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FULFILLMENT OF THE NEEDS OF SHIP BERTHING FACILITIES TO ENSURE PASSENGER SAFETY AT THE PIER OF THE CENGKLIK RESERVOIR BOYOLALI DISTRICT CENTRAL JAVA PROVINCE

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ABSTRACT

Boyolali Regency is one of the regencies in Central Java Province that has a lake/ reservoir as a water tourism site. Cengklik Reservoir has 37 tour boats that operate around the Cengklik Reservoir. The purpose of this research was to determined the berthing facilities needed at the reservoir and determined the type of pier that used at Cengklik Reservoir. This study was conducted from February to May 2024 by obtaining data on the characteristics of the data, reservoir water elevation data, water level data, and ship passenger productivity data. This study used several methods to solve existing problems, namely analyzing the need for docking facilities, analyzing the type of dock needed, analyzing the type of fender and bolder and analyzing the number of fenders and bolder.

Based on the analysis, it was concluded that the smoothness of passenger loading and unloading activities and the safety of passengers when boarding / disembarking the ship were influenced by berthing facilities that meet the requirements that are in accordance with the needs. The need for ship berthing facilities at Cengklik Reservoir is planned to ensure passenger safety by determining the type of mobile type pier with dimensions of 31, 46 meters long and 8, 58 meters wide with planned berthing facilities in the form of fenders with a total of 29 units and a distance of 1, 07 meters, bolder with a total of 14 units with a distance of 2, 33 meters.

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1. INTRODUCTION

Cengklik Reservoir is a tourist attraction in Boyolali Regency with a total area of 306 hectares. Cengklik Reservoir tourism is in the form of water tourism with a route around the reservoir with several spots for photography as well as educational tourism and the Waduk Cengklik Park (WCP) playground. Boats operating at Cengklik Reservoir do not have docking facilities for passengers to board and disembark as well as facilities to moor boats during boarding and disembarking activities.

2. RESEARCH METHODOLOGY

The author uses quantitative research methods. In this method the researcher must go directly to the event or events to be studied to obtain the necessary data. Researchers made observations of every ship berthing activity and passenger loading and unloading activities at the reservoir.

The data collection technique used by the author in this study is through 2 data, namely primary data and secondary data, where the primary data is obtained from observation, documentation, and survey methods, while for secondary data obtained from institutional methods carried out by collecting data obtained from several related agencies related to the problem solving process at the time of the research.

3. RESULT AND DISCUSSION

3.1 Analysis of Cengklik Reservoir Pier Needs of the Causes of Ship Delay

Tidal Ridges = HHWL – LLWL
= 138, 35 – 137, 78
= 1, 29 meter

Based on the book by Soedjono Kramadibrata (2002) entitled Port Planning, the process of selecting the type of pier can be determined based on the tide:

Tidal Ridges < 0, 75 m = fixed pier type
Tidal Ridges ≥ 0, 75 m = non-fixed pier type

From the data obtained from the calculation of the tidal ridge that occurs in the Cengklik Reservoir, a tidal ridge of 1, 29 meters is obtained, so the type of pier that is suitable for the conditions of reservoir water fluctuations is a non-fixed type pier or pontoon dock.

3.2 Analysis of ship berthing facility needs at Cengklik Reservoir, Boyolali Regency.

3.2.1 Analysis Dimension of Cengklik Pier

1) Length of Pier

Lp = n. LOA + (n + 1) x 10% X LOA
Lp = 4 . 7, 15 + (4 . 1) x 10% x 7, 15
Lp = 28, 6 + 4 x 0, 715
Lp = 28, 6 + 2, 86
Lp = 31, 46 meter

2) Width of Pier

d = n x B + (n – 1) x b + 2 x a
d = 4 x 1,67 + (4 – 1) x 0, 3 + 2 x 0,5

d = 6, 68 + 3 x 0, 3 + 1
d = 6, 68 + 1, 9
d = 8, 58 meter

3) Floor Height of Pier

$$Freeboard = \frac{\text{Boats } \Sigma freeboard}{\text{Number of boats}}$$

$$Freeboard = \frac{7,72}{37}$$

Freeboard = 0, 2 meter

3.2.2 Analysis of Facility Needs of Cengklik Pier

1) Fender Requirements

$$E = \frac{WV^2}{2_g} \text{ x } C_m \text{ x } C_c \text{ x Cs x Ce}$$

$$E = \frac{54,249 \text{ x } (0,41)^2}{2 \text{ x } 9,8} \text{ x 1, 74 x 1 x 1 x 0, 62}$$

$$E = \frac{9,119}{19,6} \text{ x 1, 078}$$

E = 0, 501 ton/m

2) Fender spacing

Fender spacing = 0, 15 x LOA
= 0, 15 x 7, 15
= 1, 07 meter

3) Fender Quantity

$$\text{Fender Quantity} = \frac{\text{Length of pier}}{\text{Fender spacing}}$$

$$= \frac{31,46}{1,07}$$

= 29, 4
= 29 unit

4) Bolder spacing

$$\text{Bolder spacing} = \frac{1}{3} \text{ x LOA}$$

$$= \frac{1}{3} \text{ x 7, 15}$$

= 2, 33 meter

5) Bolder Quantity

$$\text{Bolder Quantity} = \frac{\text{Length of pier}}{Bolder\ spacing}$$

$$= \frac{31,46}{2,33}$$

= 13, 5
= 14 unit

3.2.3 Analysis of Port Pond Depth

h = (0,8 s/d 1 m) + $draft_{max}$
= 1 + 0, 36
= 1, 36 meter

3.2.4 Analysis of Bridges Needs

1) Height of trestle

Height of trestle = HHWL + Tinggi jagaan
= 1, 14 + 1
= 2, 14 meter

2) Trestle Width

$$W = \frac{1}{35} + n$$

$$= \frac{1}{35} + 1, 5$$

= 1, 52 meter

3) Length of Movement Bridge

$$\text{Sin } a = \frac{\text{Height of } trestle - (Freeboard \text{ ponton} + \text{LLWL})}{\text{Length of movement bridge}}$$

$$\text{Sin } 20^{o} = \frac{2{,}14-(Freeboard \text{ ponton}+\text{LLWL})}{\text{Length of movement bridge}}$$

$$\text{Length of movement bridge} = \frac{\text{Height of } trestle-(Freeboard \text{ ponton}+\text{LLWL})}{\text{Sin } 20}$$

$$\text{Length of movement bridge} = \frac{2{,}14-(0{,}2+(-0{,}22))}{0{,}342}$$

$$\text{Length of movement bridge} = \frac{2{,}14+0{,}02}{0{,}342}$$

$$\text{Length of movement bridge} = \frac{2{,}16}{0{,}342}$$

Length of movement bridge = 6, 31 meter

4) Distance of Pontoon Pier to Trestle

$$\text{Tan } 20^{0} = \frac{\text{Height of } trestle-(\ Freeboard \text{ ponton}+\text{LLWL}\ )}{\text{P+r}}$$

$$\text{P + r} = \frac{2{,}14-(0{,}2+(-0{,}22))}{0{,}364}$$

$$\text{P + 0,5} = \frac{2{,}16}{0{,}364}$$

P = 5, 93 – 0, 5

P = 5, 43 meter

5) Tilt angle at high tide

$$\text{Sin } \alpha = \frac{\text{Tinggi } trestle-(Freeboard \text{ ponton}+\text{HHWL})}{\text{Length of Movable Bridge}}$$

$$\text{Sin } \alpha = \frac{2{,}14-(0{,}2+1{,}14)}{6{,}31}$$

$$\text{Sin } \alpha = \frac{0{,}98}{6{,}31}$$

Sin α = 0, 1553 meter

$= 8, 84^{0}$

6) Length of Movable Bridge Wheel Rails

$$\text{Cos } \alpha \text{ HHWL} = \frac{\text{p+r+z}}{\text{Length of movable bridge}}$$

$$\text{Cos } 2, 14^{0} = \frac{5{,}43+0{,}5+\text{z}}{6{,}31}$$

$$\text{Cos } 3, 14^{0} = \frac{5{,}93+\text{z}}{6{,}31}$$

5, 93 + z = Cos 3, 14^{0} x 6, 31

z = 0, 99 x 6, 31 – 5, 93

z = 6, 2469 – 5,93

z = 0, 316 meter

4. CLOSING

4.1 Conclusion

a. Based on the results of the survey and analysis conducted by the author, the plan for the type of pier to be made is the pontoon type or non-fixed pier, because the tides of the Cengklik reservoir water that usually occur annually cause the results of calculating the tidal stump that exceeds 0, 75 meters, so the author concludes to choose a pontoon type pier plan.

b After calculating and analyzing the facilities needed at the Cengklik Reservoir in the form of fenders, bolder, and docks for berthing and loading and unloading passengers, conclusions can be drawn about the plan to make a dock at the Cengklik reservoir with dimensions of 31, 46 meters long, 8, 58 meters wide dock with 29 unit fender and 14 unit bolder.

4.2 Recommendations

a. To ensure the safety of passengers during boarding/disembarking activities on ships/boats at Cengklik Reservoir, ship operators must pay attention to the condition and position of the ship when docking and the selection of docking places that can facilitate and ensure the safety of ship passengers at Cengklik Reservoir.

b. Ship operators at Cengklik Reservoir can moor ships in accordance with the existing bolder and with the appropriate berthing position in order to avoid damage to the ship / dock due to friction due to water waves caused by other ship movements.

c. Controlling the speed of the ship/boat when it is about to dock must be considered for every ship operator, because the impact strength of the fenders used has been measured based on the analysis of the average speed of ships in the Cengklik Reservoir.
d. The need for FR 2 cylinder-type fenders may still be a problem due to the limited cost of procurement, so the author suggests using used tires that are cut and arranged in such a way that they can become temporary fenders in the Cengklik Reservoir dock plan.

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