

THE INFLUENCE OF DOCK LAYOUT AND GANTRY CRANE ON LOADING AND UNLOADING SPEED AT PIERS 303 – 305 PT. PORT OF INDONESIA PERSERO II

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Abstract: This research is motivated by the development of technology in the shipping industry, especially in terms of shipping goods. This study aims to see the effect of dock layout and gantry crane on loading and unloading speed at pier 303-305 at PT. Indonesian Port Persero II. The research method used in this research was case study research in which the data collection techniques used were interviews and direct observation. Analysis of the data used was the Berth occupancy ratio (BOR), Field occupancy ratio (YOR), and the performance of the gantry crane. The results of this research show that the data on the ships used are 7000 DWT with a container capacity of 200 – 500 TEU's, data on the pier with an area of 450 meters x 60 meters, data on ship flows that always increase every year and data on cargo flows starting from 2013 amounted to 361131 tons until 2019 amounted to 618375 tons. The results of the BOR calculation starting in 2013 – 2017 were found to be <70%, while the BOR for 2018-2019 was found to be >70%. Based on this, the length of the wharf that should be used at piers 303 – 305 PT. Indonesian Port of Persero II in 2019 is 616.49 meters or must increase the length of 166.49 meters. Then the results of the gantry crane calculation show that the capacity for 6 RTGs is 293760 TEU's/year. In addition, BTP and YTP at pier 303 – 305 PT. Port of Indonesia Persero II continues to grow every year.

Keywords: BOR, YOR, Gantry Crane, Port, Pier

INTRODUCTION

Currently, the development of sea transportation is very rapid, both in shipping technology or loading and unloading technology. In goods transportation services, they have also been more advanced with the presence of containers. With the presence of this container, of course, it affects other technologies in terms of shipping goods, including shipping and port technology. In addition, the presence of containers also changes the layout of the dock for berthed ships and carries out loading and unloading activities. This becomes the reference for the researchers to conduct research on the layout of the dock and gantry cranes on the speed of loading and unloading goods at the docks 303 – 305 PT. Pelabuhan Indonesia Persero II.

The research begins by discussing the meaning of the word pier itself. According to the KBBI in 2021, the pier is a low wall that extends on the beach protruding into the sea in the port area (for the base and loading and unloading of goods). In other words, the pier is a place where ships are moored to carry out loading and unloading activities. Meanwhile, the gantry crane has the meaning of loading and unloading equipment that

functions to unload / load containers quickly in carrying out container loading and unloading activities.

Afterward, the new researchers made observations by making direct visits to piers 303 – 305 PT. Pelabuhan Indonesia Persero II and conducted an interview with one of the employees of PT. Port of Indonesia Persero II, namely Ridwan Hanief. Based on the conditions at the pier 303 – 305 PT. The Port of Indonesia Persero II that were observed, the following data were obtained.

Length : 450 meters

Width : 60 meters

Depth : -4.5 m.LWS to -6.5 m.LWS

Facility

Container Stacking Field : 3000 m²

Conventional Field : 1095 m²

Warehouse : 1 unit (600 m²)

Main Office : 1 building

Customs Office : 1 building

Basarnas Office : 2 buildings

Health Office : 1 building

Loading and Unloading Tool

Container Crane : 2 Units

Mobile harbor crane : 2 Units

Rubber Tyred Gantry Crane : 6 Units

Reach Staker : 4 Units

In addition to obtaining data on the dock layout as stated above, the researchers also obtained data on the flow of ships carrying out loading and unloading of goods and data on the flow of containers. In addition, researchers also obtained data on ships that were moored at pier 304 when the researchers conducted observations and interviews with one of the employees of PT. Pelabuhan Indonesia Persero II.

Table of Ships Flow at Pier 303 - 305 PT. Pelabuhan Indonesia Persero II

Year	Ships Flow (Unit)	Container Ships Flow (Unit)	Total of Mooring Usage (Hour)
2013	1049	292	54
2014	1183	324	54
2015	1220	340	54
2016	1368	388	54
2017	1515	416	54
2018	1673	452	54
2019	1749	500	54

Source: Data of PT. Pelabuhan Indonesia Persero II

Table of Container Ships Flow at Pier 303 – 305 Tanjung Priok

Year	Container Flow (TEU's)	Cargo Weight (Ton/m ³)
2013	21243	361131
2014	23571	400707
2015	24735	420495
2016	28227	479859
2017	30264	514488
2018	32883	559011
2019	36375	618375

Source: Data of PT. Pelabuhan Indonesia Persero II

Ship data:

- Ship used : 7000 DWT
- Loa (*Length over all*) : 120 m
- Lpp (*Length between perpendicular*): 112 m
- B (*Molded breath*) : 18 m
- d (*Full load draft*) : 5.9 m
- Container capacity : 200 – 500 TEU's

METHOD

In this research, the case study materials were the layout of the dock, gantry crane, and the speed of loading and unloading of goods at the pier 303 – 305 PT. Pelabuhan Indonesia Persero II. In conducting the research, the researchers obtained data from interviews and direct observations in the field. The method applied in the writing of this research journal was arranged according to the research flow, so that research can be carried out effectively and efficiently. In addition, in doing research, the sources of data obtained to serve as guidelines were very helpful to be applied to the methods used to get the expected results.

a. Data collection technique

In this study, researchers obtained data in the following ways:

1. Primary Data, namely data obtained directly from employees in the form of interviews with the operational parties of PT. Pelabuhan Indonesia Persero II, namely with Mr. Ridwan Hanief.
2. Secondary data, namely data obtained from various reading sources such as books, journals, reports, etc.

b. Data analysis method

In processing the data that hedd been obtained, the researcher processed the data by calculating the Berth occupancy ratio (BOR), Field occupancy ratio (YOR), and the performance of the gantry crane as a measuring tool to measure the speed of loading and unloading goods at the docks 303 – 305 PT. Pelabuhan Indonesia Persero II.

c. Data Analysis Tools

1. Berth Occupancy Ratio (BOR)

Berth occupancy ratio (BOR) is a percentage that determines the level of use of a wharf by comparing the time of use of the wharf and the operating time of the wharf. The resulting BOR value must not exceed 70% in

accordance with the provisions of the Director General of Transportation. The following is the BOR formula used in calculating port performance.

$$\text{BOR} = \frac{\sum[P.Kpl + 5 \times JP]}{(PD \times 24 \times HK)} \times 100\%$$

In which:

BOR : *Berth occupancy ratio (%)*

P.Kpl : Number of ships $\times$ Length of ship

JP : Number of hours of mooring usage (Hours)

PD : Pier length (meters)

HK : calendar day (365 days)

2. Field Occupancy Ratio (YOR)

The performance of the stacking field service can be determined by the percentage of use of the stacking field facilities of a port by comparing the flow of goods faced by a port with the area of the stacking field. This percentage can be calculated using the YOR formula according to Saputro, S (2013). The following is the YOR calculation formula to obtain the percentage of usage of container field facilities.

$$\text{YOR} = \frac{\text{Flow of Goods (TEU's)} \times \text{Storing Time (Days)}}{\text{Stacking Field (m}^2\text{)} \times \text{Working Days (365 Hari)}} \times 100\%$$

In which:

YOR : Field Occupancy Ratio (YOR)

3. The Performance of the Gantry Crane

The performance of the gantry crane is the gantry crane's ability to handle loading and unloading activities and the arrangement of containers at the stacking field. To calculate the capacity of the gantry crane, the following

formula is used (Bambang Triatmodjo, 2011) :

$$T_c = (B \times 1.7 \text{ TEU's}) \times D$$

In which:

T_c : *Throughput capacity* (TEU's/tahun)

B : Service speed (box/jam/Gantry Crane)

D : Working time in one year (7200 hours/year)

The installed capacity of container handling equipment can be calculated by the following formula equation:

$$\text{Installed capacity} = T_c \times n$$

In which:

T_c : *Throughput capacity* (TEU's/year)

n : Number of tools (unit)

DISCUSSION AND RESULT

1. Ship Data

In the dock area 303 – 305 at PT. Pelabuhan Indonesia Persero II, there are several types of ships docked at PT. Pelabuhan Indonesia Persero II which handles loading and unloading of containers. The ship data must be known in advance to be needed in planning container stacking. In the dock area 303 – 305 PT. Pelabuhan Indonesia Persero II, container ship used is 700 DWT. The followings are data on container ships of 700 DWT according to Ridwan Hanief (2021).

Ship Data:

- Ship used : 7000 DWT
- Loa (*Length over all*) : 120 m

- Lpp (*Length between perpendicular*): 112 m
- B (*Molded breadth*) : 18 m
- d (*Full load draft*) : 5.9 m
- Container capacity : 200 – 500 TEU's

2. Piers Data

At pier 303 – 305 PT. Pelabuhan Indonesia Persero II, it has several available port facilities and also has a dock that handles loading and unloading of containers. The followings are the data of piers 303 – 305 PT. Pelabuhan Indonesia Persero II. This wharf is used for loading and unloading of containers. This pier has an area of:

Length : 450 meters

Width : 60 meters

Depth : -4.5 m.LWS to -6.5 m.LWS

- Facility

Container Stacking Field : 3000 m²

Conventional Field : 1095 m²

Warehouse : 1 unit (600 m²)

Main Office : 1 building

Customs Office : 1 building

Basarnas Office : 2 buildings

Health Office : 1 building

- Loading and Unloading Tool

Container Crane : 2 Unit

Mobile harbor crane : 2 Unit

Rubber Tuyred Gantry Crane : 6 Unit

Reach Staker : 4 Units

3. Ship Flow Data

Data on the flow of ships at the pier 303 – 305 PT. Pelabuhan Indonesia Persero II There are getting the results of calculations, when the researchers conducted observations and interviews with one of the employees of PT. Pelabuhan Indonesia Persero II.

Table of Ship Flow at Pier 303 - 305 PT. Pelabuhan Indonesia Persero II

Year	Ship Flow (Unit)	Container Ship Flow (Unit)	Total of Mooring Usage (Hour)
2013	1049	292	54
2014	1183	324	54
2015	1220	340	54
2016	1368	388	54
2017	1515	416	54
2018	1673	452	54
2019	1749	500	54

Source: Data of Perusahaan PT. Pelabuhan Indonesia Persero II

4. Data of Cargo and Container Flow

The combined cargo flow data from several types of cargo transported is container cargo, while the container data only shows what happened at piers 303 – 305 PT. Pelabuhan Indonesia Persero II. The following data are obtained from PT. Pelabuhan Indonesia Persero II.

Table of Container Flow Data at Pier 303 – 305 Tanjung Priok

Year	Container Flow (TEU's)	Cargo Weight (Ton/m ³)
2013	21243	361131
2014	23571	400707
2015	24735	420495
2016	28227	479859
2017	30264	514488
2018	32883	559011
2019	36375	618375

Source: Data of Perusahaan PT. Pelabuhan Indonesia Persero II

Result**1. Berth Occupancy Ratio (BOR)**

From (Supriyono, 2014) *Berth occupancy ratio* (BOR) is the percentage that determines the level of use of a dock by comparing the time of use of the dock and the operating time of the dock. The resulting BOR value must not exceed 70% in accordance with the provisions of the Director General of Transportation. The following is the BOR formula used in calculating port performance.

$$\text{BOR} = \frac{\sum[P.Kpl + 5 \times JP]}{(PD \times 24 \times HK)} \times 100\%$$

In which:

BOR : *Berth occupancy ratio* (%)

P.Kpl : Number of ships (units) × Length of ships (Loa)

JP : Number of hours of mooring usage (Hours)

PD : Pier length (meters)

HK : Calendar days (365 days)

Therefore, we calculate the Berth occupancy ratio (BOR) every year to find out whether at pier 303 – 305 PT. Pelabuhan Indonesia Persero II.

2013:

$$\text{BOR} = \frac{\Sigma[(P.Kpl + 5) \times JP]}{(PD \times 24 \times HK)} \times 100\%$$

$$\text{BOR} = \frac{\Sigma[3504 \quad 5 \times 54]}{(450 \times 24 \times 365)} \times 100\%$$

$$\text{BOR} = \frac{1892430}{(394200)} \times 100\% = 48.006\%$$

2014:

$$\text{BOR} = \frac{\Sigma[(P.Kpl + 5) \times JP]}{(PD \times 24 \times HK)} \times 100\%$$

$$\text{BOR} = \frac{\Sigma[3888 \quad 5 \times 54]}{(450 \times 24 \times 365)} \times 100\%$$

$$\text{BOR} = \frac{2099790}{(394200)} \times 100\% = 53.27\%$$

2015:

$$\text{BOR} = \frac{\Sigma[(P.Kpl + 5) \times JP]}{(PD \times 24 \times HK)} \times 100\%$$

$$\text{BOR} = \frac{\Sigma[40800 + 5 \times 54]}{(450 \times 24 \times 365)} \times 100\%$$

$$\text{BOR} = \frac{2203470}{(394200)} \times 100\% = 55.89\%$$

2016:

$$\text{BOR} = \frac{\Sigma[(P.Kpl + 5) \times JP]}{(PD \times 24 \times HK)} \times 100\%$$

$$\text{BOR} = \frac{\Sigma[46560 + 5 \times 54]}{(450 \times 24 \times 365)} \times 100\%$$

$$\text{BOR} = \frac{2514510}{(394200)} \times 100\% = 63.78\%$$

2017:

$$\text{BOR} = \frac{\Sigma[(P.Kpl + 5) \times JP]}{(PD \times 24 \times HK)} \times 100\%$$

$$\text{BOR} = \frac{\Sigma[49920 + 5 \times 54]}{(450 \times 24 \times 365)} \times 100\%$$

$$\text{BOR} = \frac{2695950}{(394200)} \times 100\% = 68.39\%$$

2018:

$$\text{BOR} = \frac{\Sigma[(P.Kpl + 5) \times JP]}{(PD \times 24 \times HK)} \times 100\%$$

$$\text{BOR} = \frac{\Sigma[54240 + 5 \times 54]}{(450 \times 24 \times 365)} \times 100\%$$

$$\text{BOR} = \frac{2929230}{(394200)} \times 100\% = 74.31\%$$

2019:

$$\text{BOR} = \frac{\Sigma[(P.Kpl + 5) \times JP]}{(PD \times 24 \times HK)} \times 100\%$$

$$\text{BOR} = \frac{\Sigma[60000 + 5 \times 54]}{(450 \times 24 \times 365)} \times 100\%$$

$$\text{BOR} = \frac{3240720}{(394200)} \times 100\% = 82.19\%$$

From the results of the calculation of BOR at the pier 303 – 305 PT. The existing Port of Indonesia Persero II must carry out an extension or in the planning in the pier area 303 – 305 PT. Pelabuhan Indonesia Persero II added a new pier because in 2018 it had a BOR of 74.31%. This figure has exceeded the BOR limit in a container dock, which is around <70%. Therefore, it is assumed to take the figure of 60% as a reference to calculate how long the pier is needed.

2018:

$$60\% = \frac{\Sigma[(P.Kpl + 5) \times JP]}{(PD \times 24 \times HK)} \times 100\%$$

$$60\% = \frac{\Sigma[54240 + 5 \times 54]}{(PD \times 24 \times 365)} \times 100\%$$

$$PD = 557.31 \text{ meters}$$

From the calculation results obtained the length of the pier that should be used at the pier 303 – 305 PT. Port of Indonesia Persero II in 2018 is 557.31 meters or must increase the length of 107.31 meters. This is done so that the BOR at piers 303 – 305 PT. Port of Indonesia Persero II reaches 60%.

2019:

$$\text{BOR} = \frac{\Sigma[(P.Kpl + 5) \times JP]}{(PD \times 24 \times HK)} \times 100\%$$

$$\text{BOR} = \frac{\Sigma[60000 + 5 \times 54]}{(450 \times 24 \times 365)} \times 100\%$$

PD = 616.49 meters

From the calculation results obtained the length of the pier that should be used at the pier 303 – 305 PT. The Indonesian Port of Persero II in 2019 is 616.49 meters or must increase the length of 166.49 meters. This is done so that the BOR at piers 303 – 305 PT. Port of Indonesia Persero II reaches 60%.

2. *Field Occupancy Ratio (YOR)*

From (Purnomo et al., 2015), the performance of a stacking field can be a factor in calculating the required stacking capacity. This is because in stacking containers, the performance of a field must be carried out effectively and efficiently which is supported by the capacity of the available stacking field. In calculating YOR, it takes data on the flow of cargo from containers using units of tons/m³.

The following is the YOR calculation for the available capacity at piers 303 – 305 PT. Port of Indonesia Persero II with a stacking field of 3000 m².

Average container load flow = 479152 ton/m³

Average storage time = 2.5 days

Stacking field area = 3000 m

$$YOR = \frac{\text{Flow of Goods (TEU's)} \times \text{Storing Time (Days)}}{\text{Stacking Field (m}^2\text{)} \times \text{Working Days (365 Days)}} \times 100\%$$

$$YOR = \frac{479152 \times 2.5}{3000 \times 365} \times 100\%$$

$$YOR = 109.4\%$$

From the calculation results obtained, the YOR percentage of the available stacking fields exceeds 100%, so it is concluded that the available stacking fields can no longer meet the average inventory that occurs. Therefore, it is recommended to expand the stacking field or for the case at the pier 303 – 305 PT. Port of Indonesia Persero II will be built a new fertilization field to meet the existing capacity.

3. Performance of Gantry Crane

The performance of the gantry crane is the gantry crane's ability to handle loading and unloading activities and the arrangement of containers at the stacking field. To calculate the capacity of the gantry crane, the following formula is used (Takaendengan et al., 2016): $T_c = (B \times 1.7 \text{ TEU's}) \times D$

In which:

T_c : *Throughput capacity* (TEU's/tahun)

B : Service speed (box/hour/Gantry Crane)

D : Working time in one year (7200 hours/year)

Known in this case

B : 4 boxes/ hour/ RTG

D : 7200 hours/ year

n : 6 pieces

$$\begin{aligned} T_c &= (B \times 1.7 \text{ TEU's}) \times D \\ &= (4 \times 1.7) \times 7200 \\ &= 48960 \text{ TEU's / year} \end{aligned}$$

$$\begin{aligned}
 T_{cTotal} &= n \times T_c \\
 &= 6 \times 48960 \\
 &= 293760 \text{ TEU's/ year}
 \end{aligned}$$

The results obtained for the capacity of 6 RTGs are 293760 TEU's/year. From the results obtained, the performance of 6 RTGs can still be used and because the most data in 2019 is 36375 TEU's / year, it is still able to be done.

4. Berth Throughput (BTP)

From (Situmorang & Buchari, 2015) Berth Throughput (BTP) is the number of TEU's (Containers) handled at one dock in a period per year. The BTP value can be calculated by the following equation (Bambang Triatmodjo, 2011):

$$BTP = \frac{\sum TEU's \times BOR\%}{L_p \times n}$$

BTP = *Berth Throughput* (TEU's/Year),

$\sum TEU's$ = Number of containers (TEU's/Year),

BOR % = Total pier usage rate per year (%)

L_p = Pier length (berth)

n = Number of piers/moorings.

Therefore, we calculate the Berth Throughput (BTP) every year to find out whether at pier 303 – 305 PT. Pelabuhan Indonesia Persero II.

2013:

$$BTP = \frac{\sum TEU's \times BOR\%}{L_p \times n}$$

$$BTP = \frac{21243 \times 48.006\%}{450 \times 3}$$

$$BTP = 755,4011 \text{ TEU's / Year}$$

2014:

$$BTP = \frac{\sum TEU's \times BOR\%}{Lp \times n}$$

$$BTP = \frac{23571 \times 53.27 \%}{450 \times 3}$$

$$BTP = 930.0942 \text{ TEU's / Year}$$

2015:

$$BTP = \frac{\sum TEU's \times BOR\%}{Lp \times n}$$

$$BTP = \frac{24735 \times 55.89 \%}{450 \times 3}$$

$$BTP = 1024.029 \text{ TEU's / Year}$$

2016:

$$BTP = \frac{\sum TEU's \times BOR\%}{Lp \times n}$$

$$BTP = \frac{28227 \times 63.78 \%}{450 \times 3}$$

$$BTP = 1333.569 \text{ TEU's / Year}$$

2017:

$$BTP = \frac{\sum TEU's \times BOR\%}{Lp \times n}$$

$$BTP = \frac{30264 \times 68.39 \%}{450 \times 3}$$

$$BTP = 1533.152 \text{ TEU's / Year}$$

2018:

$$BTP = \frac{\sum TEU's \times BOR\%}{Lp \times n}$$

$$BTP = \frac{32883 \times 74.31 \%}{450 \times 3}$$

$$BTP = 1810.026 \text{ TEU's / Year}$$

2019:

$$BTP = \frac{\sum TEU's \times BOR\%}{Lp \times n}$$

$$BTP = \frac{36375 \times 82.19\%}{450 \times 3}$$

$$BTP = 2214.564 \text{ TEU's / Year}$$

Thus, it was found that Berth Throughput (BTP) at piers 303 – 305 PT. Pelabuhan Indonesia Persero II continues to grow every year. However, it started not working optimally or over capacity in 2018 – 2019 due to BOR pier 303 – 305 PT. Pelabuhan Indonesia Persero II has exceeded the standard, which is <70% so that the BTP cannot be carried out optimally.

5. Field Throughput (YTP)

From (Plangiten et al., 2019) Field Throughput (YTP) is the number of tons or m³ or TEU's in one period that passes every square meter (m²) or ground slot of the stacking field (m² or GSL).

$$YTP = \frac{\text{Number of tons in one period}}{\text{Ground slot of the stacking field (m}^2\text{)}}$$

Therefore, we calculate the Field Throughput (YTP) every year to find out whether at pier 303 – 305 PT. Pelabuhan Indonesia Persero II.

2013:

$$YTP = \frac{\text{Number of tons in one period}}{\text{Ground slot of the stacking field (m}^2\text{)}}$$

$$YTP = \frac{361131}{3000}$$

$$YTP = 120.377 \text{ Ton/m}^2$$

2014:

$$YTP = \frac{\text{Number of tons in one period}}{\text{Ground slot of the stacking field (m}^2\text{)}}$$

$$YTP = \frac{400707}{3000}$$

$$YTP = 133.569 \text{ Ton/m}^2$$

2015:

$$YTP = \frac{\text{Number of tons in one period}}{\text{Ground slot of the stacking field (m}^2\text{)}}$$

$$YTP = \frac{420495}{3000}$$

$$YTP = 140.165 \text{ Ton/m}^2$$

2016:

$$YTP = \frac{\text{Number of tons in one period}}{\text{Ground slot of the stacking field (m}^2\text{)}}$$

$$YTP = \frac{479859}{3000}$$

$$YTP = 159.953 \text{ Ton/m}^2$$

2017:

$$YTP = \frac{\text{Number of tons in one period}}{\text{Ground slot of the stacking field (m}^2\text{)}}$$

$$YTP = \frac{514488}{3000}$$

$$YTP = 171.496 \text{ Ton/m}^2$$

2018:

$$YTP = \frac{\text{Number of tons in one period}}{\text{Ground slot of the stacking field (m}^2\text{)}}$$

$$YTP = \frac{559011}{3000}$$

$$YTP = 186.337 \text{ Ton/m}^2$$

2019:

$$YTP = \frac{\text{Number of tons in one period}}{\text{Ground slot of the stacking field (m}^2\text{)}}$$

$$YTP = \frac{618375}{3000}$$

$$YTP = 206.125 \text{ Ton/m}^2$$

From the calculation results obtained, the percentage of YTP from the available

stacking fields continues to increase from year to year for it is recommended to expand the stacking field or for the case at the piers 303 – 305 PT. Port of Indonesia Persero II will be built a new fertilization field to meet the existing capacity.

CONCLUSIONS AND SUGGESTIONS

CONCLUSION

From the preparation of this final project according to the data that have been obtained above, the author can provide the following conclusions:

1. It is necessary to determine the need for the pier area 303 – 305 at PT. Pelabuhan Indonesia Persero II by looking for an area, so that the performance of the port is fulfilled.
2. The area of the pier area 303 – 305 at PT. Port of Indonesia Persero II has exceeded the service standard, namely in 2018 and 2019, in which it has exceeded 70% of the service standard set.
3. Using a rubber tyred gantry crane (RTG) is found as the main tool in carrying out the loading and unloading process at the container stacking field at the dock area 303 – 305 at PT. Pelabuhan Indonesia Persero II.
4. The YOR from the average container carrying out loading and unloading of goods at the pier 303 – 305 PT. Port of Indonesia II has reached 109.4%. This amount has crossed the YOR limit at a pier so that it interferes with loading and unloading activities and speeds at the pier 303 – 305 PT. Indonesian Port II.
- 5.

SUGGESTION

In preparing this final project, the author can give some suggestions as follows:

1. It requires an extension of the pier in the pier area 303 – 305 at PT. Pelabuhan Indonesia Persero II in 2018 and 2019, namely in 2018 it was

557.31 meters or had to increase the length of 107.31 meters and in 2019 it was 616.49 meters or had to increase the length of 166.49 meters, so that the BOR created > 70%.

2. Accurate data can help for accuracy in planning, and the results obtained in order to get closer to the condition of the pier in the pier area 303 – 305 at PT. Pelabuhan Indonesia Persero II.

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