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The Technical Evaluation of Fixed Weir the Body Stability Planning in Cikamunding at Ciliman River Of Lebak District

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ABSTRACT
A weir is a river transverse structure that functions to elevate the water level. It can be taken and channeled through the building. The Permanent Weir in Lebak Regency in the District of Cilograng is the Ciliman River to supply raw water especially for the benefit of the agricultural sector with a total area of 1433 Ha of rice fields. This study was conducted to determine whether the stability of the Cikamunding Permanent Weir is safe against the forces that it works with (Q100). This study uses secondary data in the form of daily rainfall data for 15 years from 1 station. The forces that are calculated into account are the self weight, earthquake force, lift force, water weight force, water pressure and weir stability analysis which are calculated t are hydraulic gradient, eccentricity, soil bearing capacity, rolling force and shear force. The dimensions of the weir are safe against eccentricity, soil carrying capacity, rolling forces, shear forces and forces that work well under normal water conditions and flood water condition.

Key words: Fixed weir, planned flood discharge, stability analysis.

1. INTRODUCTION

Weir is an alternative in supplying water needs from a river. A weir is a river transverse structure that functions to elevate river water level elevation and provide and divide water, so it can flow into carrier channels and enter rice fields for irrigation purposes in order to support agriculture and national food security. Therefore the weir remains in the Lebak District precisely in the District of Cilograng is the application of the utilization of water sources from the Ciliman River irrigation area. Cikamunding to supply raw water mainly for the benefit of the agriculture sector.

The Identification of problems in the existing Cikamunding permanent dam is that there is damage to the weir caused by scouring of water and the possibility of using matrial material that is not in accordance with the technical specifications, the lighthouse body has no cover of the stone pair of the finishing has been peeled off and the right wing is perforated, with if there is damage to the weir, the writer will recalculate the stability planning of the Cikamunding permanent weir and will be compared to the initial planning calculationn.

2. LITERATURE REVIEW

2.1 Definition

According to Eman Mawardi and Ir. Moch Memed, 2006 regarding the hydraulic design of permanent weirs, weir buildings are water structures that are built across the river or river banks to raise the water level so that river water can be tapped and flowed gravity to areas in need and the weir is a threshold built transversely for the river dam of the river which consists of a fixed threshold, where the water level of the flood in the hike cannot be adjusted in elevation, the material can be made of stone pairs, concrete or stone pairs and concrete. Built generally in the river upstream and middle sections.

According to KP-02 SPI 2010 regarding planning criteria and planning standards for irrigation of main buildings can be defined as all buildings planned at rivers defined as all buildings planned in rivers or streams to divert water into irrigation networks.

2.2 The Precipitation Averages

The method used for the average rainfall in a watershed is as follows:

A. Arithmetic method

Arithmetic calculation method is determined by adding up the height of the rain from all measurements over a certain period, divided by the number of measurement posts.

$$\bar{P} = \frac{P1+P2+..+Pn}{n} \quad \text{……………………………(1)}$$

With:

$\bar{P}$ = average rain height (mm)

P_1,... P_n = height of rain at each observed rain post (mm)

n = number of rain posts

B. Thiessen Method

The thiessen method is determined by making polygons between rain posts in a watershed area and the average regional rainfall is calculated from the number of multiplications between each polygon area and the height of rain divided by the total watershed area.

$$\bar{P}=\frac{A1\ P1+A2\ P2+..+An\ Pn}{A\ total}\text{..................}(2)$$

With:
P = average rain height (mm)
P1,.,Pn = height of rain at each post (mm)
A1..An = area bounded by polygon lines (km^2)

C. Isohyet Method

The isohyet method is determined by using a map of the contour line height of an area and the average rainfall height of the watershed is calculated from the sum of the average rainfall height between the isohyet lines with the area between the two isohyet lines, divided by the total area of the entire watershed.

$$\bar{P}=\frac{A1\ (P1+P2)/2+\ A2\ (P2+P3)/2+\ \ldots+\ An\ (Pn+_{Pn+1})/2}{A\ total}\text{...}(3)$$

With:
P= average rain height (mm)
P1,., Pn = height of rain at each post (mm)
A1..An = area bounded by polygon lines (km^2)
A2 = area total watershed (km^2)

2.3 Rainfall Analysis

The analysis of rainfall frequency is calculated to produce a planned rainfall, the calculated rainfall plan is carried out using the Gumbel distribution method, the normal parameter distribution and the Log Pearson Type III distribution method.

A. Gumball Distribution Method
The steps to calculate the rainfall plan with the Gumball Method are as follows:

1. Calculate standard deviation

$$Sx=\frac{\sqrt{\sum_{i=1}^{n}(Xi\text{-}Xr^2}}{n\text{-}1}\text{ ....}(4)$$

With:
Sx = standard deviation of rainfall
Xi = measurement value of an first rain fall
Xr = the average value of precipitation of rain
n = number of bulk data rain

2. Calculate the frequency factor value

$$K=\frac{Yt\text{-}Yn}{Sn}\text{.................................}(5)$$

With:
K = frequency factor
Yn = average price of reduce variety
Sn = reduce standard Deviation
Yt= Reduce varieted

3. Calculate the rain in the return period years o f T

$$Xt = Xr + (K.\ Sx)\text{.........}(6)$$

With:
Xt = rain in the reset period year
Xr = average price
K = frequency factor
Sx = standard of deviation.

B. The Normal distribution of log Method

The Normal distribution of log method is the result of transformation from the normal distribution, namely by changing the variant value of X to logarithmic.

$$Rt=Xr+(Kt*Sx)\text{..........................}(7)$$

With:
Rt = amount of rainfall which may occur in the period of T years
Xr = average rainfall
Kt = standard variable for Return years period
Sd = standard deviation

C. Pearson Log Type III of Distribution Method
The Log-Pearson Type III distribution or the Type III Extreme distribution is used to analyze hydrological variables with minimum variance values such as the analysis of the frequency distribution of minimum *flows* (*low flows*).
The steps in calculating the Pearson Log Log distribution curve (CD Soemarto, 1999) are:
1. Deteremine the logaritm of X varian Value.
2. Calculate the average value.
3. Calculate the standar deviation value from log X.
4. Calculate the value of slope coefficient.
So, the straight line equation can be written:

$$\text{Log } Rt= \log X + Gt(SlogX)\text{........}(8)$$

2.4 Flood Plan (Design Flood)

There are three methods are recomended to establish empirical rainfall-run off rain water, namely:

A. The Der Weduwen for the waters to 100 km2.

$$\mathbf{Qn= \alpha\beta q \times F \times mn \times R70/240}\ldots(9)$$

With :
Qn = Max discharge in a certain return period (m3 / sec)
N = Reset period
Aβq = Discharge for every Km2 of 240 mm (m3 / second) of daily rainfall
F = Catchment area (Km2) k; = Coefficient (for a certain return period)
R70 = rainfall with a 70 year return period (mm)

B. Melchior's method for watersheds of more than 100 km^2

$$\mathbf{Qmax = \alpha \times F \times q \times Rmax/ 240}\text{...........................}(10)$$

With
Qmax = debit maximum that is expected (m^3 / sec)
α = drainage coefficient
F = catchment area (km^2)
Q = debit per km^2(m^3/ second / Km^2)
Rmax = average maximum daily rainfall from a representative station

C. Haspers Method for watersheds of more than 5,000 ha.

$$\mathbf{q = \frac{\underline{Rt}}{3,6t}}\text{..........................}(11)$$

Rt = SxU................................(12)

With:
t = rainfall time (hours)
q = maximum rain (m^3 / sec / km^2)
R = average maximum rainfall (mm)

2.5 Hydraulic Weir Planning

A. The Height of Marcus
To determine a lighthouse pail weir then in account the parameters as follows:
a. Highest rice field elevation
b. high water in the fields
c. losing pressure from tertiary to rice fields
d. loss of pressure from secondary to tertiary
e. pressure loss from primary to secondary
f. loss of pressure due to oblique lines
g. pressure loss in measuring devices
h. loss of pressure from the river to the primary
i. loss of press-pressure supply from the river to the primary
j. miscellaneous supplies for building

B. Effective Width Weir

$$B_{ef} = B - \sum t - \sum b + 0.80 \sum b \quad \ldots(13)$$

with:
B_{eff} = effective weir width
B = width of the entire weir
$\sum$ = number of pillar thicknesses
$\sum b$ = total width of the rinse door.

C. Pillar Thickness
Thick weir pillars can be taken at 2 m to 3 m for river stone pairs, and 1 m to 2 m for concrete pairs.

D. The Drain / Rinse Door Width
As abig benchmark for rinshing can take the biggest price between ½ the door wide intake or 1/10 for the wide of weir (B).

E. The maximum water levelin the river. The formulas used in this calculation are:

1. The river sloping averages

$$S = \frac{\Delta h}{L} \quad \ldots\ldots\ldots\ldots(14)$$

With:
S = Slop of the river bed
Δh = High difference
L = The river length

2. The irrigation formula
De Chezy Flow

$$V = C\sqrt{RI} \quad \ldots\ldots\ldots\ldots(15)$$

Bazin Wall Roughness Coefficient

$$C = \frac{87}{(1+\frac{\gamma B}{\sqrt{R}})} \quad \ldots\ldots\ldots\ldots(16)$$

3. The Formula Section Cross
The wet cross-sectorial area

$$A \text{ or } F = (b+mh)\,h \quad \ldots\ldots\ldots\ldots(17)$$

Wet Around

$$O \text{ or } P = b+2h\sqrt{1+m^2} \quad \ldots\ldots\ldots\ldots(18)$$

Hydraulic radius

$$R = \frac{F}{O} \text{ or } \frac{A}{P} \quad \ldots\ldots\ldots\ldots(19)$$

The river flow

$$Q = AV \quad \ldots\ldots\ldots\ldots(20)$$

With:
Q = the flow rate passing above lighthouse (m^3 / sec)
V = The flow speed (m^3 / sec)
A = The cross-sectorial area
C = The Speed coeffisient(the function of the profile shape and roughness
R =Hydraulic radius
I = River sloping average
O = Wet circumference
¥β = Roughness coefficient (for the river can be taken between 1.50 and 1.75)
b = The channel base width (m)
h = height/the depth of runing water
K = The strickler roughness coefficient
w = The high guard or working (m)
m = The channel slope

Figure 1: The Transverse of Trapezoidal Channel

F. The maximum water level of Mercu Bunschu formula above used:

$$Q = m\,b\,d\sqrt{g\,d} \quad \ldots\ldots\ldots\ldots(21)$$

$$d = 2/3\,H \quad \ldots\ldots\ldots\ldots(22)$$

$$H = h+k \quad \ldots\ldots\ldots\ldots(23)$$

The price of k and m using the Verwoerd formula:

$$k = \frac{4}{27}\, m^2 . h^3 \left(\frac{1}{h+p}\right)^2 \ldots\ldots\ldots\ldots(24)$$

$$m = 1{,}49 - 0{,}018\left(5 - \frac{h}{r}\right)^2 \ldots\ldots(25)$$

With:
Q = the flow rate passing above lighthouse(m^3/sec)
b = effective weir width (m)
h = height of water (front) above lighthouse (m)
k = height of energy speed (m)
g = gravity speed (9.81 m / s^2) m = drainage coefficient (1.34)
p = weir height (m)
r = radius of rounding top of the lighthouse

G. Flow Behind (*Back Water Curve*)

L = $\underline{2h}$....................................(26)

With:

L = the length of development influence in the direction of the bumpkin, calculated from the weir point. (m)

i = river slope

h = height of water level rise at the weir point, due to development (m)

H. The Olak Pool

In the Design Review of Cimanyangray Fixed Weirs in the Ciliman River in Lebak Regency, a Type Vlugter was chosen with modification. As for the type of vlugter, the following conditions are used:

a. If : $4/3 < Z / H < 10$
then $D = L = R = 1.1\ Z + H$ ......(27)
a. $= 0.15\ H \sqrt{H/Z}$ ....(28)

b. if : $1/3 < Z / H < 4/3$
then $D = L = R = 0.6\ H + 1.4\ Z$ ..(29)
$a = 0.20\ H \sqrt{H/Z}$.....(30)

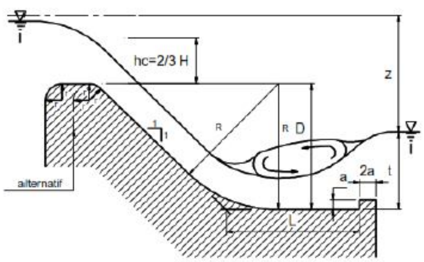

Figure 2: The Olak Pool based on Vlughter

I. Front Floor

1. Bligh's theory
   $\Delta h = l / C$ (31)
   With:
   Δh = Pressure difference
   L = Length of the creep line
   C = creep ratio
   So that construction is safe against this water pressure:
   $\Delta h \leq C\ u \geq \Delta h \times C$
   And with this provision the floor length can be determined.
2. Lane Teory
   $\Delta = (Lv+1/3\ Lh)/C$...........(32)
   The reuirements required by Lane is: $L=Lv+Lh \geq C\Delta h$.

2.6 Stability of Weir

A. The Forces act on the building

1. This gravity is the weight of the construction, directed vertically downward, whose line of work exceeds the weight of the construction. The force calculated is the area x the specific gravity of the construction (for stone pairs usually 1.80 are taken).
2. The earthquake force must be taken into account in construction. Calculated by the formula:
   $K = f\ G$. ....(33)
   with:
   K = earthquake force
   f = earthquake coefficient
   G = construction weight
3. Mud pressure, when the weir has exploited, the sediment buried in front of the weir, this silt is calculated as high as the lighthouse.

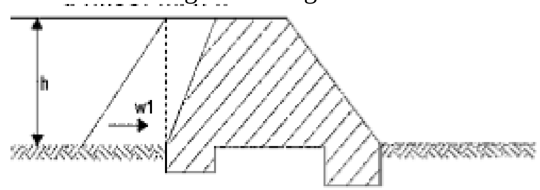

Figure 3: Mud Pressure Occurred

$W_1 = \frac{1}{2}\ \gamma s\ h^2 \left(\frac{1-\sin\alpha}{1+\sin\alpha}\right)$

untuk *silt* diambil $\alpha = 30^0$

$\frac{1-\sin\alpha}{1+\sin\alpha} = \frac{1-0,5}{1+0,5} = \frac{1}{3}$ *en*

Jadi $W_1 = \frac{1}{6}\ \gamma s\ h^2$.....................(34) *gle of*

the slit

4. The Hydrostatic Force

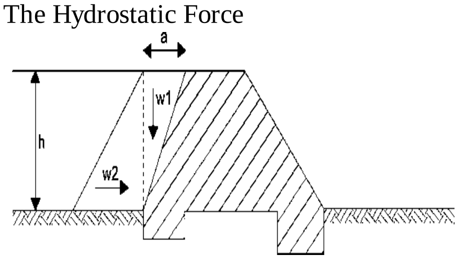

Figure 4: The Hydrostatic force of Not Sinking in Mercu

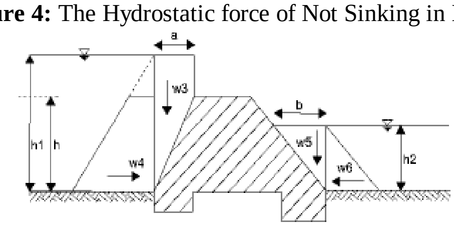

Figure 5: Hydrostatic forces on a non-submerged beast in a state of flood water

$W_1 = \frac{1}{2}\ \gamma\ a$..................(35)

$W_2 = \frac{1}{2}\ \gamma\ a\ h^2$................ (36)

$W_3 = \frac{1}{2}\ \gamma\ a\ (2h_1 - h)$ ....(37)

$W_4 = \frac{1}{2}\ \gamma\ h\ (2h_1 - h)$.......(38)

$W_5 = \frac{1}{2}\ \gamma\ b\ h_2$.....................(39)

$W_6 = \frac{1}{2}\ \gamma\ h_2^2$......................(40)

5. The Lighthouse sinking

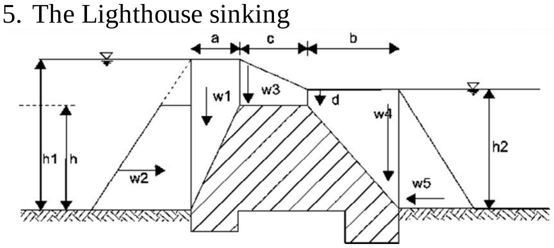

Figure 6: Hydrostatic Forces on a Sinking Floodwater

When normal water is the same as in the event the lighthouse does not sink. during a flood, the situation is as follows:

$W_1 = \frac{1}{2}\ \gamma\ a\ (2h_1 - h)$ .....(41)

$W_1 = \frac{1}{2}\ \gamma\ h\ (2h_1 - h)$ ......(42)

$W_3 = \frac{1}{2}\ \gamma\ c\ (h_1 - h + d)$ ......(43)

$W_4 = \frac{1}{2}\, \gamma\, b\, (h_2 + d)$ ......(44)

$W_5 = \frac{1}{2}\, \gamma\, h_2$ ....(45)

6. *Uplift-Pressure*

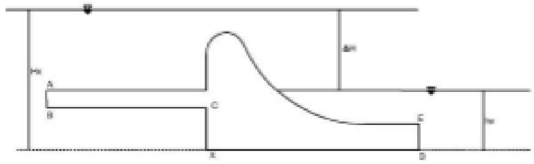

Figure 7: Uplift-Pressure Style on the Piece Over The Body of Weir

$$Ux = \Delta H - \frac{lx}{\sum L}\,\Delta H + hx$$

$$= \Delta H + hx - \frac{lx}{\sum L}\cdot\Delta H \;...(47)$$

With:

Ux = *uplift-pressure* point x

Hx = height of point x with water upfront

Lx = length of *creep line* to the point X (ABCX)

∑L = number of *creep line* lengths (ABCX)

ΔH = The pressure differences

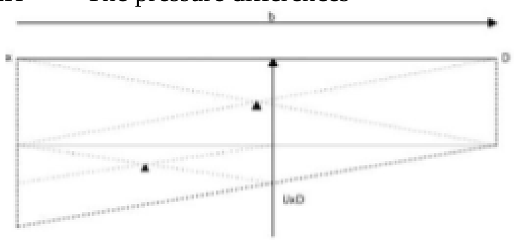

Figure 8: Uplift Style XD Field

Uplift force in the XD field is:

$U_{XD} = \frac{1}{2} b\ (U_x + U_d)$ ....(48)

And works at the trapezoidal center of gravity. For a good subgrade with good drainage, uplift can be considered to work 67%, so uplift pressure works between 67% and 100%.

7. Stability Requirements
   1. In construction with stone, no tensile stress can occur.
   2. Moment of resistance (Mt) must be greater than the moment of bolster (Mg). safety factor for this can be taken between 1.50 and 2.0.

      $$\mathbf{R} \geq \frac{Mt}{Mg} \;......\;......(49)$$

   With:

   R = Safety Factor

   3. The construction should not be shifted; the safety factor for this can be taken between 1.50 and 2.0.

      $$F = \frac{\sum Vf}{\sum H} \;.............(50)$$

   4. The resulting soil stress must not exceed the allowable stress ($\sigma_g \leq \sigma_g$)
   5. Every point on all thirst construction must not be lifted by an upward force. (Balanced between upward pressure and downward pressure.

3. RESEARCHMETHODOLOGY

3.1 Data Collecting

A. Primary Data

Primary data is data obtained directly from the object by researchers, at form of questions and answers or interviews with the people who has the most mastery of the work, namely the consultant planner PT. Budhi Chakra Consultan

B. Secondary Data

Secondary data is data taken indirectly by the researcher from the research object, in the form of written data about location maps, detailed images and other documents that support the research.

C. Observation

Observation is field observation data, in the form of *walkthrough*, tracking or detailed researching.

D. Literature / Reference Books

I.e. the data that was obtained by the author from the literature or reference books.

3.2 Flow Chart

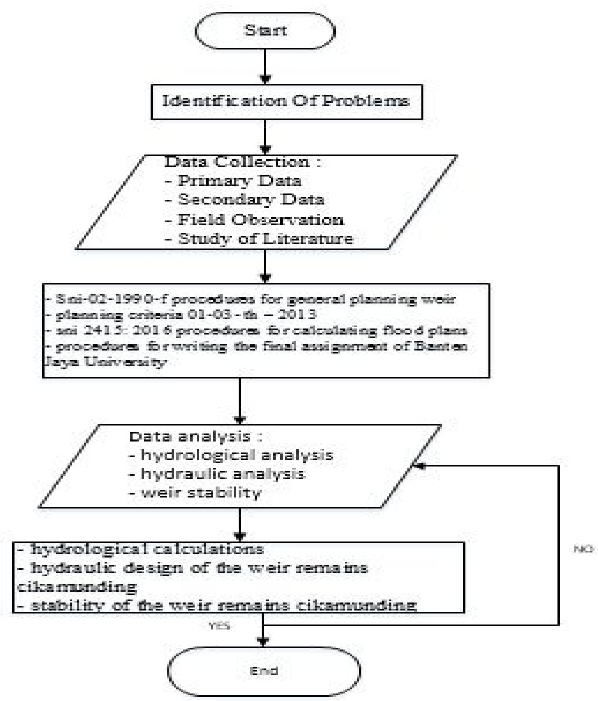

Figure 9: Flowchart of Final Project Writing Report

3.3 Research Schedule

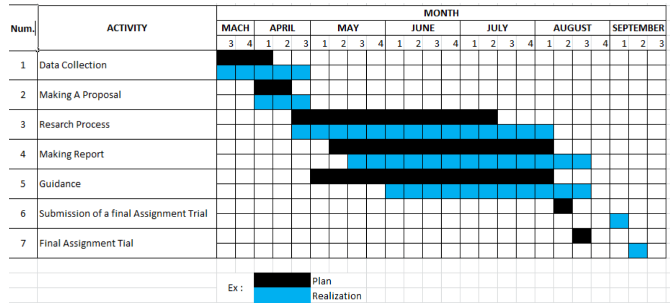

Figure 10: Report Research Schedule

4. RESULTS AND DISCUSSION

4.1 Rain Analysis

A. Calculation of the Gumbel Method Rainfall Plan

Table 1: Rainfall Recapitulation Plan for Cimanyangray Fixed Weirs Using the Gumbel Method

Tr (thn)	Y_{Tr}	R_{Tr} (mm)
2	0,37	97,12
5	1,50	127,33
10	2,25	147,33
25	3,20	172,60
50	3,90	191,35
100	4,0	209,96
200	5,30	228,51
1000	6,91	271,46
Source : Calculation		

B. Calculation of Rainfall Plan for the Normal Log Method

Table 2: Recapitulation of Rainfall Plan for Cimanyangray Permanent Weir Using the Normal Log Method

Tr (thn)	KTr	KTr . S log (Rmax)	Log (RTr)	RTr (mm/hr)
2	0,00	0,00	1,99	97,85
5	0,84	0,09	2,08	119,71
10	1,28	0,13	2,12	133,04
25	1,64	0,17	2,16	145,05
50	2,05	0,21	2,20	160,05
100	2,33	0,24	2,23	171,18
200	2,58	0,27	2,26	181,77
1000	3,09	0,32	2,31	205,442

C. Calculation of Rainfall Log Pearson Type III Method Plan

Table 3: Recapitulation of Rainfall Plan for Cimanyangray Permanent Weir with Log Person Type III Method

Tr (thn)	K_{Tr}	$\log R_{Tr}$	R_{Tr} (mm)
2	-0,059	1,9841	96,41
5	0,819	2,0798	120,16
10	1,314	2,1336	136,01
25	1,867	2,1938	156,24
50	2,239	2,2344	171,55
100	2,584	2,2719	187,04
200	2,909	2,3073	202,89
1000	3,607	2,3833	241,72

D. Rain Recapitulation Distribution

Table 4: Rainfall Recapitulation Plan for Cimanyangray Permanent Weir

Num	Period (Years)	Design Rain (mm)		
		Gumbel Method	Normal Log Method	Pearson Log Method Type III
1	2	97,12	97,85	96,41
2	5	127,33	119,71	120,16
3	10	147,33	133,04	136,01
4	25	172,60	145,05	156,24
5	50	191,35	160,05	171,55
6	100	209,96	171,18	187,04
7	200	228,51	181,77	202,89
8	1000	271,46	205,44	241,72
Source : Calculation				

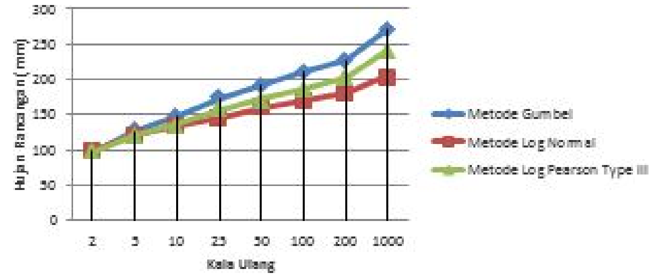

Figure 11: Graph of Distribution Curve Rainfall Plans for Fixed Flood Cimanyangray

E. Test Data Distribution of Rainfall Rain

Table 5: Rainfall Recapitulation Planned Weirs Remains Cimanyangray Test Data Distribution

Uji CHI Square			
CHI - Square Count	5,52	8,85	3,85
CHI - Square is Critical	5,99	5,99	5,99
Free Degree	2,00	2,00	2,00
The Degree of Significance	5,00	5,00	5,00
Hypothesis	**Be Accepted**	**Not Accepted**	**Be Accepted**
Source : Calculation			

By comparing the three methods and seeing which method produces the most CHHM (maximum daily rainfall), the **Gumbel Distribution Method was** chosen because it has the highest maximum rainfall.

4.2 Design Flood Discharge

Der Weduwen Method

$\alpha\beta q$ = 6,5 m^3/second

F = 58,4 km^2

Mn = 0,94

R100/240 = 0,875 mm

Q100=6,5x58,4x0,94x 0,875

= 312,166 m^3/second

So the Flood Discharge Plan (*Design Flood*) for a period of 100 years with the Der Weduwen method is **460,072 m^3/second ≅ 460 m^3 / second.**

2. Haspers Method

α = 0.526

Tx = 2.685 Hours

➔ 2 <Tx <19

(L = 10.24 km, i = 0.0185)

β = 0.81

Rt = 152,978 mm

q = 15,827 m^3 / second / Km^2

Q100 = 0.526 x 58.4 x 0.81 x 15,827 = 393,109 m^3/second

So *Design Flood* Discharge for the period 100 years with the Haspers method is **393,109 m^3/second.**

4.3 Calculation of Flood Water Levels before Fixed Weir

A. Calculation of Q River Discharge with Stickler

Table 6: Calculation Results for the Debit Curve Graph Before fixed Weir

NO	Elevasi (h)	A	O atau P	R	V	Q
	(m)	(m^2)	(m)	(m)	(m/dtk)	(m^3/dtk)
1	0,250	5,063	20,707	0,244	1,916	9,698
2	0,500	10,250	21,414	0,479	2,998	30,729
3	0,750	15,563	22,121	0,704	3,875	60,312
4	1,000	21,000	22,828	0,920	4,634	97,319
5	1,250	26,563	23,536	1,129	5,311	141,074
6	1,500	32,250	24,243	1,330	5,926	191,122
7	1,750	38,063	24,950	1,526	6,493	247,134
8	2,000	44,000	25,657	1,715	7,020	308,864
9	2,250	50,063	26,788	1,899	7,513	376,122
10	2,400	53,760	26,788	2,007	7,795	419,068
11	2,500	56,250	27,071	2,078	7,978	448,761
12	2,750	62,563	27,778	2,252	8,418	526,667
13	3,000	69,000	28,485	2,422	8,837	609,747

h =240 m

Wet passenger area of A= (B+ mh)h

A = (200+(1x2,40))x2,40

= 53,76 m2

Wet around O=B+2h√

O = 20,00+4,80x1,414

= 26,79m

The hydropolis radius R = A/O

R = 53,76 / 26,79

= 2,007 m

Speed according toStrickler $V = K,R^{2/3},I^{1/2}$

$V = 36 \times 2{,}007^{2/3} \times 0{,}0185^{1/2}$

= 7,7951 m/second

River discharge Q = V.A

Q = 7,7951 x 53,76

= **419,0677 m^3/second**

B. The calculation of Q river discharge with De *Chezy dan Bazin*

1. Set

   B = 1,6

   R = 2,007 m

   I = 0.0185

   A = 53,760 m^2

   $C = \frac{87}{1+\frac{1,6}{\sqrt{2,007}}}$

   = 40,8556

   $V = 40{,}8556 \times \sqrt{2{,}007 \times 0{,}018}$

   = 7,8276 m/dtk

   Q = 403,464 m^3/dtk

2. Set

   γB = 1,7

   R = 2,007 m

   I = 0.0185

   A = 53,760 m^2

   $C = \frac{87}{1+\frac{1,7}{\sqrt{2,007}}}$

   = 38,92

   $V = 38{,}92 \times \sqrt{2{,}007 \times 0{,}018}$

   = 7,6242 m/dtk

   Q = 409,877 m^3/dtk

3. Set

   γB = 1,75

   R = 2,007 m

   I = 0.0185

   A = 53,760 m^2

   $C = \frac{87}{1+\frac{1,75}{\sqrt{2,007}}}$

   = 38,92

   $V = 38{,}92 \times \sqrt{2{,}007 \times 0{,}018}$

   = 7,502 m/dtk

   Q = 403,405 m^3/dtk

4.4 The Calculation of weir

A. Determination of Mercury weir elevation

Table 7: The Calculation of Mercury Weir Elevation Calculation of Mercury Weir Elevation

Num	Information	Elevation
1	Highest Rice Field Elevation	598,0
2	High waterin the fields	0,1
3	Loss of pressure from tertiary to rice fields	0,1
4	Pressure loss from secondary to tertiary	0,1
5	Pressure loss from primary to secondary	0,1
6	Loss of pressure due to oblique lines	0,15
7	Pressure loss in measuring devices	0,4
8	Loss of pressure from the river to the primary	0,2
9	Pressure supply from the river to the primary	0,1
10	Supplies for building	0,25
	So the elevation of the weir dam	**599,5**

B. Mercury Weir Height

H = 2,4 m

P = 0,5H

= 0,5 x 2,4 = 1,2 m

Set P = 1,5 m < 4 m ➔OK

C. Calculation of Weir Width, Flushing Door, Pillar Width

1. Bensung width (Bn)

   Bn = b + 2 (m,h)

   = 22,4 ≅ **22 m**

2. The weir Width (b)

   B diambil 1/10 bn=1/1x 22 = 2,2 m

   Made 2 doors = 2,2/2 = 1,1 m

   Taken 1,2 m

   Assign 1 rinse door ➔∑b 1 x 1,2 = 1,2 m

3. Pilar Width (t)

   T pillar width taken 1,0 m

➔ t = 1,0 m

∑ = 1 x 1 = 1,0 m

4. Calculation of Effective Width of Beff Weir = 22 –1 – (0,2x1,2) = 20,76 m
   Effective width of fixed weir Cimanyangray ➔ 20,76 m
5. Calculation of elevation Front Air
   Max On top Mercu
   h = 4,09 m
   H/r = 3,80
   r = 0,902 dibulatkan 0,90 m
   m = 1,49 – 0,018 x 1,44
   m = 1,464
   k = 0,148 x 2,143 x 68,70 x 0,0319 k = 0,967 m
   H = h + k = 4,095 + 0,697 H = 4,792 m
   d = 2/3 H
   d = 3,195 m
   Q = 1,464 x 20,76 x 3,195 x 5,598
   Q = **543,653 m^3/dtk**
   543,653 m^3/dtk > 543,652 m^3/sec
   ➔ OK
   So the maximum elevation of the flood level above the lighthouse (after the weir) is ➔ 599,5 + 4,096 = + **603,596**
6. Flow behind (Back Water Curve)
   L = 6,39 / 0,0185 = 345,1 m
   For the Design Review of Cimanyangray Dam, the elevation of the embankment is **345 meters long**.
7. Determine the hydraulic form of the weir and the energy damper / processing chamber.

B	=	22,00	m
P	=	1,50	m
H	=	4,792	m
D	=	13,00	m
R	=	13,00	m
L	=	19,50	m
2a	=	1 ,20	m
a	=	0,60	m
r	=	2,30	m
Z	=	7,523	m
m	=	1	

8. Calculation of the height of the water surface at the peak (crest) of the Mercu

$$D = \frac{v_1^2}{2g} + d_1$$

D = 603,595 – 586,5 = 17,10

L = 20,76 (Beff)

$$D = \frac{393{,}108 * 20{,}76 * d_1^2}{19{,}5} + d_1 = \frac{18{,}275}{d_1^2} + d_1$$

$$17{,}10 = \frac{18{,}275}{d_1^2} + d_1 \rightarrow d_1 = 1{,}06 \text{ m}$$

maka:

$$17{,}10 = \frac{18{,}275}{1{,}06^2} + 1{,}06 = 17{,}33$$ ➔ OK

ditentukan d_1 = 1,06 m

Num	section	Lv	Lh	Δh = L : C
1	A-B	6		2000
2	B-C		1	0,333
3	C-D	2,44		0,813
4	D-E		7,35	2,450
5	E-F		15,21	5,070
6	F-G	5,4		1,800
7	G-H		3	1,000
8	H-I	3		1,000
9	I-J		3	1,000
10	J-K	5,5		1,833
11	K-L		0,82	0,273
12	L-M	0,85		0,283
13	M-N		0,8	0,267
14	N-O	1,5		0,500
15	O-P		6,61	2,203
16	P-Q	0,8		0,267
17	Q-R		1	0,333
18	R-S	0,8		0,267
19	S-T		4,5	1,500
20	T-U	0,8		0,267
21	U-V		1	0,333
22	V-W	0,8		0,267
23	W-X		3,8	1,267
24	X-Y	0,89		0,297
25	Y-Z		0,8	0,267
26	Z-A1	1,7		0,567
ΔLV		30,48		
ΔLH			48,89	
ΔLH				26,457

Source : Calculation

Control According to Bligh

∑ V = 30,48 m

∑ H = 48,89 m

L = LV + LH > H,C

= 30,48 + 48,89

> 13 x 3

= 79,37

79,37 > 39 □Eligible

Creep Ratio Price

L ≥ H,C = 79,37 ≥ 13,C

$$C = \frac{79{,}37}{13} \geq 3$$

= 3,598

3,598 ≥ 3 ➔ Eligble

According to Bligh Lane

L = LV + 1/3 LH ≥ H,C

= 30,48 + 16,297 ≥ 13 x 3

= 46,77

46,77 ≥ 39 ➔Eligible

Creep Ratio Price

L ≥ H,C = 46,77 ≥ 13,C

$$C = \frac{46{,}77}{13} \geq 3$$

= 3,598

3,598 ≥ 3 ➔ Eligble

9. Calculation of Thick Floor In Rear weir
   a. Floor Thickness at Point A

$t + p \leq t,\ 1{,}80$

$5{,}4 + 2{,}27 \leq 5{,}8 \times 1{,}8$

$7{,}67 \leq 9{,}72$ ➔ Eligble

b. Floor Thickness at Point B

$t + p \leq t,\ 1{,}80$

$4{,}0 + 2{,}5 \leq 4{,}0 \times 1{,}8$

$6{,}50 \leq 7{,}20$ ➔ Eligble

10. Calculation of Irrigation Area Retrieval Dimension
(A) =1164.5 ha
NFR = 1,69 l/dtk/ha
Primary Channel Efficiency (EP)=0,648

$$Q = \frac{NFR * a}{EP}$$

$$= \frac{1164{,}5 * 1{,}69}{0{,}648}$$

$= 3037$ 1/dt $= 3{,}037\ m^3$/dtk

Vpermission set = 0,7 m/sec

1 : m = 1 : 1,5 m = 1,5

n = b/h = =4 b = 4h

W (Waking/height of guard) = 0,75 m K Strickler Coefficient) = 42,5

$$F = \frac{Q}{V}$$
$$= \frac{3{,}037}{0{,}7}$$
$$F = 4{,}338\ m^2$$

Look for channel dimensions with the Strickler formula

$F = (b+mh)h$
$= (4h+1{,}5h)h$
$F = 5{,}5\ h^2$
$4{,}338 = 5{,}5\ h^2$
$h^2 = \frac{4{,}338}{5{,}5}$
$= 0{,}79$
$h = \sqrt{0{,}79}$
$= 0{,}89$ m
$b = 4h$
$b = 4 \times 0{,}89$
$= 3{,}552$

➔ dietermined b = 3,6 m

$F = (b + mh)\ h$

$= (3{,}6 + 1{,}5 \times 0{,}89)\ 0{,}89$

$= 5{,}538\ m^2$

Control ➔ V permit = 0,7 m/dtk

V = Q/F

$= \frac{3{,}037}{5{,}538} = 0{,}548$ m/sec

$= 0{,}548$ m/dtk $< 0{,}7$ m/sec

➔ Safe (OK)

Slope of channel

$P = b + 2h\ \sqrt{1 + m2}$
$= 3{,}6 + 1{,}4 \times 1{,}80$
$= 6{,}123$ m
$R = \frac{5{,}538}{6{,}123}, \quad = 0{,}904$
$R^{2/3} = 0{,}904^{2/3}$
$= 0{,}935$
$I = \frac{V}{K.R^{2/3}}$
$= \frac{0{,}548}{42{,}5 * 0{,}935}$
$= 0{,}0137$

Intake Door coefficient calculation setting (μ)=0,8
Energi Loss (Z)=0,3 m

$Q = \mu, b, a, \sqrt{2, q, z}$
$3{,}037 = 0{,}8 \times 3{,}6 xa \times 2{,}426$
$3{,}037 = 6{,}987\ a$
$a = \frac{3{,}037}{6{,}987} = 0{,}435$ m

$= 599{,}4 - 0{,}3 - 0{,}435$

$= +\ 598{,}655$

11. Calculation of Drain Width Planned 2 Left and Right Doors
Width of each door = 1,2 m

= 1 x 1,2 = 1,2 m

Drain Door Opened as High as an Onderspuier Plate
Weir Height (P) = 1,5 m
$\mu = 0{,}62$
$y = 1{,}5$
$h = P - ½\ y = 0{,}75$
$F = b \times y = 1{,}2 \times 1{,}5 = 1{,}8\ m^2$

$Q = \mu F \sqrt{2gh}$
$= 0{,}62 \times 1{,}8\ \sqrt{2 \times 9{,}81 \times 0{,}75}$
$Q = 4{,}280\ m^3$/dtk
$V = Q/F$
$= \frac{4{,}280}{1{,}8} = 2{,}378$ m/dtk

Speed Control
$Vc = 1{,}5 \times C\sqrt{d}$
$C = 3{,}5$
$D = 0{,}1$
$Vc = 5\ 5\ \sqrt{0}$
$= 1{,}6602$
$= 1{,}6602$
$1{,}6602 \leq 2{,}378$ ➔ Safe (OK)

The Door Is Fully Opened

$z = \frac{1}{3}p$

$= \frac{1}{3} \times 1{,}5 = 0{,}5$

$h = \frac{2}{3} \times 1{,}5 = 1$

$\mu = 0{,}75$

$Q = \mu bh\sqrt{2gh}$

$= 0{,}75 \times 1{,}2 \times 1 \times 3{,}132$

$= 2{,}818\ m^3/dtk$

$F = 1 \times 1{,}2$

$= 1{,}2\ m^2$

$V = Q/F$

$= \frac{2{,}818}{1{,}2}$

$= 2{,}349\ m/dtk$

Speed control

$Vc = 1{,}5 \times C\sqrt{d}$

$C = 3{,}5$

$d = 0{,}1$

$Vc = 1{,}5 \times 3{,}5\ \sqrt{0{,}1}$

$= 1{,}6602$

$= 1,6602 \leq 2,349$ ➔ Safe (OK)

4.5 Calculation of Stability

Planning data:

Weir is made of stone fitting Bj stone pairs = 1,8 ton/m3

Q of Floods 100 thn = 393,108 m3/sec

Cohesion (C) = 0,36 kg/cm2

Bj Sold grain (Gs) = 1,79 ton/m3 Moisture content(W) = 39,92 %

Pore content (l) = 0,83

Permit ground voltage $\bar{\ }$= 50 ton/ m2

Deep Sliding angle (Ө) = 29 0

Permit ground voltage

Weight of soil content

$\gamma t = \frac{Gs.\gamma w\ (1+w)}{1+l}$

$= \frac{1{,}79*1*(1+39{,}92\%)}{1+083}$

$= 1{,}35\ ton/m^3$

$\gamma_{sat} = \frac{\gamma w\ (Gs+1)}{1+l}$

$= \frac{1*(1+1{,}79)}{1+083}$

$= 1{,}53\ ton/m^3$

Determination of the Soil Pressure Coefficient

Coefficient Active Soil Pressure

$Ka = Tg^2\ (45^0 - \frac{\theta}{2})$

$= Tg^2\ (45^0 - \frac{17{,}18}{2})$

$Ka = 0{,}850$

Passive Soil Pressure Coefficient

$Kp = Tg^2\ (45^0 + \frac{\theta}{2})$

$= Tg^2\ (45^0 + \frac{17{,}18}{2})$

$Kp = 1{,}149$

Horizontal Force Sediment Sediment Sludge (*Silt*)

$Ps = ½\ \gamma sub\ .H^2.Ks$ ➔ $Ks = \frac{(1-Sin\ 30)}{(1+Sin\ 30)}$

$= ½ \times 0{,}78 \times (1{,}5)^2 \times \frac{(1-0{,}50)}{(1+0{,}50)}$

$= 0{,}29$ ton

Water Pressure

Hydrostatic Water Pressure

$Pw = ½\ \gamma w\ H^2$

$= ½ \times 1 \times (1{,}5)^2$

$= 1{,}125$ ton

Earthquake Coefficient of Earthquake Area 3

Earthquake zone coefficient z = 1.56

Coefficient of soil type = rock, n = 2.76 m = 0.71

Return period = T = 100 years Basic earthquake acceleration / basic shock acceleration a_c = 160 gal (1 gal. = 1m / s^2) Plan earthquake acceleration $a_d = n\ (a_c.Z)^m$

$= 2.76\ (160 \times 1.56)^{0.71} = 138.98$ gal.

Earthquake coefficient

$E = \frac{\alpha d}{g} = \frac{138.98}{980} = 0.1418 \cong 0.15$

So the earthquake coefficient E = 0.15

A. Stability During Normal Water Without Earthquake

Normal Surface Water Pressure

Active Soil Pressure

$Pa = ½\ \gamma sat\ H^2 Ka$

$= ½ \times 1{,}53 \times (3{,}60)^2 \times 0{,}850$

$= 8{,}40$ ton

Uplift Style

From Table 4.15 Lane and Bligh obtained:

$\sum = 78{,}37\ m\ L_N = 25{,}0\ m\ L_F = 47{,}37\ m$

Δh = El Crest – El d/s

= 599,50 – 586,50

=13,00 m

H_N = 599,50 – 594,40

= 5,10 m

$U_N = H_N - \frac{LN}{\sum l} \times \Delta h$

$= 5{,}10 - 0{,}318 \times 13$

$= 0{,}95$ ton

H_F = 599,50 – 585,00

= 14,50 m

$U_F = H_F - \frac{LF}{\sum l} \times \Delta h$

$= 14{,}50 - 0{,}604 \times 13$

$= 6{,}64$ ton

Looking for *Uplift* Style Arm

X =

$$\frac{(0{,}5 \times 5{,}69 \times 12{,}95 \times 8{,}63)+(0{,}95 \times 12{,}95 \times 6{,}475)}{(0{,}95 \times 12{,}95)+(0{,}5 \times 5{,}69 \times 12{,}95)}$$

$= \frac{397{,}945}{49{,}179}$

$= 8{,}09$ m

$P_U = \frac{UN + UF}{2} \times L$

$= \frac{7{,}60}{2} \times 12{,}95$

$= 49{,}179$ ton

Uplift style taken 67% (Soenarno, Permanent Weir, 1972, Sub Directorate of Technical Planning, Directorate of Irrigation, Directorate General of Water, Department of:

$P_{U\,Eff}$ = 67% x 49.179
= 32,95 Ton

Momen due to *Uplift* (M_U) to point of F

M_U = 32.95 x (12,95-80.09)
= 160,08 tm

Stability :

$\sum MT$ = 1013,11 tm
$\sum M$ = M_U $\sum M$ (T be 4 8)
= 160,08 + 146,51
= 306,59 tm
Ms = $\sum MT - \sum M$
= 1013,11 – 306,59
= 706,51 tm
$\sum V$ = gaya – $P_{U\,Eff}$
= 164,86 – 32,95
= 131,91 ton
$\sum H$ = 9,82 ton

1. Stability Against Bolster

$S_F = \frac{\sum MT}{\sum MG}$
$= \frac{1013{,}11}{306{,}59}$
$= 3{,}304 > 1{,}5$ ➔ Safe (OK)

2. Stability Against Shear

$S_F = \frac{F * \sum V}{\sum H}$
$F = tg\ \Theta = tg\ 29^0 = 0{,}554$
$S_F = \frac{0{,}554 * 73{,}077}{9{,}82}$

= 7,441 > 1,5 ➔ Safe (OK)

3. Tension / Eccentricity Control

$e = \left(\frac{\sum Ms}{\sum V} - \frac{L}{2}\right) < \frac{L}{6}$
$= \left|\left(\frac{706{,}51}{131{,}91} - \frac{12{,}95}{2}\right)\right| < \frac{12{,}95}{6}$
$= |5{,}356 - 6{,}475| < 2{,}158$
$= 1{,}118$ m

= 1,118 m < 2,158 m ➔ Safe (OK)

4. Ground Voltage Control

Clay C = 0,58 t/m^2
Weight of soil contents γ = 1,54 t/m^3
$\Phi = 29^0 \cong 30^0$ ➔ factor is the power capacity of land according to Terzaghi N_C = 37,20
N_q = 22,50
$N\gamma$ = 19,70
B = 12,95 m
D = 13 m
D/B = 0,99
0,99 < 1 ➔ OK (shallow type continuous foundation)

Carrying capacity of Terzaghi

Q_{ult} = C N_C + γ D N_q + 0,5 B γ $N\gamma$ ➔ Q_{OP} = γD
= 0,5 (37,2) + (1,54 x 13) (22,5) + 0,50 (12,95 x19,7x1,54)
= 18,6 + 450,45 + 196,438
= 665,48 t/m^2 ➔ FK = 3

$Q_{all} = \frac{665{,}48}{3}$
= 221,829 t/m^2

221,829 t/m^2 > 50 t/m^2 ➔Save

If span weir = 22 m
Then the foundation = 25 m
The maximum load that can be held by weir foundation is:
Q_{all} x A = 221,829 x 13.95 x 25
= 71817,306 ton
Normal water stability with sediment without earthquake è Aman (OK)

B. Stability During Normal Water With Earthquake

1. Stability Against Bolster

$S_F = \frac{\sum MT}{\sum MG}$
$= \frac{1013{,}11}{520{,}247}$
$= 1{,}946 > 1{,}1$

➔ Safe

2. Stability Against Shear

$S_F = \frac{F * \sum V}{\sum H}$
$F = tg\ \Theta = tg\ 29^0$
$S_F = \frac{0{,}554 * 57{,}68}{34{,}718}$ ➔ Safe

3. Tension/Eccentricity Control

$e = \left(\frac{\sum Ms}{\sum V} - \frac{L}{2}\right) < \frac{L}{6}$
$= \left|\left(\frac{492{,}759}{57{,}68} - \frac{12{,}95}{2}\right)\right| < \frac{12{,}95}{6}$
$= |8{,}543 - 6{,}27| < 2{,}15$

= 2, 06 m < 2,15 m ➔ Save

4. Ground Voltage Control

$\sigma_{tanah} = \frac{57{,}68}{12{,}95 \times 1}\left(1 \pm \frac{6 \times 2{,}06}{12{,}95}\right)$
$= 4{,}453\ (1 \pm 0{,}954)$
$\sigma 1 = 4{,}453 \times (1+0{,}954)$
$= 8.705$ t/m^2 < ($\overline{\sigma}$) 50 t/m^2

➔ Safe (OK)

$\sigma 2 = 4{,}453\ (1- 0{,}954)$
= 0,202 t/m^2 < $\overline{\sigma}$ 50 t/m^2

➔ Safe(OK)

Stability when the water floods with an earthquake

➔Safe (OK)

5. Stability During Normal Water With Earthquake

The active soil of pressure

Pa = 1/2 γsat H^2Ka

= ½ x 1,53 x $(3,60)^2$ x 0,85

= 8,40 ton

***Uplift* Force**

From table 7 lane and bligh are obtained:

∑l	=	78,37 m
L_N	=	25,0 m
L_F	=	47,37 m
H_N	=	El Crest – El d/s
	=	603,596 – 594,50
	=	9,096 m
Δh	=	603,596 – 593,023
	=	10,573 m
U_N	=	$H_N - \frac{LN}{\sum l}$ x **Δ**h
	=	9,096 – 0,318 x 10,57
	=	5,72 ton
H_F	=	603,596 – 582,20
	=	22,396 m
ΔF	=	603,595 – 585,50
	=	18,096 m
U_F	=	$H_F - \frac{LF}{\sum l}$ x **Δ**F
	=	22,39 – 0,604 x 18,09
	=	1,458 ton

Looking for *Uplift* Style Arm

$$x = \frac{(0{,}5 \times 5{,}73 \times 12{,}95 \times 8{,}663)+(5{,}72 \times 12{,}95 \times 6{,}475}{(5{,}72 \times 12{,}95)+(0{,}5 \times 5{,}73 \times 12{,}95)}$$

$$= \frac{800{,}48}{111{,}248}$$

$$= 7{,}20 \text{ m}$$

$$P_U = \frac{UN + UF}{2} \times L$$

$$= \frac{17{,}18}{2} \times 12{,}95$$

$$= 111{,}25 \text{ ton}$$

Uplift force is taken at 67% (Soenarno, Permanent Weir, 1972, Sub Directorate of Technical Planning, Directorate of Irrigation, Directorate General of Water Resources, (Public Works Department)

Then:

$P_{U\,Eff}$ = 67% x 111,25

= 74, 536 Ton

Moment due to uplift (M_U) to point F

M_u = 74,536 x (12,95 – 7,20)

= 428,927 tm

Stabilitas :

∑MT ∑MT ∑M =1994,13 + 11,06

= 2005,19 tm

∑M ∑M M_U =178,85 + 428,927

= 607,78 tm

Ms = ∑MT - ∑M

= 2005,19 – 607,78

= 1397,41 tm

∑V = Gaya – $P_{U\ EFF}$

= 303,94 - 74.536

= 228,87 ton

∑H =| Gaya – Gaya|

= |12,58 – 4,78|

= |7,79| ton

a. Stability Against Bolster

$$S_F = \frac{\sum MT}{\sum MG}$$

$$= \frac{2005{,}19}{607{,}78}$$

$$= 6{,}58 > 1{,}5$$ ➔ Safe (OK)

b. Shear Stability

$$S_F = \frac{F * \sum V}{\sum H}$$

$$F = \text{tg}\ \Theta = \text{tg}\ 29^0 \cong \text{tg}\ 30^0$$

$$S_F = \frac{0{,}554 * 228{,}87}{7{,}79}$$

= 16,27 > 1,5 ➔ Safe (OK)

c. Tensile / Eccentricity Control

$$e = \left(\frac{\sum Ms}{\sum V} - \frac{L}{2}\right) < \frac{L}{6}$$

$$= \left|\left(\frac{139{,}41}{228{,}87} - \frac{12{,}95}{2}\right)\right| < \frac{12{,}95}{6}$$

$$= |6{,}105 - 6{,}475| < 2{,}158$$

= 0,369 < 2, 18 ➔ Safe (OK)

d. Ground Tension Control

$$\sigma tanah = \frac{228{,}87}{12{,}95 \times 1}\left(1 \pm \frac{6 \times 0{,}82}{12{,}95}\right)$$

$$= 17{,}673\ (1 \pm 0{,}379)$$

σ1 = 17,673 x (1+ 0,379))

= 27.378 t/m^2 < ($\bar{\sigma}$) 50 t/m^2

➔ Safe (OK)

σ2 = 17,673 (1- 0.379)

= 10,958 t/m^2 < ($\bar{\sigma}$) 50 t/m^2

➔ Safe (OK)

Stability when the water floods with sediment without earthquake ➔ Safe (OK)

e. Stability when the water floods with an earthquake

∑MT ∑MT ∑M =1994,13 + 11,06

= 2005,19 tm

∑M = ∑M ∑M M_U

= 195,215 + 299,12 + 428,927

= 923,26 tm

Ms = ∑MT - ∑M

=2005,19 – 923,26

= 1081,93 tm

$\sum V$ = Gaya – $P_{U\ EFF}$
= 303,40 - 74.536 = 228,87 ton
$\sum H$ = |Gaya – Gaya|
=|13,52 – 4,78| = |8,73| ton

f. Stability Against Bolster

$$S_F = \frac{\sum MT}{\sum MG} = \frac{2005{,}19}{923{,}26} = 2{,}171 > 1{,}5$$

= 2,171 > 1,5 ➔ Safe (OK)

g. Stability Against Shear

$$S_F = \frac{F * \sum V}{\sum H}$$

$$F = tg\ \Theta = tg\ 29^0 \simeq tg\ 30^0$$

$$S_F = \frac{0{,}554 * 228{,}87}{8}$$

= 8,548 > 1,5 ➔ Safe (OK)

h. Tension / Eccentricity Control

$$e = \left(\frac{\sum Ms}{\sum V} - \frac{L}{2}\right) < \frac{L}{6}$$

$$= \left|\left(\frac{1081{,}93}{228{,}87} - \frac{12{,}95}{2}\right)\right| < \frac{12{,}95}{6}$$

$$= |4{,}727 - 6{,}475| < 2{,}158$$

= 1,74 < 2,158 ➔ Safe (OK)

i. Ground Voltage Control

$$\sigma_{tanah} = \frac{228{,}87}{12{,}95 \times 1}\left(1 \pm \frac{6 \times (2{,}40)}{12{,}95}\right)$$

$$= 17{,}763\ (1 \pm 1{,}111)$$

$$\sigma 1 = 17{,}763 \times (1 + 1{,}111)$$

$$= 37{,}324\ t/m^2 < (\overline{\sigma})\ 50\ t/m^2$$

➔ Safe (OK)

σ 2= 17,763 (1- 1,111))
= 1,97 t/m^2 < $^-\sigma$ 50 t/m^2

➔ Safe (OK)

Stability when the water floods with an earthquake

➔ Safe (OK)

4.6 Comparison of Calculation Results

Table 8: Compares the original planning and the results of the review of the cimanyangray permanent weir in the Ciliman River, Lebak Regency

	Original planning (existing)	online evaluation results	difference
1	Plan flood discharge (Q100) 227.41 m2 / sec (nakayasu method)	Plan flood discharge (Q100) 393,109 m2 / second (hasper method)	165.69 m2 / sec
2	length of cikamunding weir = 31 m	length of cikamunding weir = 51.65 m	20.65 m
3	the length of the olak pool (stilling basing) = none	the length of the olak pool (stilling basing) = 19.5 m	19.5 m
4	height of lighthouse (P) = 1.6 m	height of lighthouse (P) = 1.5 m	0.1 m
5	upstream = 12 m	upstream = 18 m	6 m
6	Weirs are safe against :	Weirs are safe against :	
	a. bolster	a. bolster	
	b. slide	b. slide	
	c. eccentricity	c. eccentricity	
	d. soil carrying capacity	d. soil carrying capacity	
	e. soil pressure under the foundation during normal water conditions and flooding	e. soil pressure under the foundation during normal water conditions and flooding	
7		to overcome the scour under the floor at the end of the olak space can be added boulder> 20 cm along 6 m in accordance with the excavation of luggage which also aims to overcome the weakening due to excavation of luggage and change the transition turbulence to the laminer or quiet flow	
8		The addition of a tracking iron / sieve to the rinse door and retrieval door to hold debris (pieces of wood, rubbish, etc.) from entering the door	
9		To reduce the uplift force, the uplift hold is installed on the floor of the olak room by using an O4 inch PVC pipe with the distance adjusted to the area of the olak room.	

5. CONCLUSION

From the results of the discussion and calculation can be concluded as follows:

a. 100 year return period (Q100) debit generated 393,109 m^3/s debit based on rainfall in the last 12 years.
b. The dimensions of the Cikamunding permanent weir are safe with the results of re-evaluation of the water debit with

normal water conditions or flooding with a 100-year return period (Q100) at this time

c. The stability of the weir remains safe to withstand the return of water flow 100 years return period, because the weir is safe against the rolling force, shear force, eccentricity and carrying capacity of the soil.
d. Dam damage may be caused by flood discharge that is greater than the initial design, besides the age factor of the building, the quality of materials used during construction and the lack of maintenance after the dam work is completed.
e. Repair fixed weir that must be done is by way of redesigning and repairing hydraulic weir dimensions Cikamunding. Keep it can still be used optimally and sustainably or function sustainably.
f. In the calculation of the forces that work on the body of the dam should be done carefully, because the influence of these forces is very great in controlling the stability of the dam.
g. Work executor must pay attention to technical specifications such as the dimensions of the building and construction materials on the work of the weir, so that the weir does not damage quickly and the building of the weir is strong until the specified age of the building.

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