

CHAPTER 20: DESIGNING ONSITE SANITATION FACILITIES

20.1 Introduction of the Unit of Learning

This unit covers the competencies required to design onsite sanitation facilities.

It involves Collection and analysis of onsite sanitation design data, calculation of onsite sanitation design parameters, drawing onsite sanitation units, designing shit flow diagram and compilation of onsite sanitation design report.

This standard applies in water industry.

20.2 Performance Standard

Collect onsite sanitation design data, analyse onsite sanitation design data, calculate onsite sanitation design parameters, draw onsite sanitation units, design shit flow diagram, and compile onsite sanitation design report based on job requirements/specification and tools prepared.


20.3 Learning Outcomes

20.3.1 List of Learning Outcomes

- a) Collect onsite sanitation design data
- b) Analyse onsite sanitation design data
- c) Calculate onsite sanitation design parameters
- d) Draw onsite sanitation units
- e) Design shit flow diagram
- f) Compile onsite sanitation design report

20.3.2 Learning Outcome No 1: Collect Onsite Sanitation Design Data

20.3.2.1 Learning Activities

Learning Outcome No 1: Collect Onsite Sanitation Design Data	
 Learning Activities	Special Instructions
1.1 Map out area to be served 1.2 Prepare <i>tools for data collection</i> 1.3 Collect data and information	<ul style="list-style-type: none">• Demonstrate how to correctly map out an area and prepare tools needed• Elaborate on the data collection process

20.3.2.2 Information Sheet No.20/LO1: Collect Onsite Sanitation Design Data



Introduction to learning outcome

This unit focuses on collection of onsite sanitation design data for a mapped out area and using prepared tools as per the job specification. Data collection tools are also discussed

Definition of key terms

Tools for data collection – these include the instruments or methods that are employed so as to obtain data, interpret it and present it.

Onsite sanitation facility – this is a sanitation facility that treats the wastewater at the place where it has been generated.

Content/Procedures/Methods/Illustrations

1.1 Map out area to be served based on job requirements/specification.

The area to be served by the on-site sanitation system is mapped using already existing base maps and by employing the use of GPS and GIS to acquire more accurate data. To acquire these maps a team made up of individuals with a range of different skills will be employed.

Mapping is important for the following reasons:

1. It enables the site to be charted and this helps in having a better understanding that will aid in planning the sanitation facility.
2. It aids in marking the boundaries of the site
3. It prevents the occurrence of overlaps as a result of miscalculation.

1.2 Prepare tools for data collection (Questionnaires, Stationery, GPS, Cameras, Check list, Sampling equipment, Maps, Measuring instruments, Safety equipment, Safety box, First aid kits) based on onsite sanitation facility (septic tanks, bio-digesters, anaerobic baffled reactors, latrines. Soak pits, ecosan toilets, imhoff tank) to be designed.

Tools for data collection are the instruments or methods that are employed so as to obtain data, interpret it and present it.

They include:

Interviews, questionnaires, reporting, existing data, observation, focus groups and combination research.

The necessary preparations that have to be made include:

- i. Making logistical arrangements at the site of the sanitation facility
- ii. Preparing the questionnaire by doing a pre-test of the questions to be asked
- iii. Selecting and preparing the required equipment at the site
- iv. Rechecking the questionnaires

After the data can proceed to be collected for subsequent analysis.

1.3 Collect data and information based on tools prepared.

The data that is expected falls into two categories:

Quantitative data; which is data that can be expressed as values that indicate quantity. It is expressed numerically. It is usually then interpreted and presented in tables or graphs.

Qualitative data; which is data that is descriptive and describes qualities. It answers questions like “why?” and “how?” It explains the values obtained as quantitative data.

Data is collected from the site using the tools of data collection i.e.: Interviews, questionnaires, reporting, existing data, observation, focus groups and combination research and analysed. This information will then be used to design the onsite sanitation facility.

Data collection aids in design in the following ways:

1. It enhances the research by verifying its integrity.
2. It reduces arising of errors.
3. It is important in decision making since data will be used to have a better understanding
4. It saves time and costs that would have been lost if decisions were made without a better understanding

Conclusion

This learning outcome served collection of onsite sanitation design data to meet the need for wastewater disposal and within a legal framework.

Further Reading



Do some further research on mapping and the various data collection tools?

20.3.2.3 Self-Assessment



Written Assessment

1. Which of the following is not a method of data collection?
 - a) Interviews
 - b) Questionnaires
 - c) Observations
 - d) Experiments
2. While doing preparations for the data collection tools, which among the following must be rechecked?
 - a) The site
 - b) Questionnaire
 - c) First aid kits
 - d) Sampling equipment
3. Which of the following fits the description “Collection of data by the use of questionnaires alongside other methods”
 - a) Survey
 - b) Interviews
 - c) Mapping
 - d) Sampling
4. Define tools for data collection.
5. What is an on-site sanitation facility?
6. Expound on the preparations that have to be made on tools for data collection.

Practical Assessment

Come up with a simple questionnaire on construction of an on-site sanitation facility to be used within your locality. Use them to collect data from individuals living in that area.

Oral Assessment

1. Mention various tools of data collection.
2. Mention various challenges faced while collecting data using questionnaires.

20.3.2.4 Tools, Equipment, Supplies and Materials

- Questionnaires
- Stationery
- GPS
- Cameras
- Check list
- Sampling equipment
- Maps
- Measuring instruments
- Safety equipment
- Safety box
- First aid kits


20.3.2.5 References



- Pearce L. & Axinn W. (2006). Mixed Method Data Collection Strategies. New York: Cambridge University Press.
- Sapsford R. & Jupp V. (2006). Data Collection and Analysis. London : SAGE Publications.
- Kurian M. & McCarney P. (2010) Peri-urban Water and Sanitation Services: Policy, Planning and Method. Springer.

20.3.3 Learning Outcome No 2: Analyse Onsite Sanitation Design Data

20.3.3.1 Learning Activities

Learning Outcome No 2: Analyse Onsite Sanitation Design Data	
 Learning Activities	Special Instructions
2.1 Arrange data and information 2.2 Present data	<ul style="list-style-type: none">Utilize excel software to analyze the collected data

20.3.3.2 Information Sheet No20/LO2 Analyse Onsite Sanitation Design Data



Introduction to learning outcome

This unit aims to arrange and present collected data and information based on the onsite sanitation facility to be designed.

Definition of key terms

Arrangement of data – this is where data is put into tables so as to have it organized according to similarities. It is also referred to as classification of data.

Presentation of data- this involves organizing data in such a manner that it is summarized and is attractive so as to be able to easily interpret it.

Content/Procedures/Methods/Illustrations

1.1 Arrange data and information based on onsite sanitation facility to be designed.

Data arrangement involves classifying the data collected using tools for data collection into groups. This is done by checking the similarities of the raw data that has been gathered. This is done so as to aid in the understanding of data before it is finally analysed. Also, suitable comparisons can be made. The data for the design of the onsite sanitation facility from the various data collection tools such as: questionnaires, reporting, existing data, observation, focus groups and combination research, is classified so that it is easier to be able to further understand it.

Classification of data is done according to the following basis:

a. Qualitative classification.

This is where data is put into categories based on qualities. For example, data collected from a population can be classified according to employment where there would be the unemployed and those that are employed.

b. Quantitative classification.

This is putting data into classes in the basis of characteristics that can be measured such as: length, width etc.

c. Chronological classification.

It is also called temporal classification. This involves putting data in clusters in accordance to time, either in descending or ascending order. Time could be in weeks, months, years etc.

d. Geographical classification.

It is also called spatial classification. This is classifying data according to geographical locations such as counties, countries, cities etc.

After the data for designing the onsite sanitation facility has been classified then analysis and presentation can be done.

1.2 Present data based on onsite sanitation facility to be designed.

Presentation of data is done so as to allow for decisions to be made. The data collected in the previous outcome after it has been classified needs to be presented for it to aid in designing the onsite sanitation facility.

There are various methods of presenting data, called tools of data presentation. These include:

a. Textual presentation.

This is where data comprising of texts and values is written and then read.

b. Tabular presentation.

This involves putting data systematically in rows and columns. This makes up a statistical table.

c. Graphical presentation.

This is where statistical data is presented in the form of lines or curves plotted on coordinated points.

Examples of graphs: bar graph, pie chart, line graph etc.

A suitable method of data presentation should be selected from the above list to present the data needed to design the onsite sanitation facility.

Conclusion

This learning outcome served arrangement and presentation of data and information collected from the previous outcome.

Further Reading



Read more on the various classifications of data and the methods of presenting data.

20.3.3.3 Self-Assessment



Written Assessment

1. Which of the following is not a method of data classification?
 - a) Temporal classification
 - b) Spatial classification
 - c) Graphical classification
 - d) Quantitative classification.
2. One of the following is not a method of presenting data?
 - a) Textual presentation
 - b) Graphical presentation
 - c) Chronological presentation
 - d) Tabular presentation
3. Give three reasons why data classification is important.
4. What are the three data presentation tools?
5. Write an essay highlighting the process of arranging and presenting the data for the onsite sanitation facility and specify what methods you used in both.

Oral Assessment

Mention types of graphs.

Mention the 4 types of data classification.

Practical Assessment

Arrange and present the data for designing the onsite sanitation facility. Use excel to generate the graphs.

Oral Assessment

Mention the observations you have made from the presented data.

20.3.3.4 Tools, Equipment, Supplies and Materials

- Software e.g. Excel

20.3.3.5 References



Reynolds L. & Simmonds D. (2012). Presentation Of Data In Science: Dordrecht. Martinus Muhoff Publishers.

Hennessy E. (2014). Presenting Data: How to Communicate Your Message Effectively: Wiley.


Evergreen S. (2017). Presenting Data Effectively: Communicating Your Findings For Maximum Impact: SAGE Publications.

Wills J. (2004). Data Analysis and Presentation Skills. West Sussex: Wiley.

easytvvet.com

20.3.4 Learning Outcome No 3: Calculate Onsite Sanitation Design Parameters

20.3.4.1 Learning Activities

Learning Outcome No 3 Calculate Onsite Sanitation Design Parameters	
 Learning Activities	Special Instructions
3.1 Identify <i>design parameters</i> to be calculated 3.2 Identify <i>tools for design parameter calculation</i> 3.3 Calculate various onsite sanitation facility design parameters	<ul style="list-style-type: none"> • Present design parameters and tools for their calculation through a power point presentation.

20.3.4.2 Information Sheet No20/LO3: Calculate Onsite Sanitation Design Parameters

Introduction to learning outcome

This learning outcome involves the calculation of design parameters based on wastewater design manual, calculation of design parameters already identified based on required design codes and calculation of various onsite sanitation facility design parameters based on the design codes.

Definition of key terms

Design parameters: Design parameters are aspects of a system that are required to make something happen according to www.igi-global.com/dictionary.

Tools for design parameter calculation: The tools for design parameter calculation are tools that assist in coming up with the required system design to function well.

Content/Procedures/Methods/Illustrations

3.1 Identify *design parameters* to be calculated based on wastewater design manual.

Design parameters: Design parameters are aspects of a system that are required to make something happen according to www.igi-global.com/dictionary.

The design manual is intended to serve as a guide for those already in the field who may use it for cross-checking purposes and as a starting point for those interested in wastewater and would like to be involved in the design of works (Freese, 2009)

Design parameters in wastewater design:

- Maximum quantity of sewage
- Volume of sewage

- Surface area
- Detention period
- Depth
- Diameter
- Free board

Types of settling	Overflow rate m ³ /m ² /day		Solids loading kg/m ² /day		Depth	Detention time
	Average	Peak	Average	Peak		
Primary settling only	25-30	50-60	-	-	2.5-3.5	2.0-2.5
Primary settling followed by secondary treatment	35-50	60-120	-	-	2.5-3.5	
Primary settling with activated sludge return	25-35	50-60	-	-	3.5-4.5	-
Secondary settling for trickling filters	15-25	40-50	70-120	190	2.5-3.5	1.5-2.0
Secondary settling for activated sludge (excluding extended aeration)	15-35	40-50	70-140	210	3.5-4.5	-
Secondary settling for extended aeration	8-15	25-35	25-120	170	3.5-4.5	-

Figure 187: Design parameters for settling tank

Source: www.slideshare.com by Bibhabasu Mohanty.

3.1 Identify tools for design parameter calculation (laptops, calculator, stationery, and software) based on the parameter to be calculated.

The tools for design parameter calculation are tools that assist in coming up with the required system design to function well. These tools are explained below:

Laptops: Laptop is a portable computer that can be conveniently transferred and used in a number of locations that run software and access the same type of files according to edu.gcfglobal.org/computer-basics.

Calculator: Calculator is a tool that performs mathematical arithmetic operations as stated by whatis.techtarget.com/calculator.

Stationery: Stationery is a type of writing material, such as paper, envelopes, pens, pencils and books according to Cambridge Advanced Learner's dictionary.

Software: Software is a series of programs designed to perform a well-defined purpose according to www.tutorialspoint.com/software.

3.2 Calculate various onsite sanitation facility design parameters based on design codes.

On-site sanitation facilities: are wastewater systems designed to treat and dispose of effluent on the same property that produces wastewater in areas not covered by public sewage infrastructure (Tkgd2007, 2008).

Design procedure

In designing a sanitary sewer system, the designer commences by:

Step 1: Establishing the boundaries of the specific area to be serviced

Step 2: Obtaining mapping as required

Step 3: Breaking the defined area into units

Step 4: Determining the existing and proposed land use

Step 5: Deciding on an ultimate population to be attached to each unit

Step 6: Determining the design flow for the population of each unit

Step 7: Determining a design allowance for infiltration.

After the proposed sewer routing is established and the necessary profiles obtained, the designer will proceed to calculate sewer pipe sizes and grades.

The design of the latrine is driven both by customer preferences and by public health requirements. While basic design factors (pit length, septic tank retention time, etc.) remain the same, local circumstances and specifications influence the factors that regulate the final cost of the latrine.

Pit latrine design

Step 1: Size of the pit

Three conditions must be met when determining the size of a pit latrine opening:

- The pit will have ample storage space for all sludge that accumulates during its operating life or prior to its expected emptying according to (R Franey, 1992).
- When the service life of the pit is finished, enough space will still be left for the contents to be enclosed.
- Appropriate wall space should be available at all times so that any liquid in the pit can enter the surrounding soil (R Franey, 1992).

Step 2: Capacity to store

Adequate capacity should be accounted for when designing the pit's operating life according to (R Franey, 1992)

Step 3: Depth of soil seal

This is usually taken as 0.5 m (R Franey, 1992). In the case of the double pit latrines, the depth is to the bottom of the inlet drain.

Step 4: Zone of penetration

A significant amount of water can reach the pit in communities where people use water for anal cleaning or bathing in the toilet. When the soil pores below the sludge surface are believed to be blocked, additional wall areas must be allowed to penetrate the liquids above the sludge (R Franey, 1992)

Step 5: Depth of pit

According to R Franey, (1992) total depth of the pit shall be calculated as follows:

Pit depth = sludge depth + infiltration depth + depth of soil seal



Figure 188: Pit latrine design

Source: Pit toilets (Latrines)/ Global Water Pathogen Project

Conclusion

This learning outcome has covered calculation of onsite sanitation design parameters such as wastewater estimation and population projection, tools for design parameters and design of onsite sanitation facilities based on design codes.

Further Reading



Read more on:

1. Design of onsite sanitation facility: Engineering Design Manual by Sudbury, C. o. (2012). On-site Sanitation facility. *Engineering Design Manual*.
2. Watch a video on Design criteria (<https://slideshare.com/slide/4326901>)

20.3.4.3 Self-Assessment



Written Assessment

1. Which one of the following is not an onsite sanitation facility to be designed?
 - a) Latrines
 - b) Stationery
 - c) Septic tank
 - d) Site office
2. Which one is not a tool for design parameter calculation?
 - a) Software
 - b) Stationery
 - c) Design manual
 - d) Laptop
3. Define design parameters
4. Differentiate the tools for design parameter calculation
5. Determine various onsite sanitation design parameters
6. Discuss the importance of calculating onsite sanitation design parameters

Oral Assessment

Outline the tools for design parameter calculation.

State the technical skills an individual need to have in calculation of onsite sanitation design parameters.

Project Assessment

Design a septic tank suitable for 120 users assume a flow of sewage 100l/h/day and a retention period of 24 hours assume any other necessary information.

20.3.4.4 Tools, Equipment, Supplies and Materials

- Laptops
- Calculator
- Stationery
- CAD Software
- Internet

20.3.4.5 References




- Mehraban Sadeghi, H. H. (2012). Design Parameters. International Journal of Environmental Health Engineering.
- Sudbury, C. o. (2012). On-site Sanitation facility. Engineering Design Manual.
- Tkgd2007. (2008). Onsite sanitation facility. Scratch in Adobe illustrator.

easytvvet.com

20.3.5 Learning Outcome No 4: Draw Onsite Sanitation Units

20.3.5.1 Learning Activities

Learning Outcome No 4: Draw Onsite Sanitation Units	
 Learning Activities	Special Instructions
4.1 Identify and gather drawing 4.2 Draw onsite sanitation facilities 4.3 Submit onsite sanitation facility drawings for approval	<ul style="list-style-type: none">• Facilitate group discussions and provide online videos on how to draw the sanitation facilities.• Provide exercises to the trainees for submission

20.3.5.2 Information Sheet No20/LO4 Draw Onsite Sanitation Units



Introduction to learning outcome

This units aims to ensure the trainees are able to draw chosen onsite sanitation facilities based on the design parameters calculated.

Definition of key terms

Drawing tools -these are instruments to help the learner draw a required design.

Supplies -these are the available items that are provided.

Materials -objects which the drawing will be put down to help in visualization.

Content/Procedures/Methods/Illustrations

4.1 Identify and gather *drawing tools*, (software, pencils, ruler, T-square, scale rule, eraser, set square, drawing board) *supplies* (masking tapes, software) and *materials* (drawing paper, photocopying/printing papers, and stationery) based on available resources and complexity of the design.

Drawing tools

Pencils-an instrument used for writing or drawing made from a thin piece of granite

Ruler-a straight piece of wood or plastic which is marked and used for measuring distances

T-square-an implement used for drawing horizontal lines or testing angles

Scale rule-instrument used to measure and transfer length
Eraser-a piece of rubber used to wipe out unwanted writings
Set square-an instrument used for drawing lines at certain degrees
Drawing board-a table used for drawing or writing

Supplies

Masking tape-tape used to cover unwanted painting areas
Software-instructions set on a computer that are used carry out certain tasks

Materials

Drawing paper-paper used for drafting finished work
Photocopying paper-a plain paper used for printing
Stationery –a collection of writing materials

4.2 Draw onsite sanitation facilities based on the design parameters.

Onsite sanitation facility -this is where the waste is collected and treated on the same facility

Design parameters –these are the considerations needed before starting something.

- The demand for sanitation
- Project definition
- Background information
- Comparison and selection of systems

Soak Pits can be used with latrines

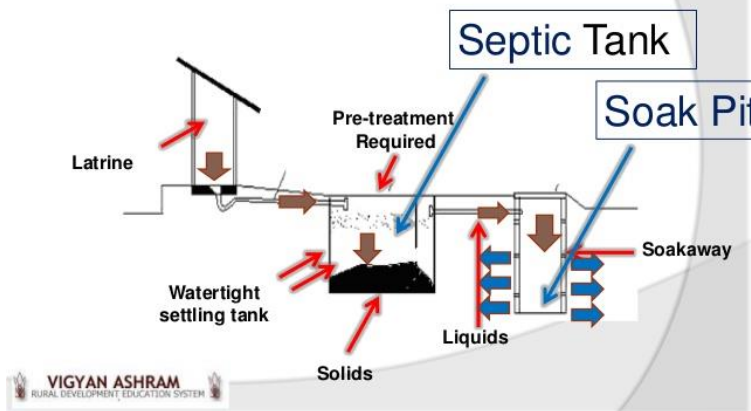


Figure 189: Soak pit

Source: Vigyan Ashram, Introduction to Water, Rural Development Education System, <https://slideshare.net/mobile/vigyanashram/day-1-recycle-grey-water>

4.3 Submit onsite sanitation facility drawings for approval as per legal requirements

Legal requirements –protocols put in place by the government that needs to be fulfilled and act as guidelines.

Should be readily available to the community.

Local government to include onsite sanitation plans to reduce expenditures.

The health sector should play a part in ensuring the safety of the public's health

Inspection of sanitation systems to avoid exposure of excretes materials and endangerment of people's health.



Figure 190 : Onsite sanitation facility drawings

Source: Texas A&M Agrilife Extension, Onsite Wastewater Treatment Systems (OWTS), <https://ossf.tamu.edu/onsite-wastewater-treatment-systems-owts/>

Conclusion

This learning outcome served the drawing of onsite sanitation units using available resources and based on the complexity of the design. The learner should be able to comfortably define terms related to the onsite sanitation and implementing the knowledge taught.

Further Reading



Read more on the design parameters of onsite sanitation facility.

20.3.5.3 Self-Assessment



Written Assessment

1. Identify a factor which doesn't affect waste disposal in onsite sanitation
 - a) Ground conditions
 - b) Human waste
 - c) Insects and vermin problems
 - d) Significance of pollution
2. In planning of onsite sanitation facility different considerations are taken into account. Give a factor with least consideration.
 - a) Mode of transport
 - b) Need for sanitation
 - c) Financial aid
 - d) Background information
3. Define onsite sanitation.
4. Give the objective of onsite sanitation
5. In relation to onsite sanitation give two examples.
6. Describe the preparation for an onsite sanitation facility.

Case Study Assessment

While on an attachment you're asked by your supervisor to help with the ongoing onsite sanitation facility construction, which design criteria will you use to help them draw the facility?

Oral Assessment

Which design criteria did you use?

Practical Assessment

In your class identify and name the different tools and materials available.

Oral Assessment

What are the tools used for?

20.3.5.4 Tools, Equipment, Supplies and Materials

Tools:

- Software
- Pencils
- Ruler
- T-square
- Scale rule
- Eraser
- Set square
- Drawing board

Supplies:

- Masking tapes
- Software

Materials:

- Drawing paper
- Photocopying /printing papers
- Stationery

Equipment:

- Computer
- Printer
- Photocopiers
- Calculator

20.3.5.5 References




Texas A&M Agrilife Extension. (2019). Onsite Wastewater Treatment Systems. Texas. Agrilife Bookstore.

WHO. (2018). WHO Guidelines on Sanitation and Health. Geneva. World Health Organization

20.3.6 Learning Outcome No 5: Design Shit Flow Diagram

20.3.6.1 Learning Activities

Learning Outcome No 5: Design Shit Flow Diagram	
 Learning Activities	Special Instructions
5.1. Identify data required for SFD preparation 5.2. Identify methodology for data collection 5.3. Identify and gather tools, supplies and materials 5.4. Collect, sort and analyze data 5.5. Prepare SFD	<ul style="list-style-type: none">Utilize the available resources to gather the data required for designing a shot flow diagram.

20.3.6.2 Information Sheet No20/LO5 Design Shit Flow Diagram



Introduction to learning outcome

The objective of this unit is to design a shit flow diagram by first collecting the required data using the available resources and as per the standards needed. The learner should be able to understand and work with a shit flow diagram.

Definition of key terms

Shit flow diagram –a diagram that shows how excrete flows in an urban or rural setting.

Fecal Sludge management –it is the collection, transportation, and treatment of the fecal sludge

Content/Procedures/Methods/Illustrations

5.1 Identify data required for SFD preparation according to standards

- Boundary of area-political and administrative boundaries may differ with the areas sanitation boundaries.
- Population -using census data to know the area population.
- Types of sanitation systems and how they operate.
- The key geographical features to know the areas climate and topography.
- Policies or regulations of the area for easier sanitation delivery.
- Co-ordinates to locate service chain components.

5.2 Identify methodology for data collection as per the standards

Methodology is a way of gathering information.

- Questionnaire- a set of questions written on paper and given to people to answer them.
- Interviews- meeting held by two parties to gather information by asking questions.
- Pictures- captured images by use of an instrument called a camera.
- Identifying the stakeholders- stakeholders are the relevant authority that gives permission for a project to start.
- Relevant identification documents and introduction letters- these are used to show the institution you come from and your intentions.

5.3 Identify and gather tools, supplies and materials based on available resources

Tools: Safety equipment-these are tools or materials used to protect an individual from harm

Measuring instruments-they are used to estimate distance

Cameras-it is an instrument used to capture an object

Stationery- a collection of writing materials

Map- a tool that assists in locating or finding a place

GPS- an instrument used to find the location of a place

Supplies: Software- instructions set on computer that are used to carry out certain tasks

Materials: Drawing paper- a factory made light material used in artwork or writing.

5.4 Collect, sort and analyze data based on methodology identified

- Data collection will be through questionnaires which will be dropped and picked from the responders after filling them. Pictures will be taken by form of cameras while interviews will be carried out on one on one basis.
- Sorting will be done through: numbering of pictures that will act as proof of location.
- Questionnaires will be numbered and the questions coded.
- Analysis will be done by compiling all the data and feeding it into the SFD graphic generator.

5.5 Prepare SFD based on the data collected

Shit flow diagram- a diagram that shows how excrete flows in an urban or rural setting.

Preparation

Identify the stakeholders to ensure you get the necessary permission from relevant authorities and mark out the sanitation boundary.

Questionnaires will give you a better understanding of the sanitation situation in the area and other related issues.

Population of the area will give the measurements one needs to know for the possible best containment system to use for a certain amount of people.

Pictures will be a form of proof of the existing sanitation systems around the area.

The data will be fed into the into the SFD graphic which will be generated from the SFD matrix using the online graphic generator.

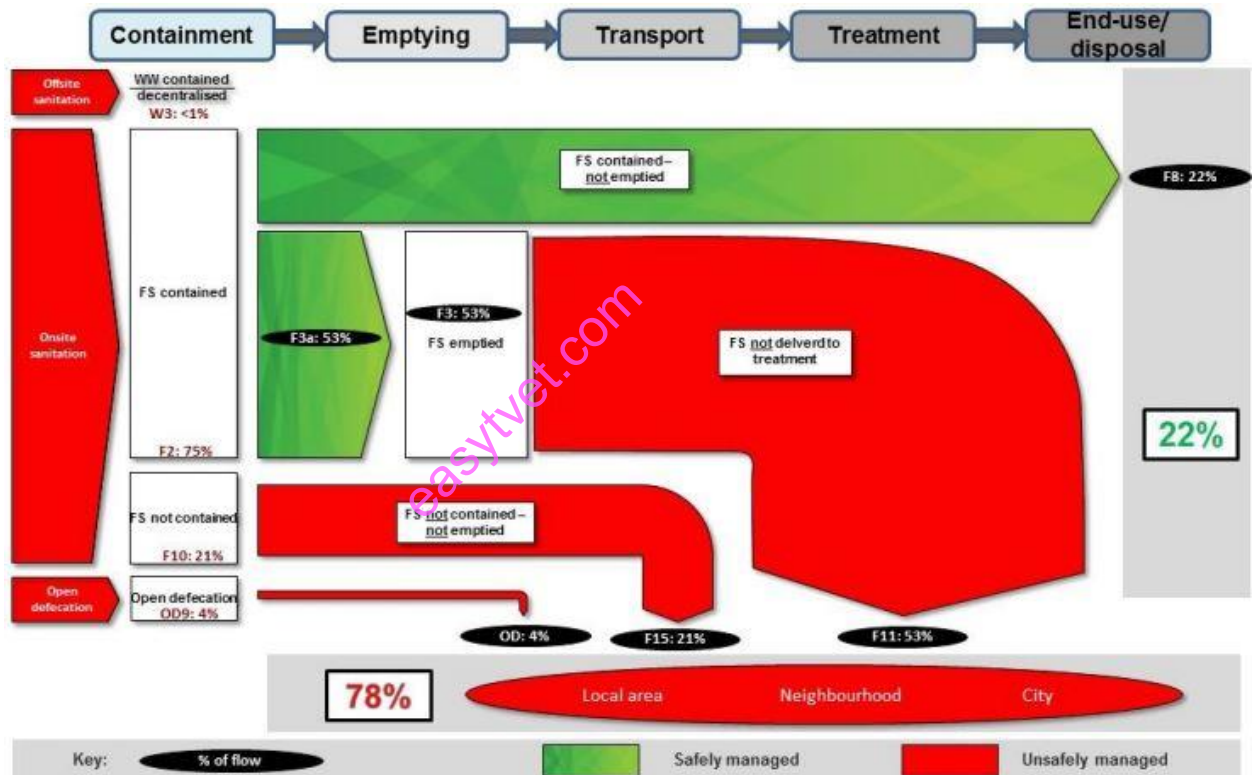


Figure 191: SFD Promotion Initiatives Updates

Source: African Water Association , 2017, SFD Promotion Initiatives Updates, USAID, <https://www.afwakm.com/sfd-promotion-initiative-updates/>

Conclusion

This learning outcome served the preparation, designing of an SFD for fecal sludge management and teaching the basics in collecting and analyzing raw data.

Further Reading



Read further on the steps of fecal sludge management

20.3.6.3 Self-Assessment



Written Assessment

1. Which area is fecal sludge management preferred the most?
 - a) Cluster settlement
 - b) Dense settlement
 - c) Sparse settlement
 - d) Stratified settlement
2. Name the mode of transport used in fecal sludge management.
3. After treatment of the fecal sludge management, what is the byproduct given?
4. List the advantages and disadvantages of fecal sludge management.
5. Differentiate between onsite sanitation and fecal sludge management.
6. Describe how social and cultural practices affect fecal sludge management.
7. Fecal sludge management is proving to be a necessary way of waste water treatment.

Oral Assessment

What was the most advantageous quality of fecal sludge management?

Case Study Assessment

On your way home, you pass by a school with a failed sewerage system. Advise the school principal on fecal sludge management and design a shit flow diagram for the school.

Practical Assessment

In groups of two find the system used to ensure a proper fecal sludge management in your area.

Oral Assessment

Which way of disposal is used in fecal sludge management?

20.3.6.4 Tools, Equipment, Supplies and Materials

Tools:

- Software
- Pencils
- Ruler
- T-square
- Scale rule
- Eraser
- Set square
- Drawing board

Supplies:

- Masking tapes
- Software

Materials:

- Drawing paper
- Photocopying /printing papers
- Stationery

Equipment:

- Computer
- Printer
- Photocopiers
- Calculator


References



- Bhitush Luthra. (2019). Shit Flow Diagram. New Delhi. Global and Indian Experience.
- Center for Science and Environment. (2019). Methodology for Data Collection. New Delhi. Center for Science and Environment.
- Ian Ross, Rebecca Scot, Ana Mujica, Zach White, Mike Smith. (2016). Fecal Sludge Management: Diagnostics for Service Delivery in Urban Areas. Leicestershire. World Bank Group.

20.3.7 Learning Outcome No 6: Compile Onsite Sanitation Design Report

20.3.7.1 Learning Activities

Learning Outcome No 6: Compile Onsite Sanitation Design Report	
 Learning Activities	Special Instructions
6.1 Obtain design report format from the wastewater design manual. 6.2 Prepare design report 6.3 Submit design report to the client	<ul style="list-style-type: none">Utilize the provided design report format from the wastewater design manual.

20.3.7.2 Information Sheet No20/LO6 Compile Onsite Sanitation Design Report



Introduction to learning outcome

This unit summarizes the design of onsite sanitation facilities because a trainee is expected to submit a design report to the client as per best practice.

Definition of key terms

Onsite sanitation entails dealing with the waste on the location where it is collected and deposited with regard to drainage and disposal of sewage and refuse from houses, examples include; septic tanks, use of latrines and many others to be obtained from the waste water manual

Onsite sanitation design report is a written guide record that is in place to show how engineers use the design process to arrive at the destined design of onsite facilities

Content/Procedures/Methods/Illustrations

6.1 Obtain design report format from the wastewater design manual.

- It can be obtained from the government catalog of ministry of water and irrigation or on the Internet by downloading from Google scholar websites
- The design report format outlines the following;
 - Existing sanitation technology
 - Existing conditions of onsite sanitation
 - Selection of sanitation technology
 - Selection of rural or urban sanitation
 - Cost comparison and alternatives and decision making

- f. Planning, design considerations and parameters of the chosen method construction
- g. Implementation phase

6.2 Prepare design report based on identified format.

A design report is prepared by conducting studies on the following basis;

- a. Existing sanitation technology in Kenya include onsite and offsite sanitation
- b. Grasping sewerage conditions for onsite treatment systems i.e climatic and site conditions, population, sociocultural factors and institutional framework in place
- c. The minimum criteria for selection is the service level of water supply, population density, ground permeability and water table
- d. Use of septic tanks, latrines are both considered in the rural and urban sanitation variations being land and water use
- e. The method with the minimum cost and maximum benefits is picked
- f. Conceptualization of the plan, actualization of drawings design data analysis and computation with respect to design principles and parameters to come up with dimensions
- g. Availability and gathering of resources and materials involved such as land, workmanship and thereafter construction

More information on the detailed design report to be found in

Ministry of Water and Irrigation draft practice manual for Sewerage & Sanitation Kenya. JUNE (2008)

6.3 Submit design report to the client as per best practice.

- The design report is submitted to client through a legal framework involving a third party where the document is reviewed and dully signed by both parties involved in the contract agreement
- The terms and conditions of monitoring and evaluation of the works are also agreed
- The client is made known to the risks, costs and maintenance measures to be put in place after project completion

An illustration below to show how sanitation technologies are designed to work

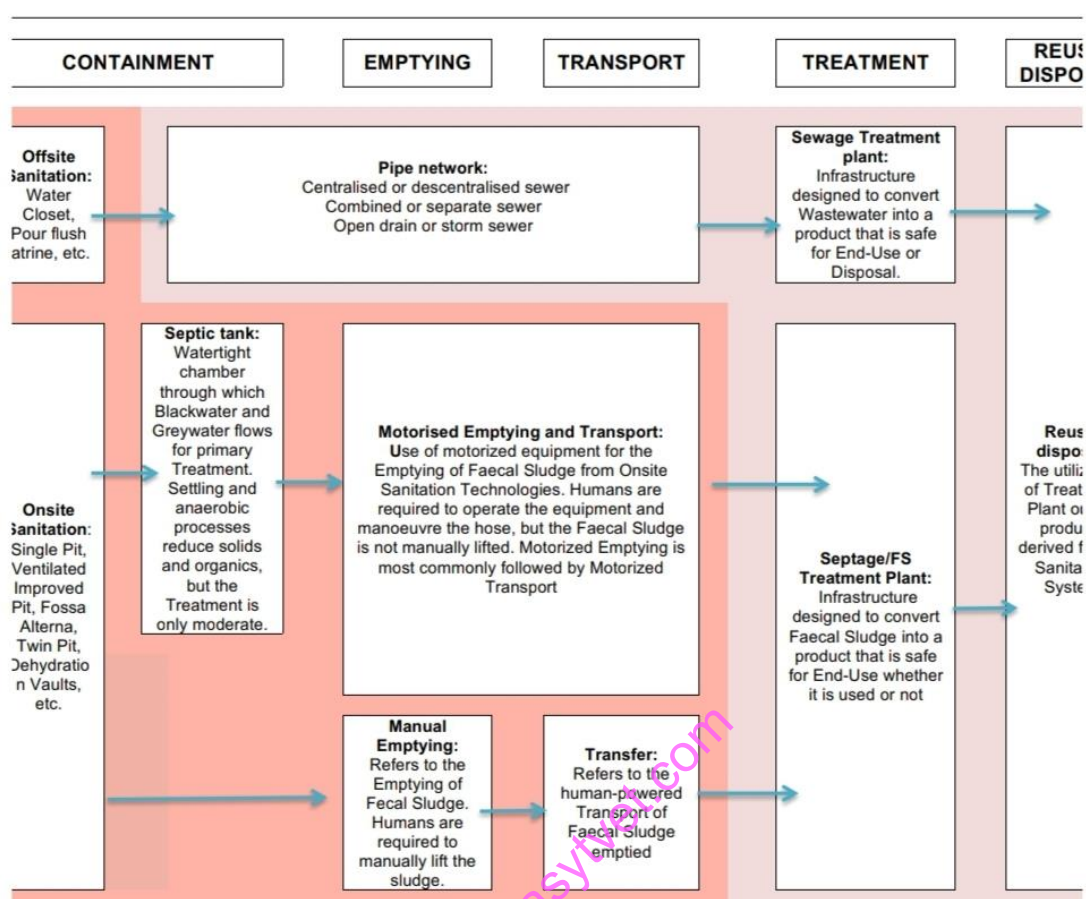


Figure 192: Sanitation technologies

Source: Using the shit flow diagrams by Lara Fernandez Martinez, Loughborough University

Conclusion

This learning outcome served the preparation and submission of an onsite sanitation design report and enlightened the learner about waste water design manual.

Further Reading



Learners should read more on design of onsite sanitation and be able to compute analysis questions on onsite sanitation, their design principles and consideration.

Go through other sections of the waste water design manual to familiarize yourself with other methods of sanitation.

20.3.7.3 Self-Assessment



Written Assessment

1. Which one of the following cannot be termed in existing condition of sanitation technology?
 - a) Population
 - b) Cost
 - c) Planning
 - d) Management
2. Septic tanks are adopted conveniently in?
 - a) Rural areas
 - b) Urban areas
 - c) Both
 - d) Low density residential areas
3. Where can one obtain a design report format?
 - a) Internet
 - b) Waste water design manual
 - c) Review journals
 - d) Onsite facility
4. Briefly define online sanitation
5. What is an online sanitation design report?
6. List two online sanitation methods practiced in a Kenya

Essay question

With reference to the waste water design manual, describe the preparation of a design report

Oral Assessment

Is online sanitation reliable in our country? If yes or no why?

Case Study Assessment

A client in Machakos has hired your consultant company to prepare a design report format for his residential houses sewerage system. Adopt the design with a suitable method of sanitation

20.3.7.4 Tools, Equipment, Supplies and Materials

- Computer
- Internet
- Printer
- Work Station
- Photocopying /printing papers

20.3.7.5 References



Republic of Kenya Ministry of water and Irrigation draft practice manual for Sewerage and Sanitation Services.

books.google.co.ke

The american water works association. (2012). waste water treatment plant design.fifth edistion. colorado: mcgraw hill professional

easytvvet.com