

Evaluation of Breakwater Design Binuangeun Fishing Port, Banten Province

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Abstract—At the current port of Binuangeun, Banten, there are strong currents and waves at the mouth of the Binuangeun fishing port where the breakwater is no longer functioning. So ships that will enter the port are often hampered due to currents and waves that occur. Design evaluation is done so that the damage that has occurred in order to be used as a basis so that the same mistakes are not repeated. In designing the implementation factors must also be studied, because of the effects of nature and the equipment used and the availability of skilled personnel. Evaluation results obtained breakwater height = 7.456 m, elevation peak breakwater El = 6.494 m, width of the breakwater peak = 4.80 m, side slope $\text{ctg} = 2$ or slope $\text{tg} = \frac{1}{2}$ ($\text{m} = 2$), thickness of the first protective layer = 1.90 m, thickness of second layer of protection = 1.40 m, thickness of third layer of protection = 0.40 m, weight of first layer of protection stone = 1490 kg, weight of second layer of protection stone = 149 kg, weight of third layer of protection stone = 7,45 kg.

Keywords: *evaluation, breakwater design, Binuangeun fishing*

I. INTRODUCTION

Breakwater is a building used to protect harbour waters from wave disruption. This building separates water areas from the high seas, so that the waters of the port are not much influenced by large waves in the sea. At the current port of Binuangeun, Banten Province, there are strong currents and waves at the mouth of the Binuangeun fishing port where the breakwater is no longer functioning. So ships that will enter the port are often hampered due to currents and waves that occur. Design evaluation is done so that the damage that has occurred in order to be used as a basis so that the same mistakes are not repeated. In designing the implementation factors must also be studied, because of the effects of nature and the equipment used and the availability of skilled personnel.

II. METHOD

This research uses the qualitative-descriptive method. The breakwater research at the Binuangeun fishing port is secondary data obtained from a number of sources both related institutions such as the Office of Maritime Affairs and Fisheries of the Province of Banten and also data from the field location survey. The secondary data include wave data, tides, wind, ocean currents, topography and other supporting data. Below will be presented a Layout of analysis studies for the development of the Port Master Plan (RIP) for the long

term and short term. The author will only discuss the short term, namely the construction of breakwaters at the mouth of the Binuangeun fishing port.

To analyze data in order to get good results, accurate and correct data is needed in order to produce the required data. In this case the authors analyzed the design of breakwater both in image planning and calculation. To assist in the Development of the Binuangeun Fishery Port from the Fish Landing Base (PPI) to achieve the classification of the Coastal Fisheries Port (PPP) as stipulated in the Banten Province RTRW, the emphasis is on the expansion of land and water areas. With the development of fisheries production at the Binuangeun Port, development of several port facilities is needed to support port operations. The development of the Binuangeun port area is constrained by inadequate land area. Currently the port land area is 1.34 Ha, it is necessary to expand the land around the port of Binuangeun which is the land of the Lebak Regency Government. The settlement of the Lebak Regency government is needed because most of the land has been used by residential areas.

III. RESULT AND DISCUSSION.

Wavelengths in the sea are calculated as :

$$L_0 = 1.56.T^2$$

$$= 1,56 (11)^2$$

$$= 188,76 \text{ m}$$

$$C_0 = \frac{L_0}{T} = \frac{188.76}{11} = 17,16 \text{ m/d}$$

$$\frac{d}{L_0} = \frac{2}{188,76} = 0.011$$

For value $\frac{d}{L_0}$:

$$\frac{d}{L} = 0,04233 \rightarrow L = \frac{d}{\frac{d}{L}} = \frac{2}{0,04233} = 47,25 \text{ m}$$

$$C_1 = \frac{L}{T} = \frac{47,25}{11} = 4,30 \text{ m/d}$$

The direction of wave arrival at a depth of 2.00 m is calculated by the equation:

$$\sin \alpha_1 = \left(\frac{C_1}{C_0} \right) \sin \alpha_0 = \frac{4,30}{17,16} \sin 45^\circ = 0,177$$

$$\alpha_1 = 10,37^\circ$$

Koefisien refraksi :

$$K_r = \sqrt{\frac{\cos \alpha_0}{\cos \alpha_1}} = \sqrt{\frac{\cos 45^\circ}{\cos 10,37^\circ}} = 0,848 \approx 0,9$$

So, K_s :

$$K_s = \sqrt{\frac{n_0 L_0}{n_1 L_1}} = \sqrt{\frac{0,5 \times 188,76}{0,9772 \times 47,25}} = 1,43$$

So, deep = 2,00 madalah :

$$H_1 = K_s \cdot K_r \cdot H_0$$

$$= 1,43 \times 0,848 \times 2,07 = \underline{2,510 \text{ m}}$$

$$H_1 = 2,510 \text{ m}$$

$$H_0 = 2,070 \text{ m}$$

$$H_b / H'_0 = 1,45$$

$$H_b = 1,45 \times 1,755 = 2,5447 \text{ m}$$

$$H = \frac{d_{HWL}}{(db / H_b)}$$

$$= \frac{3,566}{0,75}$$

$$= 4,755 \text{ m}$$

The height and depth of the breaking wave from

the previous calculation were obtained

$$S_w = 0,19 [1 - 2,82 \sqrt{\{H_b / g T^2\}}] H_b$$

$$S_w = 0,19 [1 - 2,82 \sqrt{\{2,5447 / (9,81 \times 11^2)\}}] \times 2,5447$$

$$S_w = 0,422 \text{ m} = 42,20 \text{ cm}$$

$$DWL = HWL + \text{wave set up} + \text{Wave run up (HWL, hal.}$$

44)

$$= 1,566 + 0,422 + 5,468 = 7,456 \text{ m}$$

$$El_{pem.Gel} = (HWL - MWL) + \text{wave set up} + \text{Wave run up (MWL, hal. 44)}$$

$$= (1,566 - 0,962) + 0,422 + 5,468$$

$$= 6,494 \text{ m}$$

$$W_2 = \frac{W_1}{10} = \frac{1490}{10} = 149 \text{ kg}$$

Layer III :

$$W_3 = \frac{W_1}{200} = \frac{1490}{200} = 7,45 \text{ kg}$$

$$B = nk_\Delta \left[\frac{W}{\gamma_r} \right]^{1/3} = 5 \times 1,15 \left[\frac{1490}{2650} \right]^{1/3} = 4,746 \text{ m} \approx 4,80 \text{ m}$$

Number of protective stones

$$N = \text{Ank}_\Delta \left[1 - \frac{P}{100} \right] \left[\frac{\gamma_r}{W} \right]^{2/3}$$

Layer 1 per 10 m²

$$N = \text{Ank}_\Delta \left[1 - \frac{P}{100} \right] \left[\frac{\gamma_r}{W} \right]^{2/3} = 10 \times 2 \times 1,15 \left[1 - \frac{37}{100} \right] \left[\frac{2,65}{1,49} \right]^{2/3}$$

$$= 22 \text{ pcs}$$

Layer 2 per 10 m²

$$N = \text{Ank}_\Delta \left[1 - \frac{P}{100} \right] \left[\frac{\gamma_r}{W} \right]^{2/3} = 10 \times 3 \times 1,15 \left[1 - \frac{37}{100} \right] \left[\frac{2,65}{0,149} \right]^{2/3}$$

$$= 148 \text{ pcs}$$

Layer 3 per 10 m²

$$N = \text{Ank}_\Delta \left[1 - \frac{P}{100} \right] \left[\frac{\gamma_r}{W} \right]^{2/3} = 10 \times 2 \times 1,10 \left[1 - \frac{37}{100} \right] \left[\frac{2,65}{0,00745} \right]^{2/3}$$

$$= 696 \text{ pcs}$$

Diameter of stones 1:

$$W_1 = 1490 \text{ kg/pc} = \left[\frac{1,49}{2,65} \right]^{1/3} = 0,825 \text{ m} \approx 0,90 \text{ m}$$

$$W_1 = 149 \text{ kg/pc} = \left[\frac{0,149}{2,65} \right]^{1/3} = 0,383 \text{ m} \approx 0,40 \text{ m}$$

$$W_1 = 7,45 \text{ kg/pc} = \left[\frac{0,00745}{2,65} \right]^{1/3} = 0,141 \text{ m} \approx 0,20 \text{ m}$$

Then the sloping side breakwater technical data can be obtained as below.

Broken Stone Material

Breakwater height = 7,456 m

Elevation peak breakwater El = 6,494 m

Breakwater peak width = 4.80 m

Side slope $\text{ctg } \theta = 2$ or slope $\text{tg } \phi = \frac{1}{2}$ ($m = 2$)

Thickness of the first protected layer = 1.90 m

The thickness of the second protected layer = 1.40 m

The weight of the first protected layer stone = 1490 Kg /

Fruit

Diameter ± 90 cm (Thickness of a layer must not be less than 2 times the diameter of the stone)

The weight of the second protected layer stone = 149 kg

/ Fruit

Diameter ± 40 cm

The weight of the third protected layer stone = 7.45 kg /

Fruit

Diameter ± 20 cm.

IV. CONCLUSION

Evaluation results concluded the breakwater is planned by considering several factors including, bathymetry data, waves and tides, wind, ocean currents, topography and other supporting data. Determination of the breakwater length to 275 m due to sediment deposition still occurs in the port channel when the length of the existing breakwater is 186 m. While the 130 long breakwater was built because it anticipated tidal currents during the east monsoon. In designing the implementation factors must also be studied, because of the effects of nature and the equipment used and the availability of skilled personnel. Planned with a location or position that can protect the port area properly according to its function.

Considering the advantages and disadvantages of several types of breakwaters above, the type of breakwaters that will be used is the Slant Side Breakers. The obstacle faced in evaluating the design of Binuangeun fishery harbor breakwater is that there are existing breakwaters.

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