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Feasibility Evaluation Of Passenger Piers At Jangari Pier, Cirata Reservation, West Java Province.

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Abstract

Jangari Pier is the most active activity point in the Cirata Reservoir, West Java Province, located in Cianjur Regency. The water activities in the Cirata Reservoir consist of the tourism, fisheries, and water transportation activities carried out under the supervision of the Transportation Agency in the Cirata Reservoir Environment on the basis of a cooperation agreement between the reservoir manager, namely PT PJB UP Cirata and UPTD PPP LLASDP West Java Province which placing the Cirata LLASD Service Unit, with an operating license agreement in the form of supervision of water transportation activities in the Cirata Reservoir. Water transportation is one of the most important and strategic aspects in facilitating the wheels of development, and strengthening unity and integrity, in the water transportation sector which requires comfortable and proper passenger transportation facilities in accordance with guidelines and standards. Guidelines regarding standard facilities and dock dimensions that are suitable for ships operating in passenger boarding activities at Jangari Pier based on dock analysis in the dock planning book by Bambang Triatmodjo in 2010 and Director General of Land Transportation Regulation number: KP.4756/AP005/DRJD/2020 regarding the Technical Guidelines for the Sungai Danau Stop by evaluating passenger boarding and descending activities to determine the type of pier that is in accordance with the characteristics of the Cirata reservoir so that passenger boarding and descending activities are safe, and comfortable in accordance with the calculations carried out with the aim that passenger boarding activities take place optimally.

Keywords: Feasibility; Passenger Pier; Jangari Pier; Cirata Reservoir.

1. Introduction

Cirata Reservoir is one of the largest reservoirs in West Java Province, the entire area of the Cirata Reservoir is located in 3 parts of the region in West Java Province, namely, Purwakarta Regency, Cianjur Regency, and West Bandung Regency, for the most active point of water transportation activities centered on Jangari Pier, Cianjur Regency. Water transportation activities in the Cirata Reservoir are held under the supervision of BPTD Region IX West Java Province and the Cirata LLASD Service Unit belonging to the UPTD PPP LLASDP West Java Province.

Cirata Reservoir has an area of 7,111 hectares and a water area of 6,200 hectares, the volume of water in the Cirata Reservoir at normal times is around 2,165 million cubic meters. The Cirata Reservoir area is owned by PT. PJB (Java Bali Power Plant) which was delegated by the branch office, namely PT. PJB UP Cirata or BPWC (Cirata Reservoir Management Agency), the

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main function of the construction of the Cirata Reservoir is as a PLTA (Hydroelectric Power Plant) which acts as a supplier of electricity supplied to the islands of Java and Bali. developing fish cultivation in floating net cages, marine tourism activities that take advantage of the beautiful scenery around the Cirata Reservoir, and becoming a fishing location on the outskirts of the reservoir.

The condition of the passenger pier which is divided into 2 positions of the pontoon dock with inadequate mooring facilities and the pontoon dock mooring system when adjusting the water level, will be pulled or pushed and tethered using ropes on bamboo stuck in the ground. Unavailable wharf facilities such as mooring equipment, so that ships are moored with ropes tied to support poles on pontoon docks, unaccounted for strength and lack of awareness of operators who use support poles as mooring places cause the mast to fall off and damage, the pier fender is only found on one of two pontoon docks, which are tires cut lengthwise attached to the front side of the pier.

The condition of the water level in the Cirata Reservoir by the entrance and exit of the reservoir water managed by BPWC in accordance with the needs of water supply, this makes the effect on the reservoir water level unlike tides in the sea or rivers which are influenced by celestial bodies, the highest reservoir water elevation reaches 223 meters and the lowest reservoir water elevation is at 205 meters with a normal elevation at 220 meters.

2. Research Method

The data collection in this study was obtained from primary data and secondary data. According to Hasan (2002: 82), primary data is data obtained or collected directly in the field by the person conducting the research or the person concerned who needs it. While secondary data according to Hasan (2002: 58) is data obtained or collected by people conducting research from existing sources. This data is used to support primary information that has been obtained from library materials, literature, previous research, books, and so on. The primary data used are:

a. Observation Method
   Observation is a systematic observation which is then recorded. In this method the authors carry out data collection activities by:
   1. Pier Characteristic Survey
   2. Ship Characteristics Survey
   3. Ship docking speed survey
   4. Ship Arrival and Departure Survey
   5. Passenger Up and Down Survey
   6. Port Pond Depth Survey

b. Library Method
   The library method is a method of collecting data using the existing literature in the Palembang River Lake and Crossing Transportation Polytechnic Library or other books related to research.
   The literature that becomes a reference include:
   1. Port Planning Module
   2. Port Planning Book.

c. Institutional Method
   Institutional method is a method of collecting data by making visits to agencies or offices to obtain secondary data related to research. These agencies include the following:

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1. BPTD West Java Province
2. West Java Provincial Transportation Service
3. UPTD LLASDP West Java Province
4. Central Bureau of Statistics of West Java Province
5. Cirata Reservoir Management Agency (BPWC)

3. Results and Discussion

a. This Water Condition Analysis

1) Water Level Difference

To determine the type of jetty, it is necessary to know the data on the highest water level and the lowest water level, based on data from the Cirata Reservoir STA for the last 2 years. After it is known that the highest water level is 219.69 meters on June 3, 2020 and the lowest water level is 206.08 meters on November 13, 2020, it can be calculated the difference in water level with the formula:

Ride Mount = HHWL – LLWL
Horseback Ride = 219.69 meters – 206.08 meters
Horseback Riding = 13.61 meters

Information :
HHWL = Highest Water Level
HLWL = Lowest Water Level

2) Harbor Pool Depth

To determine the safety of the high draft of the ship when carrying out maneuvers, it is important to know the depth of the harbor pool

The water depth data at Jangari Pier was taken through an observation survey of the depth of the harbor pool, the length of the depth survey from the shore at the time of the survey and each spot is 1.5 – 10 meters apart which is divided into 7 measurement points.

a) The depth of the harbor pool at HHWL . conditions

In determining the depth of the harbor pool at the time of the highest water level, it can be calculated by the formula:

The depth of the harbor pool at the time of HHWL
= (HHWL – survey water level) + depth

Where :	HHWL	= 219.69 m
	Survey water level	= 215,51 m
	Depth at point S0	= 1,5 m

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Then the depth of the harbor pool at HHWL
= (219.69 m – 215.51 m) + 2.50 m
= 5.58 m

b) The depth of the harbor pool at LLWL . conditions

In determining the depth of the harbor pool at The lowest water level can be calculated by formula :

The depth of the harbor pool at the time of LLWL
= (LLWL – survey water level) + depth
Where: LLWL = 206.08 m
Survey water level = 215,51 m
Depth at point S_0 = 2,5 m
Then the depth of the harbor pool at the time of LLWL
= 206.08 m – (215.51 m – 1.5 m)
= 2.07 m

To find out the depth of the port pool is affected by *draft*maximum ship and safe distance. In the Port Planning book, for a safe distance the depth of the port pool used is 1 meter from the draft of the ship, then the depth of the port pool can be determined using the formula:

The depth of the harbor pool (h) = (0.8 to 1 m) + draft max
The depth of the harbor pool (h) = 1 + 0.70 meters
The depth of the harbor pool (h) = 1.70 meters

Information :
H = harbor pool depth (m)
d max = maximum ship draft (m)

b. Analysis of Mooring Conditions

1) pontoon length

a) Long back type

L= 2a + (n.LOA) + (n-1) b
10.25= 2 x 0.5 + (n.10.69) + (n-1) 0.5
10.25= 1 + 10.69n + 0.5n – 0.5
$\frac{10,25 + 0,5}{1}$ **= 10.69n + 0.5n**
10.75 = 11.19n
$= n\frac{10,75}{11,19}$
$0,96 = n$
$n = \approx 1$ **kapal**

Information :
L = Pier Length (m)
a = safe distance from the end of the ship to the end of the pier (0.5 m)
N = number of ships moored
LOA = length of the largest ship (m)
B = safe distance between ships (0.5 m)

b) Upright Backrest Type

L= 2a + (nB) + (n-1) b
10.25 = 2 x 0.5 + (n.2.10) + (n-1) 0.5
10.25 = 1 + 2.10n + 0.5n – 0.5

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$\frac{10,25+0,5}{1}$ **= 2.10n + 0.5n**
10.75 = 2.15n
= n $\frac{10,75}{2,15}$
$\mathbf{5 = n}$
$\mathbf{n = 5\ kapal}$
Information :
L = Length Pier(m)
a = Safe distance from the end of the pier to the ship (0,5 m)
B = Max Ship Width. (m)
b = safe distance between ships (0,5 m)

2) Pontoon Width
The width of the pier is adjusted to the activities of up and down passengers, so that these activities run smoothly and the width of the pier can be used for mooring ships.
a) Elongated Back Type
L= 2a + (n.LOA) + (n-1) b
5.10 = 2 x 0.5 + (n.10.69) + (n-1) 0.5
5.10= 1 + 10.69n + 0.5n – 0.5
$\frac{5,10+0,5}{1}$ **= 10.69n + 0.5n**
5.15 = 11.19n
= n $\frac{5,15}{11,19}$
$\mathbf{0,46 = n}$
$\mathbf{n =}$ **tidak bisa sandar memanjang pada sisi lebar dermaga**
Information :
L = Pier Length
A = safe distance from the end of the ship to the end of the pier (0.5 m)
N = number of ships moored
LOA = Average ship length (m)
B = safe distance between ships (0.5 m)
b) Upright Backrest Type
L= 2a + (nB) + (n-1) b
5.10 = 2 x 0.5 + (n.2.10) + (n-1) 0.5
5.10= 1 + 2.10n + 0.5n – 0.5
$\frac{5,10+0,5}{1}$ **= 2.10n + 0.5n**
5.15 = 2.15n
= n $\frac{5,15}{2,15}$
$\mathbf{2,39 = n}$
$\mathbf{n = 2\ kapal}$
Information :
B = Wharf Width
A = Safe distance from the end of the pier to the ship (0,5 m)
B = Max Ship Width. (m)
b = safe distance between ships (0,5 m)
Therefore, the analysis of the condition of the mooring of ships at the current pier

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can be used to moor to a maximum with 5 ships on the front side of the pier and 2 ships on the side, with a total of 7 mooring ships.

c. Plan Pier Analysis

1. Selection of Pier Type Based on Riding Tides

   It is necessary to know the data of the highest and lowest tides, so that the tidal level (TP) can be analyzed using the formula:

   $$\mathbf{TP = HHWL - LLWL}$$

   Horseback Ride = 219.69 meters – 206.08 meters

   Horseback Riding = 13.61 meters

   Information :

   TP = ride pairs

   HHWL = highest water level

   LLWL = lowest water level

   However, if the results of the tidal calculation are:

   TP < 0.75 m = fixed pier type

   TP > 0.75 m = type of pier is not fixed (tiered, pontoon)

   Tide ride 13.61 m > 0.75 m

   So, the type of pier used according to the riding tideusing a non-fixed dock or a pontoon dock

2. Pier Dimension

   To find out the dimensions of the pier, it is necessary to know the number of ships that will dock at the planned pier, based on the number of ships mooring together, a survey is carried out.

Table 1.
of Mooring Vessel Survey Results

No.	Date and time	Ship Type	Departure (units)	Arrival (units)	Number of ships (units)	Number of ships moored together (units)
1	08.00-09.00	Getek	9	7	16	10
2	09.00-10.00	Getek	10	7	17	9
3	10.00-11.00	Getek	10	7	17	9
4	11.00-12.00	Getek	9	6	15	10
5	12.00-13.00	Getek	2	2	4	2
6	13.00-14.00	Getek	6	6	12	8
7	14.00-15.00	Getek	5	9	14	6
8	15.00-16.00	Getek	4	11	15	7
Amount			55	54	109	61
Total			109			

Judging from the table above, the number of boats mooring together is 10 ships which are divided into 2 pontoon dock locations, the number of n is 5 ships for one pontoon dock, but by calculating the condition of the mooring boats, the

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current pontoon dock can still be used optimally.
Pier Length : 10,25 meters
Wharf Width : 5,10 meters
Number of Mooring Boats : 7 Ships
Mooring Type : Perpendicular

3. Wharf Support Facilities
   a) Bolder / Mooring Tool
      Aiming for safe and comfortable passenger up and down activities, it is necessary to have a boat mooring tool available at the pier, namely a bolder. Calculation of the number and distance between bolders for vertical mooring types can be calculated using the formula:

      Distance between bolders= $\mathbf{B} + \mathbf{b}$
      $=\mathbf{2,10} + \mathbf{0,5}$
      $= 2{,}15\ m$
      Number of bolders $= \frac{\textbf{jumlah panjang dermaga}}{\textbf{Jarak antar bolder}}$
      $= \frac{\mathbf{10.25}}{\mathbf{2,15}}$
      $= 4{,}8$
      $= 5\ bolder$
      Number of bolders $= \frac{\textbf{jumlah lebar dermaga}}{\textbf{Jarak antar bolder}}$
      $= \frac{\mathbf{5,10}}{\mathbf{2,15}}$
      $= 2{,}4$
      $= 2\ bolder$
   b) Fenders
      To avoid damage to ships and docks due to collisions, the front side of the pier is given a cushion that can absorb impact energy, namely fenders. The simplest form of rubber fenders are used car tires mounted on the front side along the pier. These car tire fenders are used on docks to dock small ships. because it is easy to obtain and the price is relatively cheaper, it is possible to use used tires as fenders on dock facilities with a diameter of 0.5 m and a weight of 2.5 kg.
      So, the number of fenders needed is:
      Long side of the pier = Pier Length / Tire diameter
      = 10.25 m / 0,5 m
      = 20.5
      = 20 Units
      wide side of the pier = wharf width / Diameter
      = 5,10 / 0.5
      = 10.2
      = 10 Units
      Total Number of Fenders = Amount beside the pier + number in front of the pier

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= 20 + 10
= 30 units

So the number of fenders is 30 units with a diameter of 0.50 m

c) Connecting road

The connecting road that will be used is the HDPE (High Density Polyethylene) floating cube.

HDPE Floating Cube Dimensions : 50 cm x 50 cm x 40 cm
Maximum buoyancy : 350 g/m^2
Cube weight : 7 kg

The characteristic of the floating cube was chosen because it can adjust the water level and the ground level based on the tidal mount of the reservoir reaching 13.61 m, thus using the calculation:

1) Connecting road

Length of connecting road = riding tide
The length of the connecting road = 13.61 m = 1361 cm
Width of connecting road = customized
Connecting road width = 1.5 m = 150 cm

Connecting road length:

$$\text{Jumlah kubus HDPE} = \frac{\boldsymbol{panjang\ jalan}}{\mathbf{50\ \ cm}}$$
$$\text{Jumlah kubus HDPE} = \frac{\mathbf{1361\ cm}}{\mathbf{50\ cm}}$$
$$\text{Jumlah kubus HDPE} = \mathbf{27,66}$$
$$\text{Jumlah kubus HDPE} = \mathbf{28\ buah}$$

Width of connecting road:

$$\text{Jumlah kubus HDPE} = \frac{\boldsymbol{lebar\ jalan}}{\mathbf{50\ \ cm}}$$
$$\text{Jumlah kubus HDPE} = \frac{\mathbf{150\ cm}}{\mathbf{50\ cm}}$$
$$\text{Jumlah kubus HDPE} = \mathbf{3\ buah}$$

Number of HDPE cubes connecting road

$$\text{Jumlah kubus HDPE} = \mathbf{28\ x\ 3}$$
$$\text{Jumlah kubus HDPE} = \mathbf{84\ buah}$$

2) The connecting road between the piers

Connecting road length = 5 m = 500 cm
Connecting road width = 3 m = 300 cm

The length of the connecting road between the piers

$$\text{Jumlah kubus HDPE} = \frac{\boldsymbol{panjang\ jalan}}{\mathbf{50\ \ cm}}$$
$$\text{Jumlah kubus HDPE} = \frac{\mathbf{300\ cm}}{\mathbf{50\ \ cm}}$$
$$\text{Jumlah kubus HDPE} = \mathbf{6\ buah}$$

The width of the connecting road between the piers

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$$\text{Jumlah kubus HDPE} = \frac{\boldsymbol{lebar\ jalan}}{\mathbf{50\ \ cm}}$$
$$\text{Jumlah kubus HDPE} = \frac{\mathbf{200\ cm}}{\mathbf{50\ \ cm}}$$
$$\text{Jumlah kubus HDPE} = \mathbf{4\ buah}$$

Number of HDPE cubes connecting roads between docks
$$\text{Jumlah kubus HDPE} = \mathbf{6\ x\ 4}$$
$$\text{Jumlah kubus HDPE} = \mathbf{24\ buah}$$

Total HDPE cubes
$$\text{Jumlah kubus HDPE} = \mathbf{24\ buah} + \mathbf{84\ buah}$$
$$\text{Jumlah kubus HDPE} = \mathbf{108\ buah}$$

From the results of the analysis to overcome the existing problems, namely by making improvements and adding facilities to the existing pontoon dock and calculated according to analysis and comparison so that the function of the pier can be used optimally. The characteristics of the pier conditions that are taken into account are as follows:

a. Pier Type

Based on the results of the tidal ride analysis, the difference in water level of 13.61 meters and 0.75 meters, the type of dock that is suitable for serving up and down passengers at Jangari Pier is a mobile type (pontoon).

1) Mooring Pattern Type
The mooring pattern used is the perpendicular mooring pattern
2) Pier Length
The length of the existing pontoon dock is 10.25
3) Wharf Width
The width of the existing pontoon dock is 5.10 meters
4) Bolder
Bolder plans to be built on the pier plan is 7 pieces.
5) Fenders
To determine the type of fender, fenders from used car tires with a diameter of 0.5 m are used, because they are less expensive and easy to obtain.
6) Connecting Road or Connecting Bridge
   a) The length of the connecting road to be built is 13.61 meters long.
   b) Width of Connecting Road or Connecting Bridge
   In planning the width it is assumed that the width is 1.5 meters

In the condition of the design pier, with calculations based on the 13.61 m high tide the pier is placed on the part of the water surface that is not affected by the high water level and low water level, which is connected by a connecting road in the form of an HDPE floating cube that can adjust the water level. reservoirs, so that passenger up and down activities are only available at one location, additional equipment for dock mooring facilities in the form of fenders and bolders with calculated mooring patterns and additional roofs for passenger docks is made.

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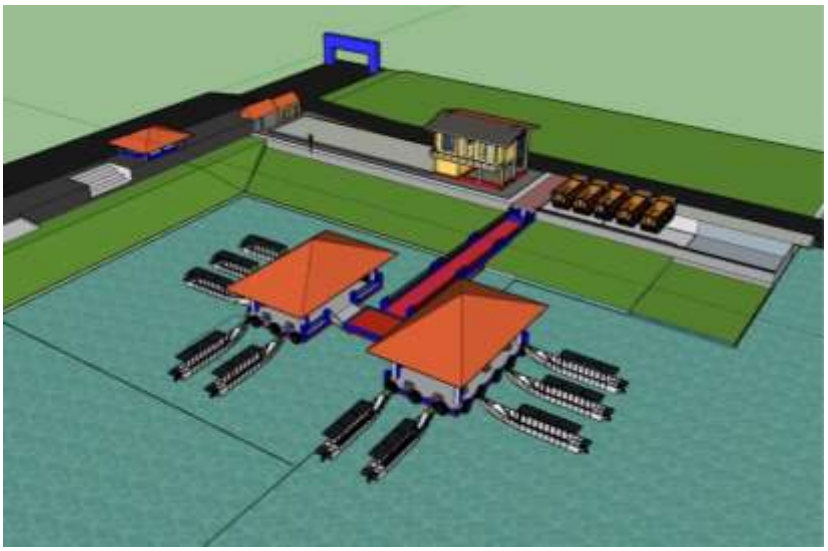
pier layout plan



Profit :

1. The planned passenger jetty has gone through analytical calculations according to high and low water levels, so that the period of its use can be longer than the existing dock procurement.
2. The passenger pier already has a connecting road facility that can adjust the water level, so the road to the pier is safer.
3. The passenger pier already has good mooring facilities so that passenger boarding activities are safer and more comfortable and equipped with a roof to increase the feasibility of the passenger dock

Loss :

It requires a large amount of money to build a connecting road infrastructure that is in accordance with the activities at Jangari Pier.

4. Closing

a. Conclusion

Based on the results of data analysis and discussion, the following conclusions are drawn:

1. The difference in water level that occurs at the Jangari passenger pier reaches 13.61 meters or more than the height of the tidal ride required to build a fixed type pier, so the type of pier that is in accordance with the characteristics of the waters in the Cirata Reservoir is a movable dock or pontoon type.
2. The current dimensions of the pontoon dock are sufficient for the perpendicular berth pattern. Based on the results of the mooring condition analysis, the dimensions of the pier are:
   a. Pier length : 10.25 meters
   b. Pier width : 5.10 meters
   c. Pier facilities

Bolder	: 7 bolders
Fenders	: 30 units of used car tires
Connecting road	: 108 HDPE cubes

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b. Suggestion

Suggestions that can be proposed in improving service to passengers and as input for the Jangari jetty manager and for UPTD PPP LLASDP West Java are as follows:

1. To improve passenger service so that the dock is more comfortable when used, it is recommended to add a roof and provide waiting chairs on the pontoon dock.
2. In the construction of dock facilities, it is advisable to refer to the analysis so that there is no waste and is in accordance with the required use.
3. Due to the difference in water level which reaches 13.61 meters, the connecting road to the pontoon dock is recommended to use an HDPE floating cube which can adjust the surface of the connecting road with a cheaper price ratio compared to a connecting bridge made of concrete.

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