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DOMESTIC WASTEWATER PLANNING STRATEGY WITH THE COMMUNAL SEPTIC TANK METHOD (TANJUNG PRIOK, NORTH JAKARTA)

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ABSTRACT

A Communal Septic Tank is a domestic waste treatment system commonly used in densely populated areas, both in urban and rural areas. This system functions to process waste from households and commercial buildings to make it safer for the environment and human health. This research was conducted in the densely populated Sunter Agung settlement, Tanjung Priok, North Jakarta, with an area of 4.62 km^2, as a trial of domestic waste treatment to reduce environmental pollution and its impact on health. The process begins with community outreach, area observation, and preparation of technical documents such as working drawings and Budget Plans (RAB). Planning follows the provisions of SNI 2398:2022. The results of the data study showed that there were 85 families and 413 people. So that the need for a septic tank with a volume size of 16,000 liters / 16 cubic meters with a total of 7 tank units, each tank is equipped with 8 water absorption fields. The total budget that will be needed is IDR 991,000,000. The community will be given training in using the tank. The benefits of using communal septic tanks include improving groundwater quality, soil fertility, and preventing diseases, such as stunting.

Keywords: *Communal septic tanks, Domestic waste treatment, Environmental sanitation, Densely populated settlements.*

1. PRELIMINARY

Background

One of the main problems that often occurs in every area of big cities is the problem of population density that is so slum, especially those in very strategic city areas and in urban centers. Residential settlements are one of the places where humans, communities or a population settle or live and carry out daily activities in an area such as in urban and rural areas. The population also greatly influences as a center for improving the quality of future generations and can also improve the quality of life that will be decent.

Over time, the population has increased at a fairly high rate with urbanization or immigration that can affect the development of infrastructure in each city and region to be determined. In terms of urbanization is the movement of people in droves from villages (small towns, regions) to big cities. Meanwhile, everyone who does this urbanization is often referred to as urbanisan. While immigration is the movement of people from another country to a particular country to settle. And reported from the official Immigration website, in Law Article 1 paragraph 1 Number 6 of 2011 concerning Immigration, immigration is "The right to traffic of people entering or leaving the territory of the Republic of Indonesia and its supervision in order to maintain the sovereignty of the state".

Due to continuous urbanization and immigration, urban areas experience a fairly high increase in population at all times. This event has caused the government to have great difficulty in managing facilities and infrastructure in urban planning. Unintegrated housing development and lack of attention to facilities and infrastructure such as clean water, septic tanks, waste disposal systems, and rainwater channels 2 Causes waterlogging problems. This is caused by development in the water channel area, narrowing of city channels, and lack of awareness of cleanliness.

One of the areas with a dense population and irregular development in the DKI Jakarta area is in Tanjung Priok, North Jakarta. For the North Jakarta area, Tanjung Priok is very bad about urinating and defecating into urban drainage. Local residents are very less aware of 'what is the meaning of urban drainage channels', so most of the population prefers to urinate (BAK) and defecate (BAB) into urban drainage channels.

The negative impacts of urinating (BAK) and defecating (BAB) into urban drainage channels are environmental pollution, poor water quality, and also experiencing health problems for humans such as: diarrhea, giardiasis, hepatitis, cholera, to cancer due to consuming polluted water. These health problems more often attack children because children's immunity is still very low and they do not maintain cleanliness. With the negative impacts that often occur in the DKI Jakarta area, North Jakarta, Tanjung Priok.

The government has created a new program with the term Communal Septic Tank by prohibiting the disposal of urinating (BAK) and defecating (BAB) waste into urban drainage channels. In realizing the government's Communal Septic Tank program so that it runs well, the government has created a program plan that is in accordance with the conditions in the Tanjung Priok area, North Jakarta.

2. *LITERATURE REVIEW*

Planning

process of setting goals and how to achieve them. Siswanto stated that planning is a stage for choosing goals and determining how to achieve them. Terry and Rue emphasized that planning is the process of setting future goals and steps to achieve them. Sa'id and Intan added that planning includes both short-term and long-term programs. In conclusion, wastewater installation planning must be effective, efficient, integrated, environmentally friendly, and sustainable.

Wastewater Installation

The wastewater installation is a household wastewater drainage system from bathrooms, kitchens, and toilets, excluding

industrial waste and rainwater. The installation includes channels, control tanks, and a minimum slope of 2%

Communal Septic Tank

Septic tanks process domestic waste through biological processes using aerobic and anaerobic bacteria. Important requirements:

1. Safe distance from drinking water sources is at least 15 m.
2. Minimum liquid height 1.5 m.
3. Liquid volume per person 0.14–0.17 m^3.
4. The tank material must be watertight (river rock, concrete, PVC, etc.).
5. Double partition: sediment chamber (70% volume) and residual solids chamber.
6. SNI 2398:2022 and the Department of Public Works are the standard referencese.

Mixed System Septic Tank

The characteristics of a mixed tank system are as follows :

1. Two chambers: sediment and residual solids.
2. Detention time 2-3 days.
3. Sludge 30-40 L/person/year.
4. Draining every 2-5 years.
5. Tank capacity and height are calculated based on the number of users and waste discharge.

Biotek Horizontal Communal Septic Tank

Biotech system uses horizontal tube with the process:

1. Initial sedimentation.
2. Anaerobic and aerobic biofilters.
3. Final sedimentation and chlorination.
4. Biofilter media from porous rubber.
5. Efficient, minimal mud, and durable.

Advanced Management System

Advanced management systems are divided into several, including:

1. Infiltration System
   a. Length of infiltration field: L = Qa/FDI.
   b. Provisions for dimensions, distance between lines, types of pipes, and gravel
   c. layers according to SNI.
2. Upflow Filter
   a. Water flows from bottom to top through filtration media.
   b. No pump needed, easy to maintain.
   c. Used in clean water and wastewater treatment.
3. Sanita Pool
   a. Natural decomposition process by microorganisms.
   b. Stages: pre-precipitation, primary sedimentation, decomposition, secondary sedimentation, and flow.
   c. Components: pool, channel, and filter media.
   d. Cost-effective, easy to maintain, without electricity.

3. RESEARCH METHODOLOGY

Research Design, Location, and Time of Research

Objective of this program is to provide The communal septic tank construction program is one of the government's strategic initiatives to improve the quality of environmental sanitation, especially in densely populated residential areas and slum areas. The main a more integrated, effective, and environmentally friendly domestic wastewater treatment system, in order to reduce the risk of pollution and improve public health.

One of the priority locations for implementing this program is DKI Jakarta Province, precisely in Sunter Agung Village, Tanjung Priok District, North Jakarta. The selection of this area is based on the high population density and environmental conditions that require improved sanitation infrastructure. Sunter Agung Village has an area of approximately 4.62 square kilometers, which includes dense residential areas, public facilities, and economic activity zones.

Picture 1. Location Map

With the realization of this communal septic tank program, the government hopes to increase public access to proper sanitation, reduce the practice of indiscriminate domestic waste disposal, and reduce the level of groundwater and environmental pollution. In addition, this program is also expected to encourage active community participation in maintaining the cleanliness and sustainability of their residential environment, so that a healthy, clean, and comfortable environment is created.

Data Collection

Data collection was conducted through two approaches:

1. Primary Data: Obtained through field surveys, direct interviews with the community and RT/RW administrators, and visual documentation of existing conditions.
2. Secondary Data: Includes population data from BPS, regional spatial plans (RTRW), and literature related to wastewater managementand communal septic tank systems.

Analysis Techniques

The technical planning of the communal septic tank construction program is carried out in the DKI Jakarta Province, with a specific location in Tanjung Priok District, North Jakarta. This planning is arranged in stages to ensure that all technical and administrative aspects of the program can be accommodated properly. In general, the technical planning is divided into two main stages that are interrelated and support each other :

1. The first stage includes technical planning related to the communal septic tank system, including a study of the number of tank units needed based on the number of Heads of Families (KK) and beneficiary souls, identification of strategic and easily accessible placement locations, and designing technical tank designs that are in accordance with land conditions, population density, and the required domestic waste processing capacity.
2. The second stage is the stage of preparing the budget for the construction of communal septic tanks. Cost calculations are carried out in a structured and detailed manner using the Unit Price Analysis (AHS) method, calculating the volume of work, preparing the Bill of Quantity (BOQ), and recapitulating the overall budget. The purpose of this stage is to obtain a realistic and accountable cost estimate, so that it can be the basis for decision making in allocating the budget and implementing the physical program.

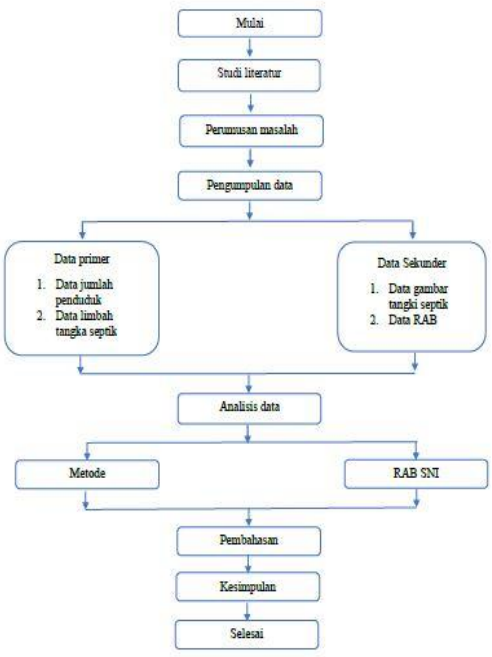
First Planning Stage

The first planning stage in the communal septic tank construction program is carried out through a series of systematic and structured technical procedures, aimed at ensuring that the sanitation system designed is truly in accordance with the needs of the community and applicable technical standards. The technical procedures for implementing this planning refer to the following stages:

1. Collection of population data for calculating tank capacity.
2. Field survey to identify physical and social conditions.
3. Determination of location and raw materials according to technical criteria.
4. Design refers to SNI 2398:2022.
5. Capacity calculation based on waste

load per person and frequency of drainage.

6. Preparation of Budget Plan (RAB).
7. Preparation of tank usage and maintenance guidelines.
8. Preparation of technical conclusions as a basis for decision making.



Picture 2. Research Flow Diagram

Second Planning Stage

The second stage is to calculate the intensity requirements for the communal septic tank as follows:

1. The population in the DKI Jakarta area, precisely in the Tanjung Priok area, North Jakarta, can be recorded with the population to determine the amount of capacity needed for one tank in making a communal septic tank planning program.
2. The location of the communal septic tank placement is carried out by reviewing the location in order to determine the number of communal septic tank units that will be needed, as well as the plan that will be made as a working drawing in the communal septic tank program. Determination of this location must also be considered from the distance of the house to other houses.

Third Plan Stage

The third planning stage is to find out the budget plan (RAB) in this communal septic tank planning program, the thing that must be considered is choosing and considering the main raw materials with the best grade quality. Factors that can be considered in the selection of raw materials, namely:

1. The raw materials used must have good and high quality materials.
2. Ease of finding the materials.
3. Ease of installation, so it does not take a lot of time.
4. Building materials can be accepted in the community without any negative impact on the environment.

To calculate the unit price of raw materials using Unit Price Analysis (AHS), consider the type of work, volume of work, Bill of Quality, and recapitulation. AHS is obtained by multiplying the price of raw materials or workers by the coefficient according to SNI. To calculate the volume of work, use the unit M, M^2, or M^3 based on the type of work.

Fourth Planning Stage

The fourth planning stage in the construction of a communal septic tank is to determine a strategic and technically feasible location for the installation of the sanitation system. Determining this location is a very crucial part, because it will affect operational effectiveness, structural durability, and ease of public access to the sanitation facilities being built. Things to consider are:

1. Avoid heavy loads from passing vehicles.
2. Avoid placement in flood and puddle areas.

Determining the right location will ensure the sustainability, function and safety of the system during wastewater management.

Procedures for Use on Communal Septic Tanks

The procedure for use is divided into several methods below as follows:

1. Collection of household wastewater as the initial step in the management process.

2. Bacterial Decomposition Reaction Using Biofilter Media The working process in the decomposition tank involves contact of wastewater with media such as wasp nests, honeycomb lamellae, water filters, or random bricks for anaerobic bacteria.
3. The next step is to inject concentrated bacterial tablets into the bio septic tank, with 1 tablet for every 500 liters of water.
4. d. Addition of filters in the water polishing process to add bio filters and bio screens to the effluent before entering the water body to prevent pollution.
5. Making infiltration wells as the final method in waste processing.

With the procedures for use, the tool used can be used for a fairly long period of time.

How to Maintain a Septic Tank

Maintenance of the sludge treatment installation, especially the communal septic tank system, is an important aspect in ensuring the continuity of the function and effectiveness of the domestic waste treatment system as a whole. This maintenance must be carried out periodically and in accordance with good and correct technical principles, so that the system can operate optimally, safely, and environmentally friendly in the long term. Some important steps in the communal septic tank maintenance procedure are as follows:

1. Maintenance starts from the wastewater reservoir The first step in maintaining a bio septic tank system is to monitor and maintain the initial part of the system, namely the wastewater reservoir.
2. Periodic inspection of the reservoir The waste reservoir must be checked periodically to ensure that there is no excess capacity.
3. The construction of the septic tank must be watertight and have an infiltration well.
4. Use of materials that meet standards for septic tank construction.
5. Inspection of media and supporting equipment for waste processing In addition to routine cleaning, it is also important to check the condition of the media and supporting devices in the waste processing system, such as air blowers, biofilter media (eg wasp nests), and other components.

By implementing systematic maintenance procedures as above, the communal septic tank system can continue to function effectively.

Benefits of Septic Tanks

With the advancement of modern technology in the field of sanitation, septic tank products with biofilter technology are now present as an innovative solution that can overcome various weaknesses of conventional septic tank systems. The following are some of the main advantages of this type of waste storage media:

1. Durable and Long Lasting is one of the significant advantages of biofilter septic tanks is the high durability of the material. This product is generally made using high-quality thermoplastic materials, such as polyethylene (PE) or polypropylene (PP), which have strong, lightweight, corrosion-resistant properties,
2. Availability of Various Capacities According to Needs Biofilter septic tanks are available in various sizes and capacities, so they can be adjusted to the needs of users flexibly. By integrating the advantages of materials and flexibility of use, biofilter septic tank technology is a modern alternative that is superior to conventional systems.

4. Results and Discussion Data Description

The data required for the wastewater installation planning stage is as follows:

1. Number of Data

To be able to determine the number of communal septic tank needs accurately and efficiently, a very important initial step is to obtain data on the number of residents

domiciled in the target area. This population data is the main basis for calculating the tank capacity needed to be able to accommodate waste optimally according to the number of users. Information on the number of residents was obtained through direct coordination with official agencies, namely the Tanjung Priok Village Office, North Jakarta.

This study involved 80 respondents who provided complete data without any missing data on the variables: gender, acceptance status, respondent RT, and number of RT members. The following is a distribution table of population data on the communal septic tank program with calculations using a Likert scale.

Jenis Kelamin

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Laki-laki	65	81.3	81.3	81.3
	Perempuan	15	18.8	18.8	100.0
	Total	80	100.0	100.0	

Picture 3. Frequency distribution table of respondent gender data

The majority of respondents in this study were male, 65 people (81.3%), while only 15 women (18.8%). This shows that participation men are much higher than women in filling in data.

Status Penerimaan

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Setuju	38	47.5	47.5	47.5
	Tidak Setuju	13	16.3	16.3	63.8
	Mck	25	31.3	31.3	95.0
	Mandiri	4	5.0	5.0	100.0
	Total	80	100.0	100.0	

Picture 4. Frequency distribution table of respondent acceptance status data

Based on the acceptance status data, as many as 38 respondents (47.5%) stated that they agreed, 25 respondents (31.3%) chose “Mck” (maybe), 13 respondents (16.3%) disagreed, and 4 respondents (5%) chose independent. From these results, it can be concluded that almost half of the respondents agreed with the statement or policy asked, but there were still about a third of respondents who were hesitant and a small number who disagreed.

RT Responden

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	5	6.3	6.3	6.3
	4	3	3.8	3.8	10.0
	6	2	2.5	2.5	12.5
	10	43	53.8	53.8	66.3
	12	6	7.5	7.5	73.8
	14	14	17.5	17.5	91.3
	15	7	8.8	8.8	100.0
	Total	80	100.0	100.0	

Picture 5. Frequency distribution table of respondent RT data

The distribution of RT where respondents live shows dominance by RT 10, which is 43 people (53.8%) of the total 80 respondents. Followed by RT 14 with 14 people (17.5%) and RT 15 with 7 people (8.8%). Other RTs such as RT 2, 4, 6, and 12 have much smaller frequencies. This shows that much data is collected from certain RTs, especially RT 10, so it needs to be considered in the analysis of population representation.

Jumlah Anggota RT

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	1	1.3	1.3	1.3
	1	1	1.3	1.3	2.5
	2	9	11.3	11.3	13.8
	3	19	23.8	23.8	37.5
	4	18	22.5	22.5	60.0
	5	12	15.0	15.0	75.0
	6	4	5.0	5.0	80.0
	7	3	3.8	3.8	83.8
	8	3	3.8	3.8	87.5
	9	1	1.3	1.3	88.8
	10	3	3.8	3.8	92.5
	11	2	2.5	2.5	95.0
	14	1	1.3	1.3	96.3
	16	1	1.3	1.3	97.5
	17	1	1.3	1.3	98.8
	28	1	1.3	1.3	100.0
	Total	80	100.0	100.0	

Picture 6. Frequency distribution table of data on the number of household members of respondents

The number of RT members reported by respondents varied between 0 and 28 people. However, the majority of respondents came from RTs with a relatively small number of members, namely: 3 members (19 respondents or 23.8%), 4 members (18 respondents or 22.5%), 5 members (12 respondents or 15.0%) These data show that most RTs have between 2 and 5 members, which illustrates the small scale of the RT membership structure.

Descriptive Statistics

	N	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Jumlah Anggota RT	80	0	28	5.16	.453	4.049
Valid N (listwise)	80					

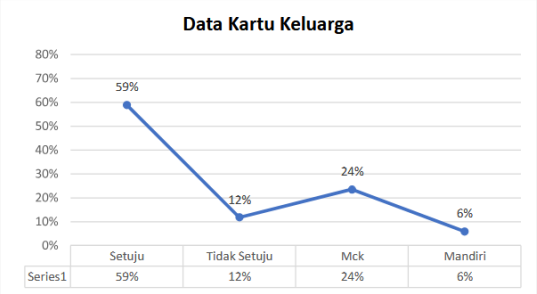
Descriptively, the average number of members in one RT is 5.16 people with a standard deviation of 4,049. The minimum value is 0 and the maximum is 28, indicating a large variation between RTs. The standard error mean value of 0.453 indicates the accuracy of the average value estimate in a larger population.

The following table and graph summarize population data on the communal septic tank program.

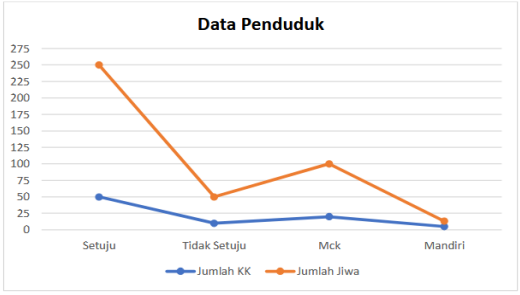
Data Penduduk

No.	Keterangan	Jumlah KK	Jumlah Jiwa	Persentase
1	Setuju	50	250	59%
2	Tidak Setuju	10	50	12%
3	Mck	20	100	23%
4	Mandiri	5	13	6%
	Jumlah	85	413	100%

Picture 8. Population Data



Picture 9. Family Card Population Data Diagram



Picture 10. Population data on number of people

Placement Location

Determining the right location for the construction of a communal septic tank in the Tanjung Priok area, North Jakarta, is a crucial stage in the technical planning process. This location must be determined carefully by considering various environmental, technical, and social aspects. For this reason, an initial analysis was carried out using administrative and topographic area maps to identify potential zones for tank placement. Furthermore, a direct field survey was carried out to evaluate actual conditions such as land elevation, accessibility, and potential flood or inundation risks.

Mixed System Septic Tank Calculation

The following is the calculation of the tank capacity used to plan a mixed system septic tank in Tanjung Priok, North Jakarta. With a total of 50 Heads of Families (KK) or equal to 250 Souls and 20 Heads of Families (KK) or equal to 100 Souls, for the communal MCK septic tank. Assuming each tank is 50 Souls.

Here are the calculations below:

1. Detention time (Td) = 2 days.
2. Amount of mud (Ql) = 30 L/person/year.
3. Water usage = 150L/person/day.
4. Number of users (n) = 50 people
5. Calculation =
   1) Wastewater discharge (Qa)
      = (60-80)% × q n (assume 80%)
      = 0.8 × 150 L/person/day
      = 120 L/person/day
   2) Tank capacity = (Va)+(V1)
      a. Water tank volume (Va)
         = Qa × n × Td
         =120 × 50 × 2
         = 15,000 L
      b. Water tank requirement = L×W×H (height of wet room)
         = L = 4.0 m^2
         = W = 2.0 m^2
         = H = 2.1 m^2 (height of wet room)
         = 4.0 m^3 × 2.0 m^3 × 2.1 m^3
         = 16.000 m^3
   3) Sedimentation volume (Va)
      = (Qa)×(Td)
      = 120 × 2

= 240 L

= 0.25 m^3 or ¼ m^3

(Assumed)

4) Sedimentation volume of Tank

= 0.25m^3×Tank Capacity

= 0.25 × 16 m^3

= 4 m^3

5) Wet room height

$$= \frac{Va}{(L \times W)}$$

$$= \frac{240}{(4.0\ m^2 \times 2.0\ m^2)}$$

$$= \frac{240}{(8.0\ m^2)}$$

= 4.0 m^2

6) Sludge volume (Vl)

$$= \frac{(Q1) \times n}{1000}$$

$$= \frac{30 \times 50}{1000}$$

$$= \frac{1500}{1000}$$

= 1.5 m^3

7) Dewatering period (PP)

$$= \frac{\text{Sludge volume}}{\text{Sedimentation volume}}$$

$$= \frac{1.5\ m^3}{4\ m^3}$$

= 0.37 × 12 months

= 4 months

8) Wet area

= L×W

= 4.0 m^3 × 2.0 m^3

= 8.0 m^3

9) Sludge height

$$= \frac{VL}{\text{Wet area}}$$

$$= \frac{1.5\ m^3}{8.0\ m^3}$$

= 0.18 m^3

10) Threshold space

= Length x Width x Freeboard

= 4.0 m x 2.0 m x 0.3 m

= 2.4 m^3

11) Total height

= T. wet space + T. mud + Freeboard

= 2.4 m^3 + 0.18m^3 + 0.3 m^3

= 2.88 m^3

So, the volume of communal septic tank needs in the Sunter Agung area, Tanjung Priok is 15,000 liters using a tank capacity of 16,000 L or 16 m^3. The need for a septic tank with a capacity of 50 families (KK) with a total of 250 people requires 5 tanks.

And for a capacity of 20 families (KK) with a total of 100 people, it requires 2 tanks. The calculation result of the septic tank capacity with a total of 350 people requires 7 septic tanks with a size of 16,000 liters or 16 m^3. With each tank having a processing time of approximately 4 months.

The following table shows the capacity results from calculating the capacity of the tank in the communal septic tank below:

Kapasitas Tabung Tangki Septik Komunal

No.	Keterangan	Hasil	Satuan
1	Waktu detensi (Td)	2	Hari
2	Banyak lumpur (Ql)	30	L/orang/tahun
3	Pemakaian air	150	L/orang/hari
4	Jumlah pemakai (n)	50	Orang / Jiwa
5	Debit air limbah (Qa) Asumsi 80%	120	150 L/orang/hari
6	Volume tangki air (Va)	15.000	Liter
7	Kebutuhan Tangki air	16.000	Liter
8	Volume pengendapan (Vp)	0.25	m^3
9	pengendapan Tangki	4	m^3
10	Tinggi ruang basah	6.0	m^2
11	Volume lumpur (VL)	1.5	m^3
12	Periode Pengurasan (PP)	4.00	Bulan
13	Luas basah	8.0	m^3
14	Tinggi Lumpur	0.18	m^3
15	Ruang Ambang Batas	2.4	m^3
16	Tinggi total	2.88	m^3

Picture 11. Septic Tank Capacity 16 m^3

Calculation of infiltration area

1. Infiltration rate (I) = 900 L/m2/day
2. Width of infiltration field = 1.00 m2
3. Water usage = 150 L/person/day
4. Mixed wastewater discharge (Qa)
   = 80% × Water usage
   = 0.8 × 150 L/person/day
   = 120 L/person/day
5. Number of users (N) = 350 people

The length of the infiltration field can be calculated using the formula:

$$L = \frac{N \times Q}{F \times D \times I}$$

❖ keterangan:

L = panjang bidang resapan, dalam m

N = jumlah orang yang dilayani

Q = banyak air limbah, L/orang/hari

D = dalam / tinggi bidang resapan, dalam

I = daya resap tanah, L/m^2/hari

F = faktor (jumlah jalur) bidang resapan

1. Length of absorption area L = (350 (120))/(8 (1.0) (900)) = 0.60 m2

The following is a table of the results of calculating the capacity of the infiltration field according to SNI 2398.

Ukuran Dan Kapasitas Bidang Resapan

No	Kecepa-tan Infil-trasi (L/m2/hari)	Lebar Bidang Resap-an (m2)	Pemaka-ian air(L/org/hari)	Debit Air Limbah Tercamp-ur (Qa)	Jumlah Pemaka-i-an (N)	Panjang Bidang Resapan (m2)	Jumlah Bidang Resapan
1	900	1.00	150	120	350	0,60	8.00

Picture 12. Size and Capacity of Infiltration Field

So, 8 infiltration fields are needed, each measuring (1.0 x 0.60 m2) for a capacity of 70 heads of families (KK) or a total of 350 people.

Planning the Calculation of the Budget Plan (RAB)

Planning the calculation of the Cost Budget Plan (RAB) on the Bill Off Quantity (BOQ) method for communal septic tanks can be made or calculated according to the needs used and required in the implementation of the work. The Cost Budget Plan (RAB) needed in making communal septic tanks can be seen in the following table:

RENCANA ANGGARAN BIAYA TANGKI SEPTIK (BIOTECH)

No	Uraian Pekerjaan	Volume	Satuan	Harga Satuan (Rp)	Harga Jumlah (Rp)
1	**Pekerjaan Persiapan**				
1.1	Survey lokasi dan penandaan	1	ls	Rp 1,500,000.00	Rp 1,500,000.00
1.2	Pembersihan lahan dan pembongkaran ringan	126	m²	Rp 65,000.00	Rp 8,190,000.00
1.3	Mobilisasi dan demobilisasi alat	3	ls	Rp 2,000,000.00	Rp 6,000,000.00
1.4	Intalasi Listrik 1300 watt	7	ls	Rp 3,500,000.00	Rp 24,500,000.00
				Sub Total	**Rp 40,190,000.00**
2	**Pekerjaan Tanah**				
2.1	Galian tanah manual (2.5x5.0x2.0)m2	210	m³	Rp 150,000.00	Rp 31,500,000.00
2.2	Angkut tanah ke TPS	105	m³	Rp 120,000.00	Rp 12,600,000.00
2.3	Urugan pasir bawah tangki	15.75	m³	Rp 350,000.00	Rp 5,512,500.00
2.4	Urugan kembali dan pemadatan	52.5	m³	Rp 150,000.00	Rp 7,875,000.00
				Sub Total	**Rp 57,487,500.00**
3	**Pengadaan dan Instalasi Tangki Biotech**				
3.1	Tangki septik Biotech kapasitas 16000 liter	7	ls	Rp 87,000,000.00	Rp 609,000,000.00
3.2	Biaya angkut tangki ke lokasi	7	ls	Rp 750,000.00	Rp 5,250,000.00
3.3	Pemasangan tangki dan pengikatan/penyetelan	7	ls	Rp 1,750,000.00	Rp 12,250,000.00
				Sub Total	**Rp 626,500,000.00**
4	**Pipa dan Fitting**				
4.1	Pipa				
	1. Pipa PVC 4" SNI	62.5	Btg	Rp 375,000.00	Rp 23,437,500.00
	2. Pipa PVC 2 1/2" SNI	28	Btg	Rp 250,000.00	Rp 7,000,000.00
4.2	Fitting (Elbow, Tee, Lem)				
	1.Elbow 4"	30	ls	Rp 45,000.00	Rp 1,350,000.00
	2.Tee 4"	60	ls	Rp 55,000.00	Rp 3,300,000.00
	3.Elbow 2 1/2"	14	ls	Rp 38,000.00	Rp 532,000.00
	4.Tee 2 1/2"	7	ls	Rp 43,000.00	Rp 301,000.00
	5.Lem (Isarplas)	3	ls	Rp 55,000.00	Rp 165,000.00
4.3	Chamber kontrol dan bak grease trap	14	ls	Rp 700,000.00	Rp 9,800,000.00
				Sub Total	**Rp 45,885,500.00**
5	**Pekerjaan Sipil (Pelindung & Penutup)**				
5.1	Pemasangan sloof/beton sekelling tangki	119	m	Rp 285,000.00	Rp 33,915,000.00
5.2	Beton cor tutup tangki (panel 1x1x0.15)m	12.6	m³	Rp 500,000.00	Rp 6,300,000.00
5.3	Manhole + penutup besi/beton	14	ls	Rp 1,500,000.00	Rp 21,000,000.00
5.4	Resapan air (1x1x1)m	7	m³	Rp 350,000.00	Rp 2,450,000.00
				Sub Total	**Rp 63,665,000.00**
6	**Pekerjaan Pembersih Akhir & Finishing**				
6.1	Pengecatan pelindung/marking tangki	7	ls	Rp 600,000.00	Rp 4,200,000.00
6.2	Pembersihan area proyek	1	ls	Rp 1,800,000.00	Rp 1,800,000.00
				Sub Total	**Rp 6,000,000.00**
7	**Zat Kimia Pelarutan Limbah**				
7.1	Biolact bakteri 30 Liter	84	Ls	Rp 1,800,000.00	Rp 151,200,000.00
				Sub Total	**Rp 151,200,000.00**
	JUMLAH TOTAL				**Rp 991,000,000.00**

Picture 13. Cost Budget Plan

The result of the calculation of communal septic tanks in the Tanjung Priok area, North Jakarta. The calculation of the results obtained in the need for installing communal septic tanks is Rp. 991,000,000.00 (Nine Hundred Ninety One Million Rupiah).

How to use

The following are the procedures for using a communal septic tank:

1. Collection of household wastewater as an initial step in the management process before processing, liquid waste containing solid waste must be collected in an equalization tank as an initial septic tank
2. Bacterial Decomposition Reaction Using Biofilter Media The working process in the decomposition tank involves contact of wastewater with media such as wasp nests, honeycomb lamellae, water filters, or random bricks for anaerobic bacteria.
3. Addition of Decomposing Starter Bacteria in the Biofilter System in the Wastewater Treatment Process.

4. The next step is to inject concentrated bacterial tablets into the bio septic tank, with 1 tablet for every 500 liters of water. For a tank with a capacity of 10 cubic meters, 20 tablets are needed.
5. Addition of filters in the water polishing process to add bio filters and bio screens to the effluent before entering the water body to prevent pollution.
6. f. Making an infiltration well as the final method in wastewater treatment. To make an infiltration well from dirty water, make sure the distance is at least 10 meters from the clean water source.

How to maintain a septic tank

Maintenance of the sludge treatment plant is carried out periodically with good and correct principles:

1. Bio septic tank maintenance starts from the wastewater reservoir.
2. The reservoir must be checked periodically; if full, immediately contact a WC suction service to dispose of it to the Sludge Treatment Plant (IPLT).
3. Septic tanks for household liquid waste must be watertight and equipped with infiltration wells.
4. Making a septic tank for processing bathroom and WC waste can use fiberglass or concrete materials.
5. In septic tank maintenance, in addition to the cleaning process, it is important to check the media and other supporting equipment, such as blowers and wasp nest media, which are used in waste processing in the waste reservoir.

Advantages of septic tanks

With modern technology, biofilter septic tank products have improved the weaknesses of conventional septic tanks. Here are the advantages of this biological waste storage media:

1. Durable and Long-lasting biofilter septic tank products are generally made of sturdy, corrosion-resistant, and unbreakable thermoplastic materials, so they can be used for more than 50 years.
2. Available for various needs Biofilter septic tanks are available in various sizes, suitable for capacities ranging from 4 to more than 12 people, so they can be adjusted for households and public facilities such as hotels and apartments.

5. CONCLUSION AND RECOMMENDATIONS

Conclusion

This research can produce effectiveness, community roles, economic aspects, and challenges and opportunities in the use of communal septic tanks as sanitation solutions in dense communities. Based on the findings and analysis conducted, the following are the main conclusions:

1. The need for sanitation facilities is 85 families or around 413 people who do not have private septic tank facilities, so a safe and efficient communal sanitation system solution is needed. Technical planning can be done by considering SNI 2398:2022, the tank capacity requirement is calculated at 15,600 liters or around 16 m^3. Therefore, it is planned to use 7 biotech tanks, each with a capacity of 16,000 liters (16 m^3). And the infiltration area measures 1.0 x 0.60 m2, with a total of 8 infiltration areas.
2. Estimated Budget Cost (RAB) with the total cost of building this communal septic tank system estimated at IDR 991,000,000.00, including preparation work, tank procurement, civil work, pipes, finishing, and waste processing chemicals.
3. Operational and maintenance procedures in the use of tanks must pay attention to the initial waste processing process, the use of biofilters and starter bacteria, as well as routine maintenance so that the system continues to function optimally and is environmentally friendly.

Suggestion

Based on the findings of this study, some suggestions for further research are as follows:

1. Increased community participation is needed, both in the planning process, construction, and operation and maintenance of communal septic tanks. Education on the benefits and how to use the correct sanitation system must be provided so that the community feels ownership and responsibility for the sustainability of this system.
2. To reduce the cost (RAB) of construction and ensure the sustainability of the system, it is recommended that there be cooperation with the government and related private companies in order to obtain the most efficient budget possible.
3. Local governments and environmental managers must conduct regular monitoring of the performance of the septic tank system, including testing the quality of processed waste. Regular evaluations will help detect system disruptions early and ensure that the processing process continues to meet applicable environmental standards.

By summarizing the findings and providing directions for future research, it is hoped that this study can make a valuable contribution to improving the understanding and practice of communal septic tank management and sanitation as a whole.

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