Civilla : Jurnal Teknik Sipil Universitas Islam Lamongan
Volume 6 No. 1 March 2021

E-ISSN 2503 - 2399
P-ISSN 2503 - 2399

Available online at
https://jurnalteknik.unisla.ac.id/index.php/CVL

https://doi.org/10.30736/cvl.v2i2

Planning Of Clean Water Network In Hamlet Dempel Village Plosogaden District Candiroto Temanggung Regency

Retno Mayasari[1], Widiyanto[2], Azzah Balqis Sabbah[3], Isna Pratiwi[4]

[1,2,3,4]Department of Civil Engineering, Faculty of Civil Engineering, State University of Semarang

E-mail:[1] retnomayasari@mail.unnes.ac.id, [2] widiyanto1210@gmail.com,
[3] azzahbalqis@mail.unnes.ac.id, [4] isnap@mail.unnes.ac.id

A R T I C L E I N F O

Article History :
Article entry : 30-01-2021
Article revised : 04-03-2021
Article received : 08-03-2021

Keywords :

bronkaptering, clean water needs, piping planning, reservoir

***IEEE Style in citing this article :* [*Heading* citation]**
One, N. P., & Second, N. P. (Year). Article Title. Civilla : Universitas Islam Lamongan, v(n), Start page – End page. [heading citation contents]

A B S T R A C T

Water is one of the basic human needs. The benefits of water resources include the provision of water for the needs of clean water, irrigation, agriculture, fisheries, etc. To know the availability of water and water needs and plan facilities that can meet these needs to know the amount, quality, provision time, location that requires water and water sources. Hamlet Dempel is located in the village of Plosogaden District Candiroto Temanggung district with a population of 770 (data 2003) with an area of 775 ha. Although the source of water comes from direct water sources the construction of clean water facilities in rural areas often experiences post-construction constraints and sustainability, thus the need to hold clean water network planning. The planning of this clean water network includes an analysis of the needs of clean water and planning a network of clean water piping gravity systems. The results of this study are; (1) The result of this analysis of clean water needs in the form of Proyeksi increase of ploso garden villagers, namely by geometric calculation model until 2030 is 2.773 people and Kneads clean water until 2030 based on the projected population of 2.773 is 1,2 liters / second.; (2) Planning the clean water piping network of this system by measuring the elevation of the spring with service area is 35,07 meters with the elevation of the spring area of 721,14 MDPL and the elevation of the service area of 686,07 MDPL so that the planning of clean water network system in Plosogaden village using gravity system, then broncaptering planning to meet the needs of clean water in Plosogaden village is 2x2x1.5 meters with a reinforced concrete structure. And reservoir planning to meet clean water needs in the village of Plosogaden is 3x3x2.5m with reinforced concrete structures.

E-ISSN 2503 - 2399
P-ISSN 2503 - 2399

1. INTRODUCTION

Water is one of the basic human needs. The development of water resources is grouped into two activities, namely the utilization and regulation of water, to be able to carry out both activities required the concept, design, construction, and operation of supporting facilities[1][2]. Water resource development is a branch of civil engineering supported by other sciences, such as economics, politics, geology, electro, machinery, chemistry, biology, environment, and social sciences.

Utilization of water resources includes the provision of water for the needs of clean water, irrigation, hydropower, fisheries, livestock, river maintenance, and water traffic. Various water needs must be served by available water, which can be in the form of surface water or groundwater[3][2]. Water availability can be said to be a function of the time when the rainy season of abundant water and vice versa when the dry season of water is reduced, therefore it is necessary to note the availability of water with certain circumstances to be able to meet these needs[4][5]. To know the availability of water and water needs and plan facilities/buildings that can meet these needs need to know the amount and quality of water, the time of provision, locations that need water and water sources[4].

Dempel sub-village is one of the hamlets located in the village of Plosogaden District Candiroto Temanggung district with a population of 770 (data 2003) with an area of 775 ha. Most of the people have a livelihood as farmers, namely coffee and rice farmers (rice fields)[5].

The utilization of water resources in Dempel sub-village is for domestic water needs (households), non-domestic water needs, namely the need for clean water for facilities and infrastructure in the form of social/public interests such as for education or schools, places of pray[6][7]. The provision of clean water in Dempel sub-village is currently from the source of the springs.

Although the source of water comes from direct springs, the Construction of Clean Water Facilities in rural areas often experiences many post-construction and sustainability constraints[8][9]. One of the important obstacles is the damage to the piping network that is not in accordance with the implementation of planning/not accordance with the standards of clean water planning and also the constraints of poverty experienced by most rural communities[10]. This community has limited access to clean water needs that are safe and decent. It has been identified that poverty and participatory types of projects or programs are significant factors that affect the condition of the clean water supply system[11].

https://doi.org/10.30736/cvl.v2i2

E-ISSN 2503 - 2399
P-ISSN 2503 - 2399

In maintaining the sustainability of clean water services in the countryside, a good Facilities Management Unit (UPS) is needed and supported by community participation, either in the form of smooth payment of water use or direct involvement in every stage of clean water service activities. Good management and community involvement are drivers of the reliability of clean water supply systems, which ultimately raises the level of community satisfaction[12][6].

2. ANALYSIS

2.1 Overview of Research Objects

Temanggung Regency is geographically located between 110023' - 110046'30" East Longitude and 7014'–7032'35" South Latitude with an area of 870.65 Km 2 (87,065 Ha), temanggung regency administratively located in the middle of Central Java Province with a stretch of North to South 34,375 Km and East to West 43,437 Km. Temanggung divided into 20 sub-districts, 266 Villages, 23 Villages, 1,568 Hamlets, 5,553 Neighborhood Pillars (RT) and 1,610 Community Pillars (RW)[13].

2.2 Population Data

Based on the results of obervasi in June to July, and research conducted on 27 - 30 August 2020, the population data of Plosogaden Village, Candiroto District, Temanggung Regency are as follows :

Table 1. Population Data year 2017 Plosogaden Village, Kec. Candiroto, Kab. Temanggung

HAMLET	YEAR			
	2017	2018	2019	2020
Krajan	365	370	388	420
Dempel I	421	430	451	476
Dempel II	306	318	322	305
Sinongko	135	139	145	147
Banjaran	351	365	379	384
Tegaltemu	240	251	264	277
Total	1818	1873	1949	2009

(source. Research Data)

2.3 Springs

Three springs were chosen by plosogaden village in Candiroto subdistrict temanggung district to meet the needs of clean water residents, ranging from domestic water needs (households) to non-

https://doi.org/10.30736/cvl.v2i2

E-ISSN 2503 - 2399
P-ISSN 2503 - 2399

domestic clean water needs (schools and places of worship)[11][14]. The springs are Songgotro springs located in Tegaltemu hamlet, Gondang Diwek springs located in Ketitang hamlet, and Dolon springs located in Batursari Village[15]

(source. Research Data)

Picture 1. Clean Water Distribution Plosogaden Village Gravity System

2.4 Clean Water Supply System

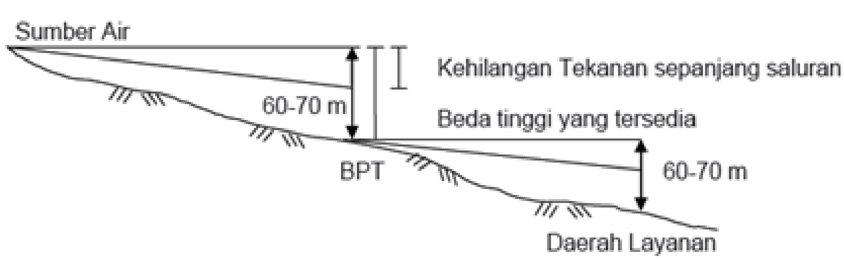
A Transmission network is a network that serves to channel clean water from the source of water to the reservoir. The way clean water is channeled depends on the location of different water sources. In this study[16][17], the distribution of clean water by gravitational system, gravity system is a system of water flows from source to reservoir by utilizing the potential energy owned by water due to the difference in the height of the location of the water source with the location of the reservoir[18].

Important considerations in planning transmission system in clean water supply system with springs include:

a. Determining The Release Trough (BPT)

The gravity system is applied when the height difference available between the water source and the location of the processing building is sufficient. However, if the available height (pressure) difference is excessive, it requires a building called a press release tub (BPT)[19][20].

.



https://doi.org/10.30736/cvl.v2i2

E-ISSN 2503 - 2399
P-ISSN 2503 - 2399

(Source : Peavy, 1985)

Picture 2. Transmission Network with CPM

(b) Calculating the length and diameter of the pipe

The length of the pipe is calculated based on the distance from the water treatment building to the main reservoir, while the diameter of the pipe is determined according to the maximum day discharge. Pipe diameter is at least 10 cm for transmission pipe. The diameter of the pipe is adjusted to the standard size and reason economically[18].

c) Pipeline

Pipelines should follow the highway and choose lines that do not require a lot of equipment to reduce construction and maintenance costs. The selection of transmission lines should be reviewed in technical and economic terms[21][22]. There are several things to note in the selection of transmission lines, namely; (1) Topographic conditions along the lines to be passed by the transmission line, wherever possible that do not require much building protection; (2) The length of the line between the location of the water source and the intended location is attempted as short as possible.; (3) Soil quality along the lines with respect to channel protection, e.g. protection against corrosion hazards; (4) Soil structure in connection with the installation of channels; (5) Implementation and maintenance shall be chosen as easily as possible in both the construction of the implementation and maintenance[23].

3. DISCUSSION

3. 1 Analysis of Clean Water Needs in Plosogaden Village

(a) Population Projection

The projected population is done so that researchers can find out how much clean water needs in Plosogaden Village. The projected population is calculated by geometric method. The projected population in this study is the projected population in the next 10 years.

Table 2. Results of Population Growth Calculation Research

YEAR	POPULATION	GROWTH PER YEAR (PEOPLE)	GROWTH PERCENTAGE	AVERAGE GROWTH
2017	1818	-	-	
2018	1873	55	0,029	0,033
2019	1949	76	0,039	
2020	2009	60	0,030	

(source. Research Data)

 E-ISSN 2503 - 2399
P-ISSN 2503 - 2399

Table 3. Results of Research Calculation of Population Growth Projection

YEAR n	YEAR	GROWTH PROJECTIONS
1	2021	2075
2	2022	2143
3	2023	2213
4	2024	2285
5	2025	2360
6	2026	2437
7	2027	2517
8	2028	2600
9	2029	2685
10	2030	2773

(source. Research Data)

(b) Projected Clean Water Needs

Projection of clean water needs in Plosogaden Village is calculated based on guidelines for providing clean water IKK Rural in 1990, domestic water needs are 30 ltr / person / day. The following are the domestic water needs of Plosogaden Village, Candiroto district, Temanggung regency, projected for the next 10 years, from 2021 to 2030.

Table 4. Total Water Needs Research Results

YEAR	DISCHARGE OF DOMESTIC WATER NEEDS (Qd)	DISCHARGE OF NON DOMESTIC WATER NEEDS Qn= (Qd x 0,05)	WATER LOOS	DEBIT TOTAL Qf=Qd+Qn+Qa
2021	0,7204	0,0360	0,1135	0,8699
2022	0,7440	0,0372	0,1172	0,8984
2023	0,7684	0,0384	0,1210	0,9278
2024	0,7935	0,0397	0,1250	0,9582
2025	0,8195	0,0410	0,1291	0,9895
2026	0,8463	0,0423	0,1333	1,0219
2027	0,8740	0,0437	0,1377	1,0554
2028	0,9027	0,0451	0,1422	1,0900
2029	0,9322	0,0466	0,1468	1,1256
2030	0,9627	0,0481	0,1516	1,1625

(source. Research Data)

https://doi.org/10.30736/cvl.v2i2

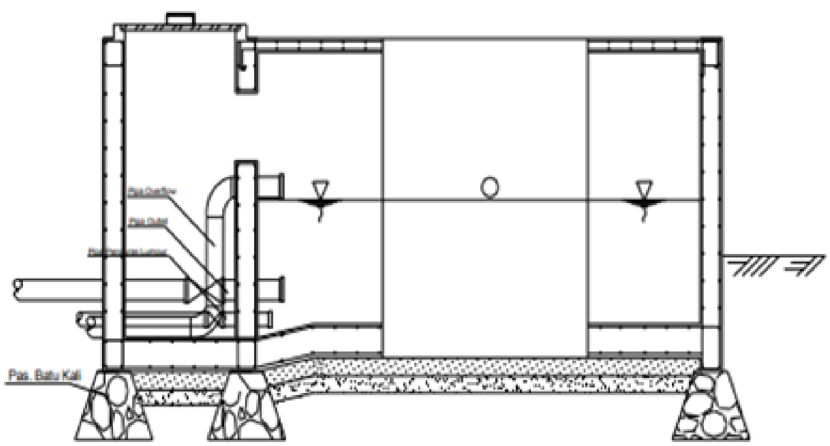
E-ISSN 2503 - 2399
P-ISSN 2503 - 2399

3.2 Determining the Source of Springs

The spring that will be utilized is Dolon Spring. In this planning, Plosogaden Village, Candiroto sub-district of Temanggung district is one of the hamlets that received water service from Dolon Spring and is a service area that can be served by gravity system and has the appropriate location and contours, in addition to other technical considerations. Technical design of raw water includes:

(a) Design of Raw Water Unit

Includes capacity planning of Water Catcher Building (bronkaptering) and planning of bronkaptering structure. Planning of the capacity of the building catcher (bronkaptering) is planned based on the discharge of the spring and the time of stay of water in the bronkaptering. Bronkaptering is useful to stabilize the water pressure before entering the transmission pipe so that the water pressure that will go through the transmission pipe remains besides that the bronkaptering also serves as a water protection against pollution.



(source. Research Data)

Picture 3. Bronkaptering

Calculation of Bronkaptering Capacity:

Dolon Spring Discharge : 18.42 liters/second

Required Water Discharge → Q = 1,2 liter/second

Required Water Discharge → Qmd = 1,15 * 1,2 = 1,38 liter/second

Used detention time (5 – 15 minute) used 15-minute detention

Fb = (free board) 0,5 m

T = water level in bronkaptering : 1 m (based on Copyright standards)

Bronkaptering Capacity :

 E-ISSN 2503 - 2399
P-ISSN 2503 - 2399

V Bronkaptering = Debit needs x Detention Time

= 1,38 liter/detik x 900

= 1242 liter → 1,242 m3 ≈ 2 m^3

Based on the calculation above, bronkaptering is used with the following dimensions:

Long (p) = 2 m

Width (l) = 2 m

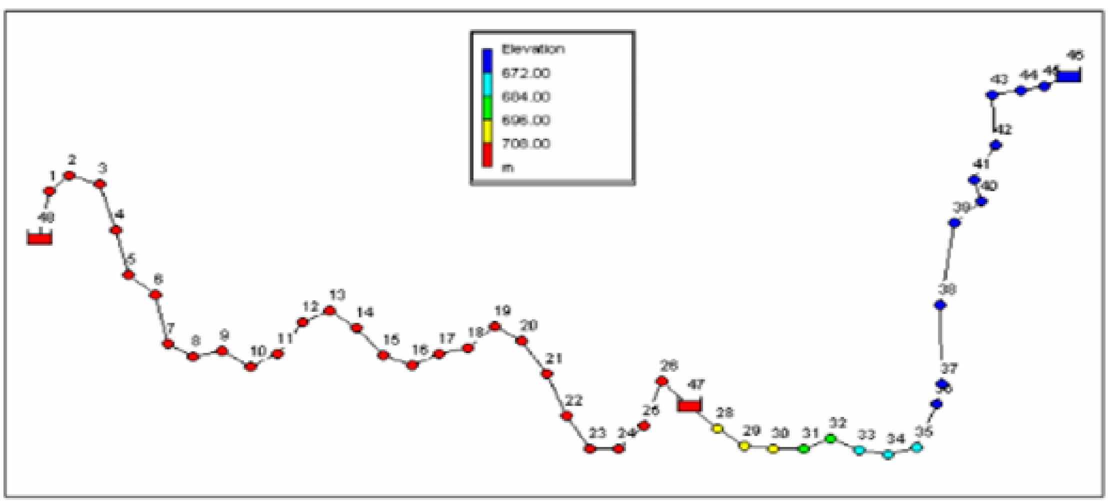
High (t) = 1

Fb = 0,5 m

Bronkaptering Dimension : 2 m x 2 m x 1,5 m

(b) Transmission Unit Design

Hydraulic analysis aims to ensure the elevation of HGL (power lines) in each existing pipeline network is higher than the elevation of the energy line (EGL) so that water can flow gravitationally. Through hydraulic analysis, it can also be determined the diameter and type of transmission pipe material used.



(source. Research Data)

Picture 4. Piping System Layout

https://doi.org/10.30736/cvl.v2i2

E-ISSN 2503 - 2399
P-ISSN 2503 - 2399

Table 5. Hydraulic Analysis Calculation

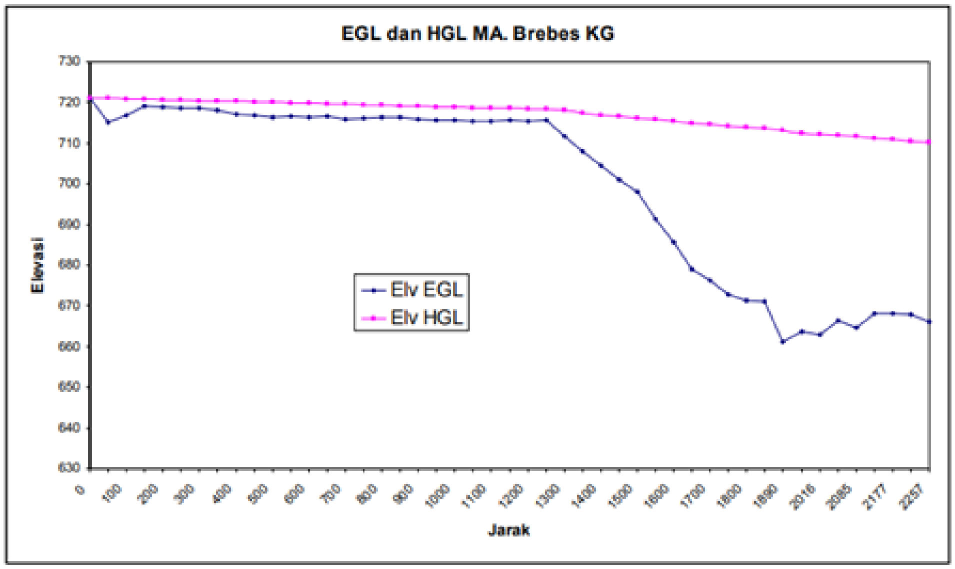
Posisi	Elevasi HS (m)	Jarak (m)	Keterangan	Q Keb. (lt/det)	Q Sup. (lt/det)	D pipa (Inch)	D pipa (m)	Jenis Pipa	CH	V (m/det)	Re	hf primer (m)	Belokan	Kb	hf sekunder (m)	hf Total (m)	HGL (m)	Residu
[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]	[18]	[19]
BM.BBS1	721,14	0	**Bronkaptering**		8,86								-	-			721,14	0
B. 1	715,21	50	Sungai (melintang)		8,86	6	0,152	GIP	120	0,49	75571	0,1139	22.5°	0,05	0,000602	0,1145	721,0255	5,8155
B. 2	716,94	100	Saluran		8,86	6	0,152	GIP	120	0,49	75571	0,1139	22.5°	0,05	0,000602	0,1145	720,9109	3,9709
B. 3	719,07	150	Saluran		8,86	6	0,152	GIP	120	0,49	75571	0,1139	22.5°	0,05	0,000602	0,1145	720,7964	1,7264
B. 4	718,85	200	Saluran		8,86	6	0,152	GIP	120	0,49	75571	0,1139			0	0,1139	720,6825	1,8325
B. 5	718,66	250	Saluran		8,86	6	0,152	GIP	120	0,49	75571	0,1139	22.5°	0,05	0,000602	0,1145	720,5680	1,9080
B. 6	718,6	300	Saluran		8,86	6	0,152	GIP	120	0,49	75571	0,1139	45°	0,14	0,001685	0,1156	720,4524	1,8524
B. 7	718,11	350	Saluran		8,86	6	0,152	GIP	120	0,49	75571	0,1139	22.5°	0,05	0,000602	0,1145	720,3378	2,2278
B. 8	717,01	400	Saluran		8,86	6	0,152	GIP	120	0,49	75571	0,1139	22.5°	0,05	0,000602	0,1145	720,2233	3,2133
B. 9	717	450	Saluran		8,86	6	0,152	GIP	120	0,49	75571	0,1139	22.5°	0,05	0,000602	0,1145	720,1088	3,1088
B. 10	716,46	500	Saluran		8,86	6	0,152	GIP	120	0,49	75571	0,1139	22.5°	0,05	0,000602	0,1145	719,9943	3,5343
B. 11	716,71	550	Saluran		8,86	6	0,152	GIP	120	0,49	75571	0,1139	22.5°	0,05	0,000602	0,1145	719,8797	3,1697
B. 12	716,3	600	Saluran, sawah		8,86	6	0,152	GIP	120	0,49	75571	0,1139	22.5°	0,05	0,000602	0,1145	719,7652	3,4652
B. 13	716,55	650	Saluran, sawah		8,86	6	0,152	GIP	120	0,49	75571	0,1139	22.5°	0,05	0,000602	0,1145	719,6507	3,1007
B. 14	716,01	700	Saluran, sawah		8,86	6	0,152	GIP	120	0,49	75571	0,1139	22.5°	0,05	0,000602	0,1145	719,5362	3,5262
B. 15	716,1	750	Saluran		8,86	6	0,152	GIP	120	0,49	75571	0,1139	22.5°	0,05	0,000602	0,1145	719,4216	3,3216
B. 16	716,34	800	Saluran		8,86	6	0,152	GIP	120	0,49	75571	0,1139	22.5°	0,05	0,000602	0,1145	719,3071	2,9671
B. 17	716,27	850	Saluran		8,86	6	0,152	GIP	120	0,49	75571	0,1139	22.5°	0,05	0,000602	0,1145	719,1926	2,9226
B. 18	715,86	900	Saluran		8,86	6	0,152	GIP	120	0,49	75571	0,1139	22.5°	0,05	0,000602	0,1145	719,0780	3,2180
B. 19	715,73	950	Saluran		8,86	6	0,152	GIP	120	0,49	75571	0,1139	22.5°	0,05	0,000602	0,1145	718,9635	3,2335
B. 20	715,71	1000	Saluran		8,86	6	0,152	GIP	120	0,49	75571	0,1139	22.5°	0,05	0,000602	0,1145	718,8490	3,1390
B. 21	715,37	1050	Saluran		8,86	6	0,152	GIP	120	0,49	75571	0,1139	22.5°	0,05	0,000602	0,1145	718,7345	3,3645
B. 22	715,39	1100	Saluran		8,86	6	0,152	GIP	120	0,49	75571	0,1139	22.5°	0,05	0,000602	0,1145	718,6199	3,2299
B. 23	715,63	1150	Saluran		8,86	6	0,152	GIP	120	0,49	75571	0,1139	22.5°	0,05	0,000602	0,1145	718,5054	2,8754
B. 24	715,45	1200	Saluran		8,86	6	0,152	GIP	120	0,49	75571	0,1139	22.5°	0,05	0,000602	0,1145	718,3909	2,9409
B. 25	715,55	1250	Saluran		8,86	6	0,152	GIP	120	0,49	75571	0,1139	22.5°	0,05	0,000602	0,1145	718,2764	2,7264

Continued Table 9. Hydraulic Analysis Calculation

B. 28	704,55	1400	Sal., jln aspal, desa	.	5,89	4	0,102	GIP	120	0,73	75357	0,3854			0	0,3854	716,9445	12,3945
B. 29	701,00	1450	Sal., jln aspal, desa		5,89	4	0,102	GIP	120	0,73	75357	0,3854	22,5°	0,05	0,001346	0,3867	716,5577	15,5577
B. 30	698,16	1500	Sal., jln aspal, desa		5,89	4	0,102	GIP	120	0,73	75357	0,3854			0	0,3854	716,1724	18,0124
B. 31	691,42	1550	Sal., jln aspal, desa		5,89	4	0,102	GIP	120	0,73	75357	0,3854	22,5°	0,05	0,001346	0,3867	715,7857	24,3657
B. 32	685,65	1600	Sal., jln aspal, desa		5,89	4	0,102	GIP	120	0,73	75357	0,3854	22,5°	0,05	0,001346	0,3867	715,3989	29,7489
B. 33	679,07	1650	Sal., jln aspal, desa		5,89	4	0,102	GIP	120	0,73	75357	0,3854	22,5°	0,05	0,001346	0,3867	715,0122	35,9422
B. 34	676,25	1700	Sal., jln aspal, desa		5,89	4	0,102	GIP	120	0,73	75357	0,3854	22,5°	0,05	0,001346	0,3867	714,6255	38,3755
B. 35	672,78	1750	Sal., jln aspal, desa		5,89	4	0,102	GIP	120	0,73	75357	0,3854	45°	0,14	0,00377	0,3891	714,2364	41,4564
B. 36	671,22	1800	Sal., jln aspal, desa		5,89	4	0,102	GIP	120	0,73	75357	0,3854			0	0,3854	713,8510	42,6310
B. 37	671,04	1820	Sal., jln aspal, desa		5,89	4	0,102	GIP	120	0,73	75357	0,1541	45°	0,14	0,00377	0,1579	713,6931	42,6531
B. 38	661,18	1890	Sungai (melintang)		5,89	4	0,102	GIP	120	0,73	75357	0,5396	22,5°	0,05	0,001346	0,5409	713,1522	51,9722
B. 39	663,57	1968	Sungai (melintang)		5,89	4	0,102	GIP	120	0,73	75357	0,6012	60°	0,36	0,009694	0,6109	712,5413	48,9713
B. 40	662,99	2016	Jalan tanah, desa		5,89	4	0,102	GIP	120	0,73	75357	0,3700	60°	0,36	0,009694	0,3797	712,1617	49,1717
B. 41	666,47	2038	Jalan tanah, desa		5,89	4	0,102	GIP	120	0,73	75357	0,1696	60°	0,36	0,009694	0,1793	711,9824	45,5124
B. 42	664,69	2085	Jalan tanah, desa		5,89	4	0,102	GIP	120	0,73	75357	0,3622	60°	0,36	0,009694	0,3719	711,6105	46,9205
B. 43	668,18	2129	Jalan tanah, desa		5,89	4	0,102	GIP	120	0,73	75357	0,3391	90°	0,98	0,02639	0,3655	711,2450	43,0650
B. 44	668,00	2177	Jalan tanah, desa		5,89	4	0,102	GIP	120	0,73	75357	0,3700			0	0,3700	710,8750	42,8750
B. 45	667,94	2217	Jalan tanah, desa		5,89	4	0,102	GIP	120	0,73	75357	0,3083			0	0,3083	710,5667	42,6267
B.46/ BM.BBS 3	666,07	2257	**Bak Jaten**	6,00	5,89	4	0,102	GIP	120	0,73	75357	0,3083			0	0,3083	710,2584	44,1884

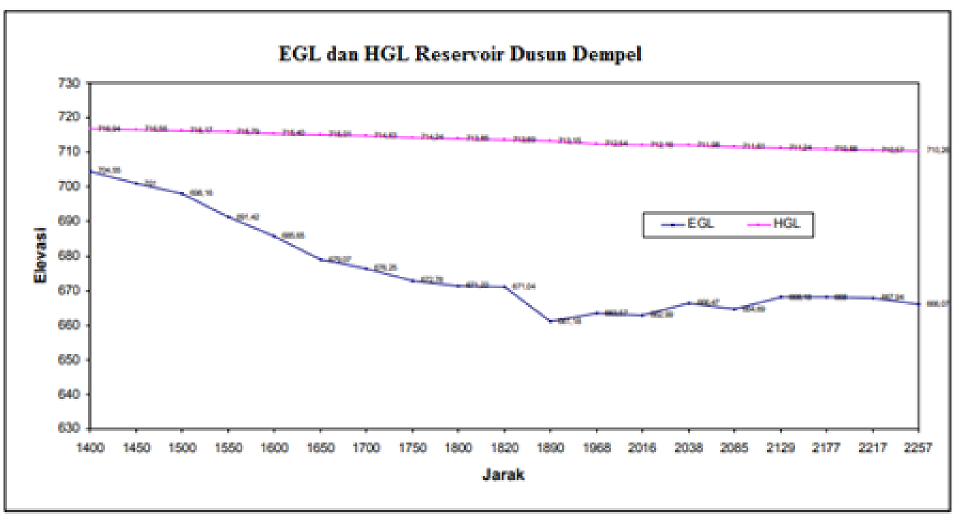
https://doi.org/10.30736/cvl.v2i2

E-ISSN 2503 - 2399
P-ISSN 2503 - 2399



(source. Research Data)

Picture 5. EGL and HGL Piping System of Plosogaden Village



(source. Research Data)

Picture 6. EGL and HGL Reservoir Plosogaden Village

https://doi.org/10.30736/cvl.v2i2

From the results of hydraulic analysis looks high effective pressure for all piping network systems turned out to be of positive value so that water can flow gravitationally. Selection of pipe types using GIP (Galvanized Iron Pipe) Galvanized Steel Pipe because it is based on the consideration of :

- Heavy terrain conditions require strong pipes
- Durability of materials longer than PVC pipes

The summary of piping network planning is presented in table 13 below:

Table 6. Planning Length, Diameter, Type, and Turn Piping

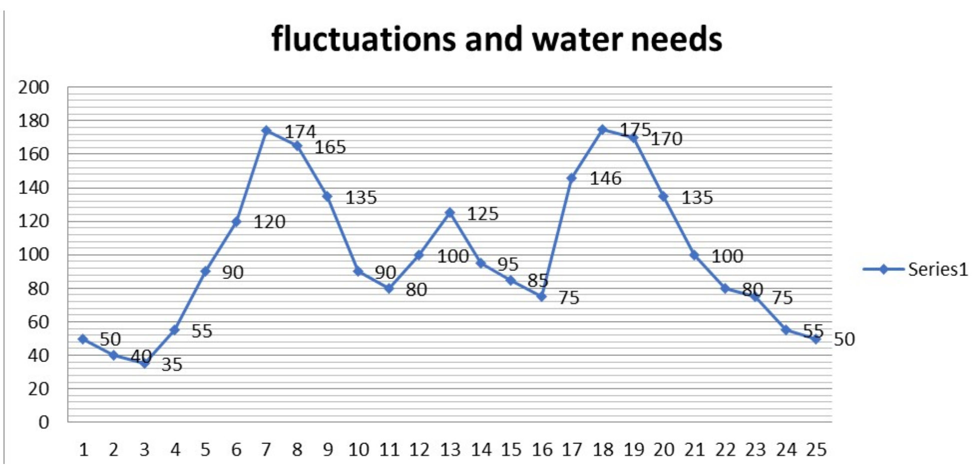
Sistem	Sub-Sistem	Panjang Pipa (m)	Diameter Pipa (Inchi)	Diameter Pipa (mm)	Jenis Pipa	Jumlah Belokan 22,5°	45°	60°	90°
MA Brebes KG	Bronk- Bak Kalidamar	1300	6	152.4	GIP	21	1	0	0
	Bak Kalidamar-Bak Jaten	957	4	101.6	GIP	6	2	4	2

(c) Water Reservoir Design

Dempel Hamlet Reservoir is located at an altitude of +666.07 meters above sea level. Reservoir capacity planning is based on peak hour needs, average needs and fluctuations in water usage for 24 hours.

From the calculation results obtained water needs average = 100,439.56 liters / Day

Maximum Daily Water Needs (Faktor 1,1) = 115.505,49 liters / Day (116 m3/day)



(source. Research Data)

Picture 7. Graph of Fluctuations in Water Usage 24 Hours Plosogaden Village

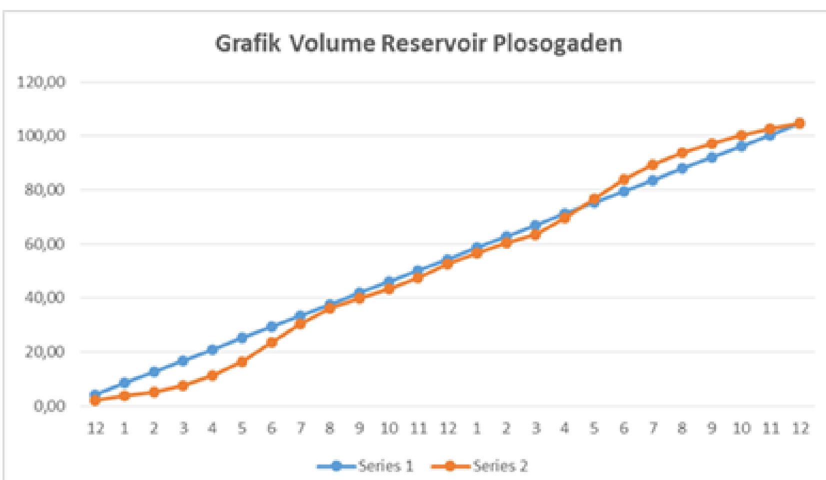
Based on the Graph of Fluctuations above, the required volume is obtained in each hour, as in table 13 below:

E-ISSN 2503 - 2399
P-ISSN 2503 - 2399

Table 7. Fluctuation of Water Needs Every Hour of Plosogaden Village

HOUR	% Estimated Consumption Every Hour	Hourly Needs (lt/s)	Average Needs (lt/s)	Average Needs (m3/h)	Hourly necessities (m3/h)	Cumulative Average Needs (m3/h)	Cumulative Needs (m3/h)
12	50	0,58	1,16	4,18	2,09	4,18	2,09
1	40	0,46	1,16	4,18	1,67	8,37	3,77
2	35	0,41	1,16	4,18	1,46	12,55	5,23
3	55	0,64	1,16	4,18	2,30	16,74	7,53
4	90	1,05	1,16	4,18	3,77	20,92	11,30
5	120	1,39	1,16	4,18	5,02	25,11	16,32
6	174	2,02	1,16	4,18	7,28	29,29	23,60
7	165	1,92	1,16	4,18	6,91	33,48	30,51
8	135	1,57	1,16	4,18	5,65	37,66	36,16
9	90	1,05	1,16	4,18	3,77	41,85	39,92
10	80	0,93	1,16	4,18	3,35	46,03	43,27
11	100	1,16	1,16	4,18	4,18	50,22	47,46
12	125	1,45	1,16	4,18	5,23	54,40	52,69
1	95	1,10	1,16	4,18	3,98	58,59	56,66
2	85	0,99	1,16	4,18	3,56	62,77	60,22
3	75	0,87	1,16	4,18	3,14	66,96	63,36
4	146	1,70	1,16	4,18	6,11	71,14	69,47
5	175	2,03	1,16	4,18	7,32	75,33	76,79
6	170	1,98	1,16	4,18	7,11	79,51	83,91
7	135	1,57	1,16	4,18	5,65	83,70	89,56
8	100	1,16	1,16	4,18	4,18	87,88	93,74
9	80	0,93	1,16	4,18	3,35	92,07	97,09
10	75	0,87	1,16	4,18	3,14	96,25	100,23
11	55	0,64	1,16	4,18	2,30	100,44	102,53
12	50	0,58	1,16	4,18	2,09	104,62	104,62

(source. Research Data)



(source. Research Data)

Picture 8. Plosogaden Village Reservoir Volume Graph

https://doi.org/10.30736/cvl.v2i2

E-ISSN 2503 - 2399
P-ISSN 2503 - 2399

From the calculation above, obtained the volume that must be accommodated :

9,63 m3/Hours + 5,86 m3/Hours = 15,5 m3 ≈ 18 m3

Reservoir capacity of Plosogaden Village:

Required volume : 18 m3

Planned height reservoir 2 m and ground floor square reservoir (h = b)

Maka dimensi Reservoir yang dibutuhkan :

V = h x l x w

18 m3 = P x L x 2 m

P2 = 9 m2

P = L = 3 m

Reservoir dimensions: P = 3 m ; L = 3 m ; t = 2.5 m. (0.5 Freeboard) with a plan wall thickness of 20 cm.

Recervoir is planned using reinforced concrete structures. Recervoir loading calculation is as follows:

Calculation of Expenses:

(1) Top Plate Cover

Plate thickness : 150 mm

The weight of the plate itself : 0.15 x 24= 3.60 kN/m2

Rain Water Load 0.05 x 10 = 0.500 kN/m2

Dead Load : 4.100 kN/m2

Life Load : 1.5 kN/m2

q ult : 1,2 DL + 1,6 LL = 7.320 kN/m2

(2) Wall

Hydrostatic pressure:

Ph = ρ.g.h

1000 x 1 x 2 = 20 kN/m2

(3) Base Plate

The weight of the plate itself : 0.25 x 24 = 6 kN/m2

Factored Dead Load : 1.2 x 6 = 7.2 kN/m2

Water Load :1 x 10 = 10 kN/m2

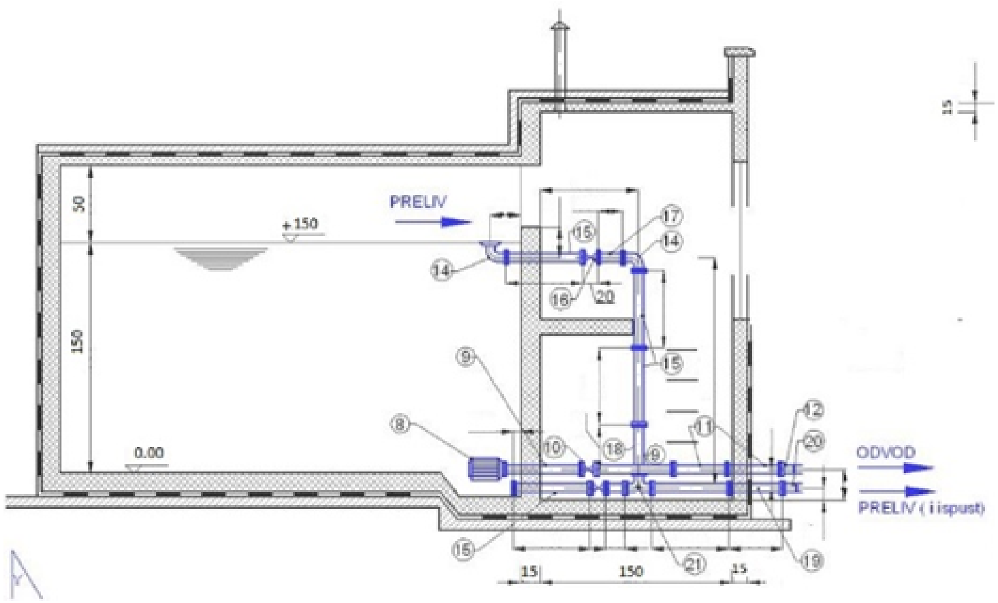
Factored Water Load : 1.6 x 10 = 16 kN/m2

Factored Total Expenses : = 23.2 kN/m2

https://doi.org/10.30736/cvl.v2i2

E-ISSN 2503 - 2399
P-ISSN 2503 - 2399

Here's a picture of reservoir planning results:



(source. Research Data)

Picture 9. Reservoir Planning

4. CONCLUSION

Based on the results of planning research of Clean Water Piping Network Planning in Hamlet Dempel District Candiroto Temanggung Regency, it can be concluded as follows:

1) The results of analysis of clean water needs in the hamlet of Dempel Candiroto district Temanggung is as follows:
   a) The projected increase in the population of Plosogaden village with geometric calculation model until 2030 is 2,773 people.
   b) The need for clean water in plosogaden village in 2030 based on the projected population of 2,773 is 1.2 liters / second.
2) Planning a network of clean water piping gravity system in the hamlet of Dempel Candiroto district Temanggung district.
   a) The difference between the elevation of the spring with the service area is 35.07 m with the elevation of the spring area of 721.14 MDPL and the elevation of the service area of 686.07 MDPL, so that the planning of this clean water network system uses a gravity system.

https://doi.org/10.30736/cvl.v2i2

E-ISSN 2503 - 2399
P-ISSN 2503 - 2399

b) Broncaptering planning to meet the needs of clean water in Plosogaden village is 2 x 2 x 1.5 meters with reinforced concrete structure.

c) Reservoir planning to meet clean water needs in Plosogaden village is 3 x 3 x 2.5m with reinforced concrete structures.

References

[1] L. Vinet and A. Zhedanov, "Air bersih," *J. Can. Dent. Assoc.*, 2016.

[2] F. Müller, "Sustainable Development Goals (SDGs)," *Peripher. – Polit. • Ökonomie • Kult.*, 2015, doi: 10.3224/peripherie.v35i140.23001.

[3] K. B. A. Walangare, A. S. M. Lumenta, J. O. Wuwung, and B. A. Sugiarso, "Rancang Bangun Alat Konversi Air Laut Menjadi Air Minum Dengan Proses Destilasi Sederhana Menggunakan Pemanas Elektrik," *e-Jurnal Tek. Elektrodan Komput.*, 2013.

[4] D. A. Keiser and J. S. Shapiro, "Consequences of the clean water act and the demand for water quality," *Quarterly Journal of Economics*. 2019, doi: 10.1093/qje/qjy019.

[5] F. Macedonio, E. Drioli, A. A. Gusev, A. Bardow, R. Semiat, and M. Kurihara, "Efficient technologies for worldwide clean water supply," *Chem. Eng. Process. Process Intensif.*, 2012, doi: 10.1016/j.cep.2011.09.011.

[6] D. P. Loucks and E. van Beek, *Water Resource Systems Planning and Management*. 2017.

[7] F. Mubin, A. Binilang, and F. Halim, "Perencanaan Sistem Pengolahan Air Limbah Domestik Di Kelurahan Istiqlal Kota Manado," *J. Sipil Statik*, 2016.

[8] D. P. Tambingon, L. A. Hendratta, and J. S. F. Sumarauw, "Perencanaan Pengembangan Sistem Distribusi Air bersih Di Desa Pakuure Tinanian," *J. Sipil Statik*, 2016.

[9] E. M. W. Makawimbang, A. Feby, L. Tanudjaja, "Perencanaan Sistem Penyediaan Air Bersih di Desa Soyowan Kecamatan Ratatotok Kabupaten Minahasa Tenggara," *J. Sipil Statik*, 2017.

[10] E. Rumengan, "Perencanaan Sistem Penyediaan Air Bersih Di Desa," *J. Sipil Statik*, 2017.

[11] M. H. D. Barang and S. K. Saptomo, "Analisis Kualitas Air pada Jalur Distribusi Air Bersih di Gedung Baru Fakultas Ekonomi dan Manajemen Institut Pertanian Bogor," *J. Tek. Sipil dan Lingkung.*, 2019, doi: 10.29244/jsil.4.1.13-24.

[12] I. Wahyuni and N. A. Affandy, "SISTEM PENYEDIAAN DAN DISTRIBUSI AIR BERSIH DI DESA TLOGOAGUNG KECAMATAN KEMBANGBAHU KABUPATEN LAMONGAN DENGAN EPANET 2.0," *J. Tek.*, 2018, doi: 10.30736/teknika.v10i1.206.

[13] A. Hijriani, K. Muludi, and E. A. Andini, "Implementasi Metode Regresi Linier Sederhana Pada Penyajian Hasil Prediksi Pemakaian Air Bersih Pdam Way Rilau Kota Bandar

E-ISSN 2503 - 2399
P-ISSN 2503 - 2399

Lampung Dengan Sistem Informasi Geofrafis," *Inform. Mulawarman J. Ilm. Ilmu Komput.*, 2016, doi: 10.30872/jim.v11i2.212.

[14] M. C. Sutandi, "Penelitian Air Bersih di PT. Summit Plast Cikarang," *J. Tek. Sipil*, 2019, doi: 10.28932/jts.v8i2.1363.

[15] A. Priyonugroho, "Analisis Kebutuhan Air Irigasi (Studi Kasus Pada Daerah Irigasi Sungai Air Keban Daerah Kabupaten Empat Lawang)," *J. Tek. Sipil dan Lingkung.*, 2014.

[16] H. T. Risky Yohanes Rottie Tiny Mananoma, "Pengembangan Sistem Penyediaan Air Bersih," *Sipil Statik*, 2015.

[17] A. Setiawan and N. A. Affandy, "EVALUASI DAERAH IRIGASI BENGAWAN JERO KABUPATEN LAMONGAN," *J. CIVILA*, 2017, doi: 10.30736/cvl.v2i1.44.

[18] Rosiana R. Handayani F. dan Qomariah S., "Strategi Pengendalian Pencemaran Air Air Sungai Pepe," *J. Matriks Tek. Sipil*, 2016.

[19] R. Naway, F. Halim, M. I. Jasin, and L. Kawet, "Pengembangan Sistim Pelayanan Air Bersih," *J. Sipil Statik*, 2013.

[20] I. Udiana, W. Bunganaen, and R. Pa Padja, "Perencanaan Sistem Irigasi Tetes (Drip Irrigation) Di Desa Besmarak Kabupaten Kupang," *J. Tek. Sipil*, 2014.

[21] L. Utama and A. Naumar, "Kajian Kerentanan Kawasan Berpotensi Banjir Bandang dan Mitigasi Bencana pada Daerah Aliran Sungai (DAS) Batang Kuranji Kota Padang," *J. Rekayasa Sipil*, 2015.

[22] S. Sholeh and N. A. Affandy, "PERENCANAAN SISTEM PENYEDIA AIR BERSIH IKK KARANGBINANGUN," *J. CIVILA*, 2017, doi: 10.30736/cvl.v2i2.79.

[23] S. T. Very Dwiyanto, Dyah Indriana K, "Analisis Pembangkit Listrik Tenaga Mikro Hidro (PLTMH) Studi Kasus : Sungai Air Anak (Hulu Sungai Way Besai)," *J. Rekayasa Sipil dan Desain*, 2018.

https://doi.org/10.30736/cvl.v2i2