

# Analysis and Design of Precast Cast-In Situ Concrete Composite (Tibar Liquiça Quay, Timor-Leste)

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## Abstract

The quay is a building structure made at sea to connect the land and harbor parts that function as a place for docking or mooring ships that will carry out loading and unloading activities of loading and unloading passengers. The wharf at the Tibar port is operated for loading/unloading general cargo containers. The dimensions of the floor plate for the wharf are 75cm, T4 transverse beams 6,900 x 1,500 x 1,500 m, longitudinal beams 5,400 x 1,750 x 1,500 m, pile cap 1.69 m<sup>2</sup> and pile foundation length The pile for the diameter of 1.5 m is 80 m, the Pile of 1.8 m is 81 m. The wharf has a length of 630 m, a width of 62 m and a depth of 16 m and the structure type of this pier is reinforced concrete and steel piles.

## Keywords :

Beam, Piles, Precast, Quay

## 1. Introduction

Port an important infrastructure, especially for sea transportation, with this transportation, the distance needed will be felt faster, especially for the economic development of an area where the center of consumer goods production can be marketed quickly and smoothly The wharf itself is a building structure made at sea to connect the land and harbor parts that function as a place for docking or tying ships that will carry out loading and unloading activities of loading and unloading passengers. The port of Tibar is operated for loading/unloading general cargo, and containers/goods. This wharf has a length of 630 m, a width of 62 m and a depth of 16 m and the type of structure of this pier is reinforced concrete and steel piles. Precast or precast concrete itself, as the name implies, this type of concrete is concrete that has been printed and made first somewhere before being used on a construction site.

## 2. Research methods

The research was conducted for three months starting on August 24, 2020 until December 4, 2020, the location of this research was carried out at an international port located in Tibar, Timor-Leste. The data collection technique was carried out by collecting data at the location and getting help from the owner, namely PMU-TBPP, looking for references from journals on the internet, and getting support from supervisors.

## 3. Results and Discussion

For the pile foundation under crane beam, steel tubular pile with diameter of 1.8m used, other row of piles use 1.5m steel tubular piles. The thickness of all the pile will be changed at elevation of -20.0m CD based on the the bending moment distribution (around the second zero point of bending moment) and the minimum embedded length requirement., The thickness of the section above -20.0m CD for the two rows of  $\Phi 1500$  steel tubular piles on landside is 24mm, and 22mm adopted for other steel tubular piles. The thickness of the section below -20.0m CD for all the steel tubular piles are 20mm. Piles and beams are modeled using beam elements, and slabs that supported on the beams are modeled by shell elements. And other longitudinal beam dimension is 5400 x 1,750 x 1,500 mm and transverse beam dimension is 6,900 x 1,500 x 1,500 , 5230 x 1500 x 1500.

### 3.1 Quai Contruction part

Quay can be classified into several parts as follows:

1. Upper : Structure  
The superstructure of the wharf consists of:
2. Slab : Is part of the pier plate to be passed by vehicles going to the ship or from the ship to the mainland.
3. Beam : Is a series of girders extending from the construction of the pier and is a stiffener and supports the floor slab.

The foundation is a part of the pier that is embedded or connected to the ground, the function of the foundation is to withstand the load of the building on it and pass it on to the subgrade. The goal is to obtain a solid and stable state or in other words there will be no large decline, both vertically and horizontal.

### 3.2. Results

For the calculation result of 1800mm piles and 1500mm piles, longitudinal beams and transverse beam are calculated using excel and the results are ok.

Table 1. The Dimention Of Transvers Beam

Structure Member	Dimension LxBxH (mm)	NOS	
T1	5230x1500x1500	71	
T1'	5230x1500x1500	86	
T1-1	5230x1500x1500	10	
T1-2	5230x1500x1500	5	
Transverse Beams	T2	5500x1500x1500	172
	T3	6630x1500x1500	71
	T3-1	6630x1500x1500	15
	T4	6900x1500x1500	86

Table 2. The Dimention Of Longitudinal Beam and slab

Longitudinal Beams	L1	5400x1000(1500)x1500	320
	L2	5400x1250(2000)x1500	80
	PS1	6400x6050x350	60
	PS1-1	6400x6050x350	5
	PS1-1'	6400x6050x350	5
	PS1-2	6400x6050x350	10
Slabs	PS2	6600x6050x350	160
	PS3	6480x6050x350	80
	PS4	7720x6050x350	60
	PS4-1	7720x6050x350	5
	PS4-1'	7720x6050x350	5

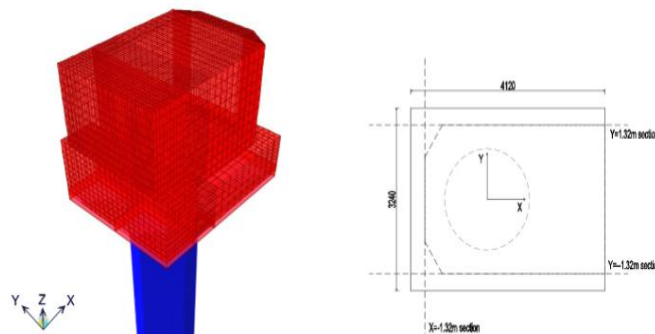
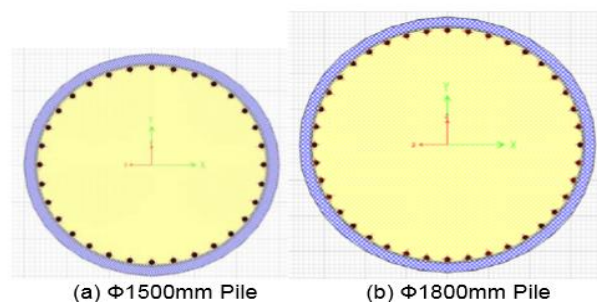


Figure 1. The Dimention of Pile Cap

Pile is part of the structure that is use to receive and transfer (chanel ) the load from the superstructure to the soporting soil which is located at a certain depth



(a)  $\Phi 1500$ mm Pile (b)  $\Phi 1800$ mm Pile  
 Figure 2. The Dimention Of Pile

## 4. Conclusions and recommendations

### 4.1. Conclusion

1. Therefore, the time factor should always be considered. That is also why in the geotechnical industry, majority of the downdrag on pile occurs for piles installed in deep soft clay.
2. For the calculation result from slab to pile are just using manual calculation.

### 4.2. Suggestion

1. The Control system for precast must be better, so that the work is not delayed too long.
2. Set aside a certain area on the construction site to store trash that must be disposed of after the daily work is completed.

## References

- Bagio, T. H. and Tavio (2019) Dasar - dasar Beton Bertulang. 1st edn.  
Project, T. B. P. (2019) Method Statement of Concrete Element.  
SNI 2847:2013 (2013) Persyaratan beton struktural untuk bangunan gedung.  
Tibar Bay Port Project (2019a) Design Calculation for Quay Deck Structures – Beams and Slabs.  
Tibar Bay Port Project (2019b) Design Calculation For Quay Deck Structures – Piles.  
Tibar Bay Port Project (2019c) Factual Report For Supplementary Geotechnical Investigatio.

## Biography

**Ercia Emanuela da Costa**, was born on August 26, 1997 in Laclubar, Manatuto District, Timor-Leste. The eldest of four children. The author started school in elementary to junior high school in Escola Primaria Samoro Soibada Timor-Leste. In 2014 the author decided to continue his education at the Kay-Rala Senior High School Manatuto. Currently the author is studying for a bachelor's degree at Narotama University Surabaya majoring in Civil Engineering

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