wastewater. (Fig.1)

Fig. WTC_M.3.20 Draining Wastewater

Fig. WTC_M.3.21 Pressure Cleaning

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Unit 3.4 Water Tank Disinfection

Unit Objectives

At the end of the unit, you will be able to:

1. Understand water tank disinfection procedures
2. Familiarize with wastewater & sludge disposal

Theory Content — 20 Minutes

3.4.1. Calculating the Amount of Disinfectant

- The Company responsible shall use food-grade quality for the above allowable disinfectants, suitable to use in drinking water storage tanks.
- The Company responsible shall follow the directions and instructions of the manufacturer when determining the quantity of disinfectants needed to properly cover all internal surfaces of the water tank, as well as SDS sheets.

3.4.2. Disinfecting Water Tanks that are Accessible

a) Tanks that are a deemed 'accessible' and are safe to access shall be disinfected using a typically recommended concentration of disinfectants which are sprayed or scrubbed onto all internal tanks' surfaces including the internal tank cover and any internal ladders. The permitted chemicals that can be used for the disinfection of water storage tanks include the following:

   - Sodium hypochlorite (food grade)
   - Calcium hypochlorite (food grade)
   - Liquid bleach (chlorine)

b) The typical concentrations for direct application of the above disinfectants to water tank internal surfaces are recommended to be in the following ranges:

   - Sodium hypochlorite and calcium hypochlorite –20mg/l

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c) Allow the disinfectant to remain for a minimum of 30 minutes.

d) Rinse the disinfectant and empty the tank.

e) Fill the tank with potable water.

f) Take a water sample and send it for analysis.

3.4.3. Tanks with Difficult Access for Disinfection

Tanks with difficult access for Cleaning and Disinfection

I. Notify Responsible Person and implement recommended provisions or safety control measures to make tank accessible and safe for cleaning.

II. Once tank is assessed as accessible and safe, follow standard procedures for cleaning and disinfection.

III. Allow the disinfectant to remain for a minimum of 30 minutes.

IV. Rinse the disinfectant and empty the tank.

V. Fill the tank with potable water.

VI. Take a water sample and send it for analysis.

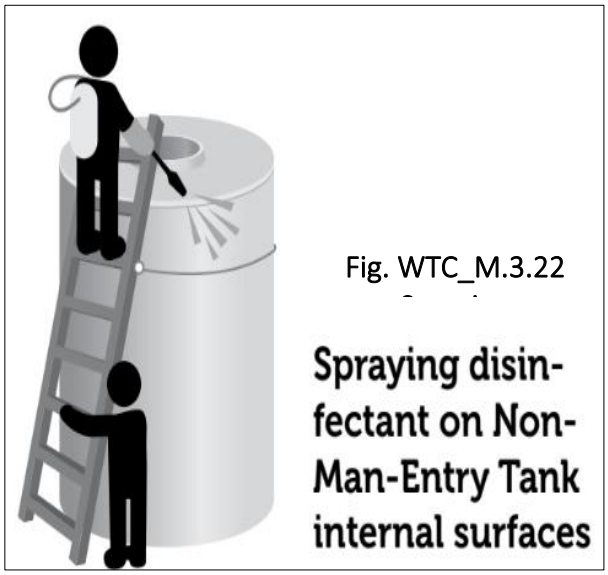

Fig. WTC_M.3.22

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Case Study 4:

Scenario: While cleaning a drinking water tank, the team did not allow the disinfectant to sit for the recommended time before rinsing. As a result, micro-organisms were not completely neutralized, and water samples failed a bacterial test. The team had to redo the entire disinfection process, delaying the tank's availability.

Learning Points:

- The importance of following recommended contact time for disinfectants in drinking water tanks.
- Risks of incomplete disinfection on public health.
- Proper application of cleaning and disinfection procedures.

Discussion: How can teams ensure disinfection procedures are followed correctly for drinking water tanks?

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Unit 3.5 Wastewater and Sludge Disposal and Water Sampling

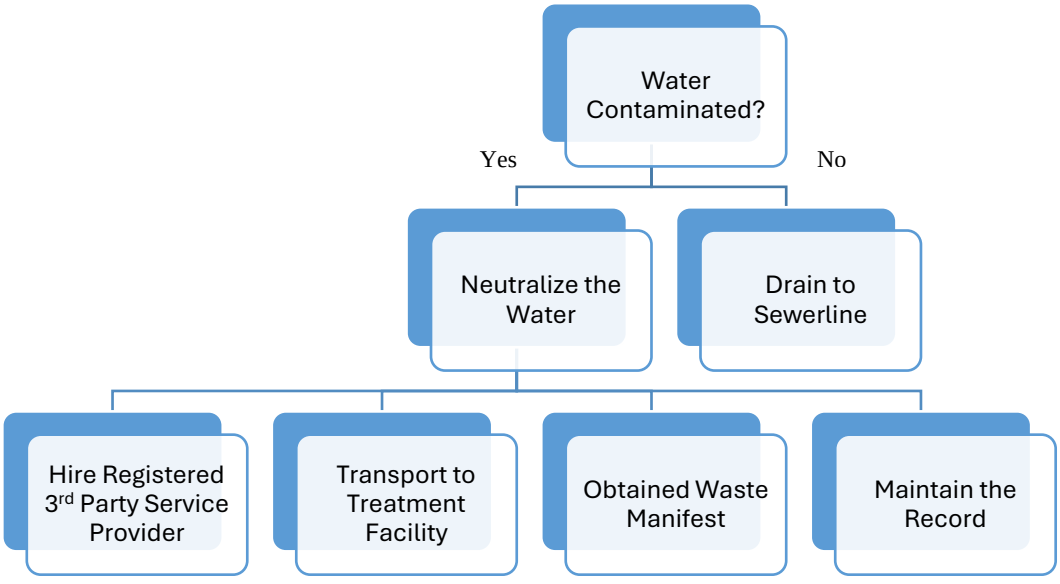
Unit Objectives

At the end of the unit, you will be able to:

1. Familiarize with wastewater & sludge disposal.
2. Importance of water sampling by a competent technician.

Theory Content — 20 Minutes

3.5.1. Wastewater Discharge



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3.5.2. Contaminated Water Disposal Procedure

- The Responsible Company shall discharge fresh water already stored in the Customer Water Storage Tank to the drain or sewer taking all necessary measures to avoid any cross-contamination.
- The Responsible Company shall minimize any wastewater by starting their cleaning operation when there is a minimum water level in the tank to be cleaned.
- The Responsible Company shall not discharge water contaminated with Cleaning Chemicals or Disinfectants or Wastewater to the sewer or storm water drainage without prior treatment, dilution or neutralization and without permission from ADSSC (discharge to the sewer) or the respective Municipality (discharge to the storm water drainage).
- The Responsible Company shall measure the pH and residual chlorine in the cleaned and disinfected Tank to determine the required water treatment prior to discharge.
- The Responsible Company shall ensure that any wastewater discharges do not exceed the residual chlorine and pH limits set in the Table below.

Wastewater Discharge to Sewer Guide Limits

Parameter	Limit
pH	>6.0 pH <9.0
Total residual chlorine	Not greater than 0.2 mg/l

DoE: Code of Practice for the inspection and cleaning of customer water storage tanks (section 8.2.18)

- The Responsible Company, shall where it is deemed necessary to neutralize the wastewater discharge, use approved neutralizing chemicals at the concentrations directed for use, by the manufacturer, for application in Customer Water Storage Tanks.

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1. **Identification of Contaminated Water:** The water would be considered contaminated if it contains cleaning chemicals or micro-organisms. If the water is contaminated, it should be disposed of according to the requirements of ADSSC and ADOSH SF CoP 54 (Waste Management).

2. **Neutralize the Wastewater:** The contaminated water must be neutralized, ensuring the pH level is between 6 to 9. Total residual chlorine should not be greater than 0.2 mg/l.

3. **Disposal:** Hire an approved third-party service provider for the collection and disposal of contaminated water. Mobile tankers are to be used for the collection and transportation of wastewater to approved treatment facility. Transfer the wastewater through suction motors to the mobile tanker. Ensure the water hoses are in good condition to prevent wastewater spillage.

4. **Waste Sludge Disposal:** The Responsible Company shall where it has removed waste sediment or sludge from inside the water tank, ensure that the waste sediment or sludge is removed off-site in a safe and hygienic manner and disposed of in an appropriate manner and in an approved waste disposal site, in accordance with the waste disposal requirements and regulations of Abu Dhabi Emirate.

5. **Record Keeping:** Obtain the waste manifest, showing the quantity of wastewater including disposal method from the service provider and maintain the record.

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Case Study 5:

Scenario: During the cleaning of a drinking water tank, the team disposed of sludge and wastewater in an open area near the tank. This led to contamination of the environment, and runoff water re-entered the drinking water system through nearby drains.

Learning Points:

- Proper disposal of sludge and wastewater to prevent environmental contamination.
- Use of licensed disposal services for waste from drinking water tanks.
- Potential risks of improper waste handling on water quality.

Discussion: What are the best practices for sludge and wastewater disposal?

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3.5.3. Sampling following Cleaning and Disinfection:

Retain records of water quality analysis for five years.

If water tests are not compliant, repeat cleaning and disinfection within 48 hours and notify tenants that the water is 'not safe for use' and next intended date & time for cleaning.

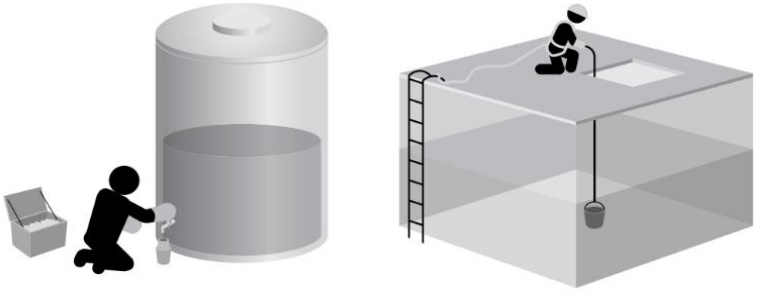

Fig. WTC_M.3.23 Water sampling after cleaning & disinfection

3.5.4. Importance of Water Sampling by a Competent Technician

The Water Sample Technician will assist in maintaining regulatory compliance and functionality of public water supplies. Duties include conducting water sampling, site inspections, and sample maintenance to monitor water quality and ensure systems are running optimally. Technicians also maintain logs of testing results and write reports for submittal to customers, as well as customer's interaction to coordinate sampling and give updates on water system conditions.

3.5.5. What Do Numbers Mean?

Once a water testing laboratory has completed the analysis of your water, you may receive a report that looks similar to Figure WTC_M.2.23. It will contain a list of contaminants tested for the measured concentration and will highlight any contamination noticed. The concentration is the amount of a given substance (weight) in a specific amount of water (volume). The most common concentration unit used is milligrams per liter (mg/L) which, in water is equal to one part per million (ppm), or one-part contaminant to one million parts of water.

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Table 1: General Water Quality Indicators

Indicator	Acceptable Limit	Indication
Coliform Bacteria	<1 coliform/100ml	Possible bacterial or viral contamination (absent) from human sewage or animal waste
pH Value	6.5 to 8.5	An important overall measure of water quality, pH can alter corrosivity and solubility of contaminants. Low pH will cause pitting of pipes and fixtures and/or a metallic taste. This may indicate that metals are being dissolved. At high pH, the water will have a slippery feel or soda taste.
Total Dissolved Solids (TDS)	500 mg/L	Dissolved minerals, like iron or manganese. High TDS also may indicate hardness (scaly deposits) and cause staining, or a salty, bitter taste.

Fig. WTC_M.3.23

Table 2: Common Nuisance Contaminants and Their Effects

Contaminant	Acceptable Limit	Effects
Chlorides	250 mg/L	Salty or brackish taste; **corrosive**; blackens and pits stainless steel
Copper (Cu)	1.0 mg/L	Blue-green stains on plumbing fixtures; bitter, metallic taste
Iron (Fe)	0.3 mg/L	Metallic taste; discolored beverages; yellowish stains on laundry, reddish-brown stains on fixtures
Manganese (Mn)	0.05 mg/L	Black specks on fixtures; bitter taste
Sulfates (SO_4)	250 mg/L	Bitter, medicinal taste; **corrosive**; offensive odor
Iron Bacteria	————	Orange- to brown-colored slime in water

Satisfactory Water Sample Report

Sample Description	:	**Tank Water**			
Sampling Method	:	**Not specified**	**Sampled By**	:	**Client Rep**
Sample Delivered By	:	**AISL Rep**	**Client Ref.No**	:	**Not specified**
Date of Analysis	:	**27/08/2022~ 30/08/2022**	**Test Conducted By**	:	**JFN**
Brand	:	**Not specified**	**Sampling Date/Time**	:	**27/08/2022 11:40 AM**
Origin	:	**Water Tank**	**Receiving Date/Time**	:	**27/08/2022 02:00 PM**
Net wt./volume per unit	:	**500 ml**	**Production Date**	:	**Not specified**
No. of Unit	:	**01**	**Expiry Date**	:	**Not specified**
Packaging Type	:	**Sterile Bottle**	**Condition of Sample °C**	:	**33.0**
Physical Observations	:	**Satisfactory**			

TEST RESULTS

MICROBIOLOGICAL ANALYSIS

PARAMETERS	TEST METHODS	UNITS	RESULTS	SPECIFICATIONS
E. coli	APHA AWWA 23rd Ed.2017, 9222B&H	CFU/100ml	Not Detected	Zero
Fecal Coliforms	APHA AWWA 23rd Ed. 2017, 9222D	CFU/100ml	Not Detected	Zero
Heterotrophic Plate Count	APHA AWWA 23rd Ed. 2017, 9215B	CFU/ml	<1	-
Pseudomonas aeruginosa	APHA AWWA 23rd Ed. 2017, 9213 E	CFU/100ml	Not Detected	Zero
Total Coliforms	APHA AWWA 23rd Ed. 2017, 9222B	CFU/100ml	Not Detected	Zero

Remarks : **Satisfactory**
Test Method Deviation : **None**
Reference Specification : **Department of Energy, Water Quality Regulations 2021.**

Fig. WTC_M.3.24

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Module 4. Emergency Management

- Unit 4.1 Importance of Emergency Management
- Unit 4.2 Role of Tank Cleaning Team in Emergency Management
- Unit 4.3 Understand the Types of Rescues

Key Learning Outcomes

- **Understand Emergency Procedure:** To understand the purpose of emergency procedures.
- **Role of Attendant and Supervisor:** To know the role of confined space (water tank) attendant and entry supervisor.
- **Know Types of Rescues:** To develop understanding about the types of emergency rescues.
- **Emergency Rescue Equipment:** To promote awareness about the rescue equipment required for emergency rescue.

Unit 4.1 Importance of Emergency Management

Unit Objectives

At the end of the unit, you will be able to:

1. Know the emergency procedures.
2. Understand the role of team members in emergency management.
3. Know the types of emergency rescue.

Theory Content — 20 Minutes

Introduction:

Many people are killed or seriously injured while working in confined spaces each year. These fatal accidents happened across a wide range of industries such as complex plants to simple storage vessels. Those killed were not only people who worked in confined spaces but also others who tried to rescue them. Therefore, good safety practices should be implemented to ensure a safe working environment for everyone.

4.1.1. Emergency Management in Tank Cleaning

1. **Create a Solid Plan –** To reduce the risks involved with tank cleaning, create a plan with trained personnel to identify the possible hazards involved. Creating a plan also involves attaining any necessary permits to enter the confined space (water tank) and coordinating safety meetings to ensure personnel are aware of any possible risks involved.

2. **Have a Confined Space (Water tank) Emergency Rescue Team –** Even if your plan is executed perfectly, unpredictable things could happen. It is best to prepare a confined (water tank) space emergency rescue team to protect your employees and facility. Deaths often occur during rescue. Employees attempt to rescue an entrant without proper training and then get caught themselves in the confined space. According to the National Institute for Occupational Safety and Health (NIOSH), **approximately 60 percent of confined-space fatalities are rescuers. Never enter the space without proper training and unless it is necessary.**

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3. **Only Use Trained and Certified Personnel –** Again, to reduce risks involved with tank cleaning, only use professionals who are trained and have the industry-specific knowledge and experience to carry out a safe tank cleaning. Any person who has significant health risks or lacks the applicable knowledge should not be involved.

4. **Always Practice Safety –** Whenever performing any type of tank cleaning, proper PPE must be worn throughout the process. Additionally, personnel must use the proper safety equipment, like oxygen and gas detectors and emergency medical kits, to be properly prepared for any emergency that may occur. Appropriate safety procedures, like properly shutting off any valves, should also always be accounted for while performing tank cleaning.

4.1.2. Communication

Means of communication must be readily available to the confined space (water tank) entry attendant for emergency rescue of entrants. In case of any emergency, the standby person/attendant shall call the supervisor immediately. Mobile phones or wireless sets should be provided for effective communication. Emergency contact numbers shall be communicated to the water tank cleaning crew.

4.1.3. Rescue Equipment

Choose the right rescue equipment as per confined space (water tank) structure or job scope. Rescue equipment will depend on the number of people working inside, the presence of hazardous gases and oxygen, location of confined space, height & depth of confined space (water tank).

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4.1.4. Essential Equipment

1. Rescue Harness: A rescue harness is designed to secure the rescued individual and provide attachment points for rescue equipment. It distributes forces across the body in case of a fall and allows controlled lifting or lowering.

   Properly fit the harness, to ensure comfort and security. Inspect it before each use for signs of wear, such as frayed straps or damaged buckles, and adhere to manufacturer recommendations for cleaning and storage.

2. SCBA (Self Contained Breathing Apparatus) The SCBA is filled with filtered compressed air, the same air that we breathe. The air should be grade "D" or better in quality. Most new standards require that SCBA should be of positive-pressure type. Positive pressure SCBA's maintain a positive pressure inside the face piece during inhalation and exhalation.

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3. Tripod and Winch System: A tripod provides a stable support system for a winch or pulley that can be used to lift the person out of a confined space. This setup is crucial for non-entry rescues. Ensure the tripod is stable and securely positioned over the entry point. Regularly check the winch mechanism for functionality and lubricate moving parts as needed.
4. Retrieval System: Retrieval systems, such as ropes and pulleys, facilitate the safe extraction of a person from a confined space without putting rescuers at risk. Use only rated ropes suitable for rescue operations. Inspect ropes for signs of wear or damage and avoid sharp edges during storage to prevent fraying.
5. Communication Devices: Effective communication between rescuers and those in distress is vital for ensuring safety and providing support. Use radios or other reliable communication devices that can function in confined spaces. Regularly check batteries and perform maintenance on communication devices to ensure their reliability.
6. Atmospheric Monitoring Equipment: Atmospheric monitors are essential for detecting hazardous gases, oxygen levels, and other environmental conditions in confined spaces. Calibrate monitors before use and regularly test them to ensure they function correctly. Follow the manufacturer's guidelines for battery replacement and maintenance.
7. Rescue Stretchers: Rescue stretchers transport injured or incapacitated individuals, ensuring their safety during extraction. Ensure the stretcher is lightweight and strong. Inspect it for tears or damage and keep it clean and contaminant-free.

Note: *- Rescue Equipment can be different for different confined space as per working condition.*

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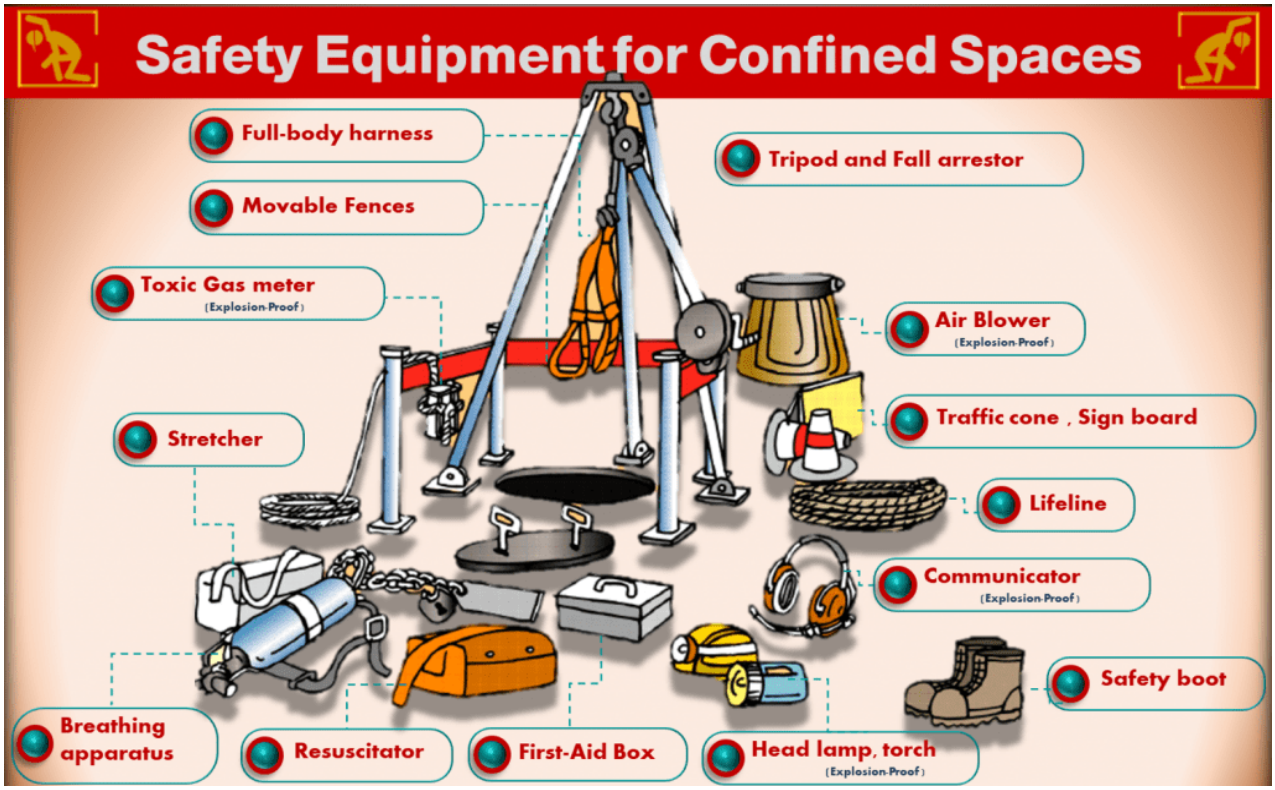

Fig. WTC_M.4.1 Typical Rescue Equipment

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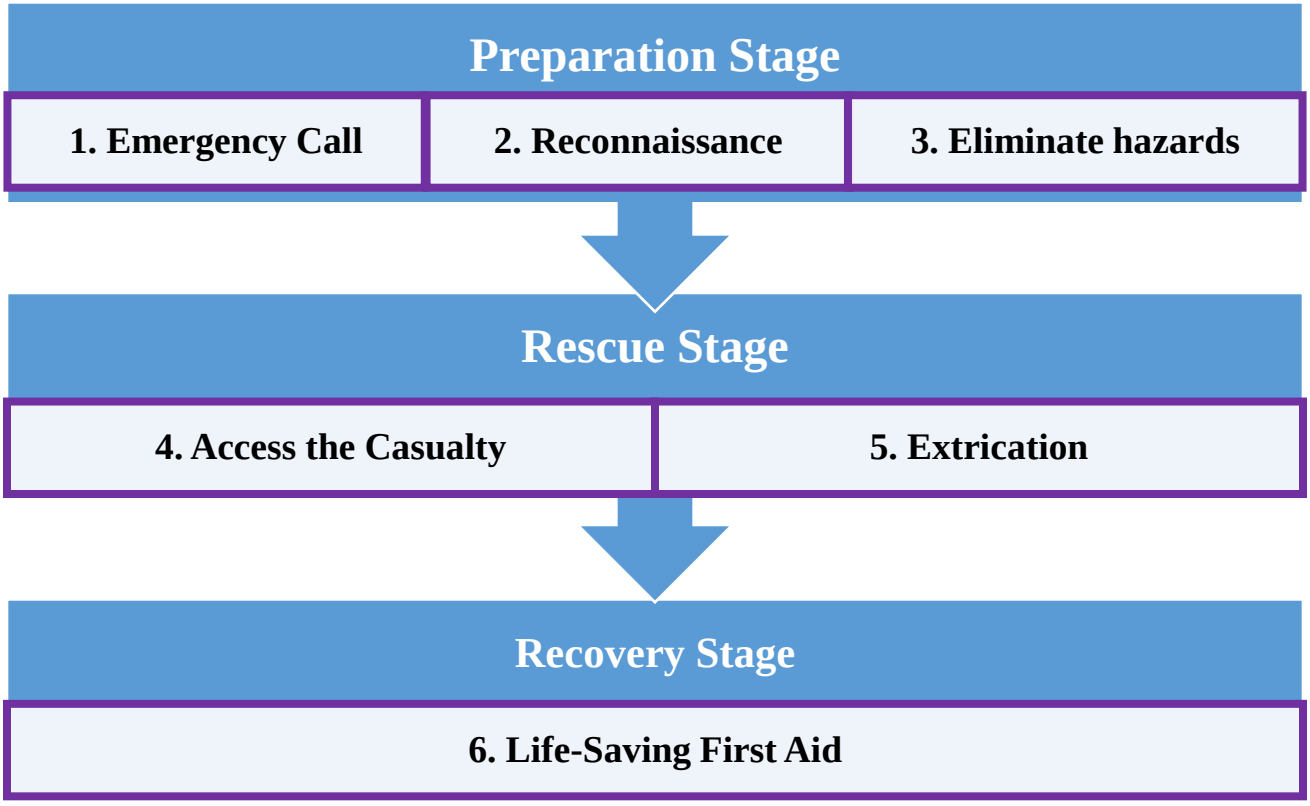
Emergency Rescue Flowchart



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4.1.5. Pre-Rescue Preparations

- Before launching any confined space rescue, pre-rescue preparations are essential to ensure the operation runs smoothly and safely.
- The first step is assessing the situation to determine potential hazards, including atmospheric dangers, structural risks, or the victim's medical condition. This assessment helps rescuers develop a safe plan of action.
- Emergency services must be notified once the hazards are identified, and a command center should be established.
- The next step is to gather and inspect all necessary rescue equipment, including personal protective gear, harnesses, and ventilation tools.
- Ensuring all equipments are in good condition and functioning properly is vital to avoid equipment failure during the rescue. Rescue teams must also verify that air monitoring devices are ready to detect hazardous gases.
- Proper preparation significantly reduces the risks involved in confined space rescues and ensures a quick and efficient response.

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4.1.6. The Rescue Operation

- Effective communication is the basis of a successful confined space rescue operation. It is crucial to establish clear communication lines between the rescuers and the victim if possible.
- Keeping the victim informed and reassured during the rescue helps reduce panic and facilitates cooperation, which can be vital in a confined space emergency.
- Rescuers should constantly communicate with their command center to update them on progress, share potential hazards, and adjust their rescue plan.
- The rescue method must be chosen based on the situation and the identified hazards.
- For instance, if the confined space has a hazardous atmosphere, breathing apparatus or ventilation may be required before entering.
- The rescue team should use harnesses, ropes, or mechanical retrieval systems to extract the victim safely.
- Throughout the operation, continuous monitoring of the confined space's atmosphere is essential to detect any dangerous gas levels or oxygen deficiencies, ensuring the safety of both the rescuers and the victim.
- A well-executed rescue operation hinges on preparation, communication, and adaptability to changing conditions.

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4.1.7. Post-Rescue Procedures

- Providing immediate medical attention is a priority once the victim has been safely removed from the confined space.
- Even if the individual appears to be unharmed, a medical evaluation is necessary to address potential injuries or complications, such as exposure to hazardous gases or traumatic injuries.
- Medical personnel on-site should be ready to assess and stabilize the victim, but they may need to be transported to the hospital for further follow up and treatment if needed.
- After the rescue, a debriefing session with the entire rescue team is essential. This meeting allows the team to reflect on what went well and identify areas for improvement in future operations.
- Gathering feedback from everyone involved helps refine rescue procedures and enhances the team's preparation for future emergencies.
- Lastly, it is critical to document the incident thoroughly. This includes recording the cause of the emergency, the steps taken during the rescue, and any lessons learned.
- Proper documentation not only aids in regulatory compliance but also serves as a valuable reference for improving future rescue plans and training.

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Unit 4.2 Tank Cleaning Team Role in Emergency

Unit Objectives

At the end of the unit, you will be able to:

1. Familiarize with the role of team members in emergency management

Theory Content — 20 Minutes

4.2.1. Responsibilities: Water tank cleaning job is a critical activity that requires a high level of responsibility. Each person in the team plays a key role in ensuring safe work operation. The following are the key roles:

1. Entrant (Tank cleaner)
2. Water Tank Attendant/ Standby Person
3. Entry Supervisor

Fig. WTC_M.4.3 Cleaning Team

4.2.2. Entrant (Water Tank Cleaner) Responsibilities

Following entry and work procedures when carrying out work in confined spaces.

- Carrying a portable gas/vapor measuring instrument for continuous monitoring of the atmosphere in the confined space for the full duration of their work.
- Inform the confined space attendant of any unsafe atmospheric conditions when any emergency situation arises; and
- Inform co-workers to evacuate from the confined space, the portable gas/vapor instruments' alarm should be activated due to unsafe atmospheric conditions.

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4.2.3. Attendant/ Standby Person

An individual stationed outside one or more permit spaces who monitors the authorized entrants and performs all attendant's duties assigned in the employer's permit space program.

- Knowledge of the hazards of the water storage tank.
- Aware of possible behavioral effects of hazard exposure for the authorized entrants.
- Continuously maintains an accurate count of authorized entrants.
- Remains outside the water storage tank during operation until relieved by another attendant.
- Communicates, with authorized entrants.
- Monitors activities inside and outside the water storage tank.
- Call rescue and other emergency services.
- Performs, non-entry rescues as specified by the employer's rescue procedure.
- Performs NO duties that might interfere with monitoring and protecting the entrants.

4.2.4. Entry Supervisor Responsibilities

- Ensuring that entrants and confined space attendants are briefed on the safety and health precautions to take prior to confined space entry and work.
- Authorizing entry into confined spaces.
- Ensuring that entrants and confined space attendants adhere to entry procedures.
- Rescue equipment and appointed rescue personnel are available when confined space work is to be carried out.
- Implementing control and preventive measures to manage all identified hazards.
- Applying the entry permit and have it endorsed by the Authorized Manager before commencement of confined space work.
- Terminating the entry permit after completion of work.

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Unit 4.3 Type of Emergency Rescue

Unit Objectives

At the end of the unit, you will be able to:

1. Familiarize with the type of emergency rescue.

Theory Content   20 Minutes

4.3.1. Emergency Rescue

During water tank cleaning and disinfection, the water tank cleaner's safety is extremely important. The cleaner needs to follow the safety protocol and report any hazardous situation that may arise during the work. In case of unsafe situation, the tank cleaner should stop the work and exit tank immediately. In situations where tank cleaner can't exit the tank by himself, he should inform the tank attendant/standby person to perform non-entry rescue using the retrieval system or activate the emergency services.

4.3.2. Types of Emergency Rescue

1. Self-Rescue
2. Non-Entry Rescue
3. Entry Rescue

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1. Self-Rescue

- Self-rescue is the quickest and safest option in many confined space emergencies. It involves the individual recognizing a hazardous situation early enough to escape without external assistance. *(Fig. WTC_ M.4.4)*
- This method is possible only if the person is conscious, mobile, and physically able to exit the confined space.
- Self-rescue is typically employed when an atmospheric danger, such as a sudden gas leak or oxygen deficiency, is detected by the worker before it reaches dangerous levels.

For self-rescue to be successful, it's essential to follow a few key guidelines:

1. First, the individual must assess the environment quickly but thoroughly. They need to ensure that the exit route is safe and free from additional hazards, such as debris or machinery that could block the way.
2. Staying calm during this process is critical, as panic can lead to poor decisions and increase the risk of injury.
3. Tools like personal alarms or gas detectors can help an individual to monitor changing conditions and expedite the escape.
4. Workers should clearly understand the rescue plan for their work environment.

While self-rescue is ideal, it's only sometimes feasible, so non-entry and entry rescues must also be part of the overall plan.

Fig. WTC_M.4.4 Self Rescue

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2. Non-Entry Rescue

- Non-entry rescue is a method in which rescuers assist individuals trapped in confined spaces without physically entering the space themselves. (Fig. WTC_M.4.5)
- This approach is often the safest and most efficient method, as it avoids exposing rescuers to the same hazardous conditions within the confined space.
- Non-entry rescue is typically used when the individual inside is incapacitated or unable to perform a self-rescue, but the situation allows them to be retrieved using external equipments.
- Common equipments used in non-entry rescues includes retrieval systems like tripods, winches, and pulley systems. These systems allow the individual to be lifted or pulled out without rescuers needing to enter the confined space.
- These systems often involve attaching a harness to the person inside, enabling a controlled and secure extraction.
- Communication tools, such as radios or hardwired systems, are critical for maintaining contact with the trapped person throughout the process.
- Continuous communication helps the rescue team monitor the individual's condition and provide reassurance while ensuring the rescue proceeds smoothly.
- Non-entry rescue methods are effective when atmospheric conditions are hazardous, such as hazardous gases or lack of oxygen.
- The rescue team must ensure they can safely reach and extract the person using external tools, minimizing the risks involved. However, when this method is not possible, entry rescue becomes necessary.

Fig. WTC_M.4.5 Non-Entry Rescue

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3. Entry Rescue

- Entry rescue is required when neither self-rescue nor non-entry rescue methods are feasible. This type of rescue involves trained personnel entering the confined space to physically assist in extracting the individual. *(Fig. WTC_M.4.6)*

- Entry rescue is necessary in more complex situations where the person inside is unconscious, injured, or in a location that cannot be accessed with external equipment. However, it carries significantly higher risks for the trapped person and the rescuers.

The procedures for entry rescue must be perfect to ensure the safety of all involved.

1. First, rescuers need to assess the hazards present in the confined space, such as hazardous gases, flammable materials, or physical obstacles.
2. Proper Personal Protective Equipment (PPE), including respiratory protection, helmets, gloves, and safety harnesses, must be worn to protect rescuers from these hazards.
3. A safety line is typically attached to the rescuer, allowing for quick extraction in case of danger.
4. Continuous monitoring of the space's atmosphere is essential to prevent sudden changes, such as gas leaks or oxygen depletion, from putting the rescuers at risk.
5. Entry rescuers require thorough preparation and training. The risks involved in entering a confined space, such as exposure to hazardous substances, physical injuries, or structural collapses, require that rescuers have clear protocols and contingency plans.
6. Post-entry procedures, such as debriefing and medical checks, are crucial to improving future operations and ensuring the team's health & safety.

Fig. WTC_M.4.6 Entry Rescue

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Case Study 6:

Scenario: A worker cleaning a large drinking water tank experienced dizziness due to inadequate ventilation. The standby team struggled to execute an emergency rescue because they lacked proper training and equipment, delaying the response time.

Learning Points:

- Critical importance of confined space training and emergency preparedness.
- Ensuring proper ventilation and use of safety equipment during drinking water tank cleaning.
- Need for trained personnel and immediate rescue protocols to handle emergencies.

Discussion: What steps can be taken to improve emergency response readiness during drinking water tank cleaning

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Knowledge Test

1. Is it safe to enter the water tank without a permit?
    a. Sometimes
    b. Only if you are in a hurry
    c. No, it is not safe
    d. Yes, if you are wearing the PPE

2. Who needs to ensure that a permit to work is obtained before entering the tank?
    a. The watchman
    b. The person responsible
    c. The tenants
    d. None of the above

3. Why is atmospheric testing required before entering the tank?
    a. To ensure the atmosphere inside the tank is safe for workers
    b. To know the temperature
    c. To check wind speed
    d. It's not necessary to test the atmosphere

4. Who is authorized to enter the tank for cleaning?
    a. Anyone
    b. Only a person wearing PPE
    c. Only trained and competent person
    d. The safety officer

5. What is required PPE for water tank cleaning?
    a. Hard hat and water-resistant clothing
    b. Gumboots, chemical safety gloves
    c. Safety goggles & respirator
    d. All the above

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Knowledge Test

6. Why is water tank cleaning important?
    a. To prevent tank leakage
    b. To ensure the water is safe for use
    c. To reduce the cost of water bills
    d. None of the above

7. What are the signs of water contamination inside the water tank?
    a. Sludge and sediments at the bottom of the tank
    b. Dead animals, insects and algae growth,
    c. Unpleasant odor or smell
    d. All the above

8. What are the signs of water contamination outside the water tank?
    a. Waste disposal near tank opening
    b. Algae growth outside tank
    c. Uncovered tank opening
    d. All the above

9. What type of diseases are associated with contaminated water usage?
    a. Coughing
    b. Pneumonia, diarrhea and stomach pain
    c. Cancer
    d. Hepatitis

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Practical Content

30 Minutes

Unit 3.1. Cleaning Procedures and Protocols

1. Pre-cleaning preparation includes:
    a. Gather equipment
    b. Inspect tank
    c. Shut off water supply
    d. Drain the tank
    e. Hands-on activity e.g. demonstrating how to drain the tank and discussing safe disposal methods for sediment-laden water
2. Safety protocol for Confined Space Entry
    a. Ventilate the tank
    b. Use PPE
    c. Check for hazardous gases and oxygen level
    d. Buddy system
    e. Hands-on activity (Practice confined space entry using proper ventilation technique, PPE etc.
3. Manual cleaning of sediment and debris
    a. Scrubbing and brushing
    b. Use pressure washer
    c. Remove sludge
    d. Hands-on activities (Engage in scrubbing the interior surfaces of a demo tank using brushes and pressure wash focusing on removing visible dirt and algae.

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Practical Content

30 Minutes

Unit 3.1. Cleaning Procedures and Protocols

4. Disinfection Process
    a. Prepare a disinfectant solution
    b. Apply disinfectant
    c. Soak and Rinse
    d. Hands-on activity (Perform the mixing of the disinfectant and apply it using sprayers to the anterior surfaces of a demo tank. Demonstrate safe handling of chemicals.
5. Post-cleaning water quality testing
    a. Refill the tank
    b. Test water quality
    e. Hands-on activity (conduct water quality tests with kits that measure residual chlorine, pH and bacterial presence in the refilled water. Discuss acceptable water quality levels.
6. Documentation and Reporting
    a. Record cleaning steps
    b. Issuing a cleaning certificate
    c. Report, any issue
    d. Hands-on activity (Fill out a cleaning log, sample certificate, and report forms.
7. Proper waste disposal
    a. Dispose of sludge
    b. Clean tools and equipment
    c. Hands-on activity (demonstrate proper sludge collection and disposal techniques, as well as the cleaning and disinfection of equipment.

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Practical Content

30 Minutes

Unit 3.1. Cleaning Procedures and Protocols

8. Emergency Procedure
    a. First aid training
    b. Fire-fighting training
    c. Hands-on activity (Practice mock drills for emergency evacuation and basic first aid scenarios)

Resources Required:

Submersible pumps, pressure washer, brushes and scrubbers, sludge pump or vacuums, hoses, buckets and containers, flashlights or portable lights, ladders or scaffolding, ventilations fans or air blowers, gas detectors, disinfection sprayers, cleaning agents or disinfectants, PPE, trained and certified cleaning team, documentation and reporting tools, wastewater disposal resources, and emergency equipment etc.

Things To Remember

1. Safety first
2. Pre-cleaning preparation
3. Effective cleaning
4. Proper disinfection
5. Water quality test
6. Waste disposal
7. Documentation

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Knowledge Test

1. What are the different types of water tanks?
    a. Concrete tank
    b. Plastic tank
    c. GRP & steel tank
    d. All the above

2. Where are the water tanks commonly used?
    a. For domestic use
    b. Agriculture use
    c. Industrial use
    d. All the above

3. Who is responsible for ensuring water tank cleaning?
    a. The regulatory authority
    b. The supervisor
    c. The tenants
    d. The person responsible

4. Why is regular tank inspection and maintenance required?
    a. To reduce maintenance cost
    b. To increase water tank storage capacity
    c. To ensure the tank safety and water quality
    d. To avoid fines and enforcement action

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Exercise

1. What are the hazards associated with Water Tank Cleaning?
2. Water Tank Cleaning notice for residents should be in which languages?
3. Who will ensure safe access and safe environment in Water Tank Cleaning jobs?
4. How long should disinfectants be left to soak in the water tank?
5. What are the basic tools required for Water Tank Cleaning?
6. What is the minimum frequency for FRP Water Tank Cleaning?
7. What is the minimum frequency for Plastic Tank Cleaning?
8. What are common visual signs of contamination of water tanks?
9. How often must water tank gas testing be conducted?
10. What procedure must be used to avoid electrocution, or drowning etc. in the Water Tank Cleaning process?

TIPS

- Continuously, prior to entry
- Minimum 30 minutes
- Arabic and English
- Sump pumps, brushes, spray cans, scrubber etc.
- Responsible person
- Biannual
- Algae, sludge, dead animals etc.
- LOTO procedure
- Trips and falls, biological hazards, poisoning etc.

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The Healthy Home®'s multidimension company in UAE providing eco-friendly service for AC servicing, water storage tank cleaning and pest control.

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