An analysis of the static load test on single square pile of 40x40 cm\textsuperscript{2}, using finite element method in Rusunawa project, Jatinegara, Jakarta

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Abstract. Piling Foundation is one of the foundations which is used to penetrate its load through soil layer. The power carried by the piling is obtained from the end bearing capacity, that is, the compressive end piling and friction bearing capacity obtained from friction bearing and adhesive capacity between the piling and the soil around it. The investigation on the Standard Penetration Test is aimed to get the description of soil layer, based on the type and color of soil through visual observation, and soil characteristics. SPT data can be used to calculate bearing capacity. Besides investigating the SPT, this study is also been equipped by taking the samples in laboratory and loading test on the piling and Dutch Cone Penetrometer (DCP) data to confirm its bearing capacity.

This study analyzed bearing capacity and settlement in the square pile of 40X40 cm in diameter in a single pile or grouped, using an empirical method, AllPile program, Plaxis program, and comparing the result with interpreting its loading test in the foundation of Rusunawa project, Jatinegara, Jakarta. The analysis was been done by using the data on soil investigation and laboratory by comparing them with Mohr-Coulomb soil model.

Ultimate bearing capacity from the SPT data in the piling of 15.4 meters was 189.81 tons and the parameter of soil shear strength was 198.67 tons. The sander point, based on Aoki and De Alencar bearing capacity was 276.241 tons and based on Mayerhoff it was 305.49 tons. Based on the loading test of bearing capacity, unlimited bearing capacity for the three methods was Davisson (260 tons), Mazurkiewich (270 tons), and Chin (250 tons). The efficiency of grouped piles according to Converse-Library Equation method = 0.73, according to Los Angeles Group Action Equation method = 0.59, and according to Sheila-Keeny method = 0.94. Bearing capacity based on piling strength was 221.76 tons, bearing capacity based on calendaring data was 201.71 tons, and lateral bearing capacity of a single piling foundation was 129.6 kN (12.96 tons). When the maximum load (280 tons) was been given, more decrease occurred in the Maintained load test of 21.00 mm and Quick Load Test method of 20.67 mm, compared with the result of Load Test in the field of 18.74 mm. Based on ASTM D1143/81, the permitted value was 25.40 mm. Therefore, based on that decreasing, it could be concluded that foundation piles were safe in the construction. The pore water pressure is highly influenced by time so that in Maintained Load Test and Quick Load Test, there was the disparity in the level of pore water pressure. Based on
the result of the calculation, Quick Load Test showed that in pore water pressure was dissipated in its acceleration.

1. Introduction
In planning the Jatinegara Rusunawa project, an accurate foundation is highly important in determining the success in the endurance of the building since a good and correct construction which is in accordance by the age of the constructed building is highly determined by its foundation. Foundation is a very crucial element in civil engineering work because it carries the entire load of the building. The type which is used in the Rusunawa project at Jatinegara is square piles of 40x40 cm produced by Wika Beton and the quality of concrete K-450.

The objective of the research was to calculate the amount of bearing capacity of single square pile foundation, based on several conventional methods. It is obtained based on soil investigation in the field; they were static penetration and SPT (boring log) data for one location from some points of observation and the analysis of the bearing capacity of the single square pile and its settlement, based on data loading test. The bearing capacity was calculated, based on Calendaring data by analyzing piling section and calculating the decrease in the single square pile. To compare the amount of bearing capacity of the single square pile and its settlement by using Finite Element method and Mohr Coulomb soil modeling. To analyze the bearing power of the calculation of some methods and drawing the conclusion or suggestion from the analysis. To study the soil parameter from the SPT (boring log) data so that the input would be inserted for Mohr-Coulomb soil modeling. To recognize the data by understanding the characteristics of soil layer as the model and the analysis of the bearing capacity piles. To evaluate the settlement and the pore water pressure by using Slow Maintained Load Test and Quick Load Test.

1.1. Review of Related Literature
Piling is parts of construction made of wood, concrete, and steel to transmit surface loads to the lower level of the surface in soil mass [1]. Piling construction foundation is used as a building foundation when its base does not have sufficient bearing capacity to carry the building weight and load on it [2]. Or, when and the entire load in the deepest layer of the depth soil surface reach more than eight meters [1].

1.2. Interpretation of Load Test for Bearing Capacity

1.2.1. Davisson Method (1972)
In the Davisson method (1972), the offset limit method is probably the best and widely known. It has been suggested by Davisson as the load which is in accordance by a movement which exceeds elastic pressure (which is assumed by a column which stands by itself) at the value of 0.15 inches and a factor which is relevant to the measurement of Pile Measurement divided by 120.

1.2.2. Mazurkiewicz Method (1972)
The loading procedure of the piling foundation according to Mazurkiewicz method is as follows [3]:
1. The plot of the loading test curve toward the settlement was based on the result of load test in the observed location;
2. Drawing lines from some selected settlement points until they cross the curve;
3. Vertical line is being drawn until it reaches loading pivot;
4. From the cross of the load, a line with an angle of 45° is being made until it crosses the next line;
5. These points are connected until a straight line is formed
6. The cross of the straight line with loading pivot is its ultimate load;
7. This method gives the assumption that loading curve movement forms the shape of parabola;
8. Therefore, the value of the collapsing loads, obtained by using Mazurkiewicz method, should approach 80% of the standardized criteria.
1.2.3. Chin Method
The procedure of ultimate load of the piling foundation by using Chin Method is as follows:
1. Drawing curve between settlement ratio and load (s/Q), where s is settlement and Q is load as shown in Figure 1.
2. Drawing straight line which represents the drawn points. The equation of the line is 
   \[ s/Q = c_1 s + c_2 \]
   Calculating \( c_1 \) from the line equation or from the slope of the straight line which is determined.
3. \( Q_{\text{ult}} = 1/c_1 \). This method produces high ultimate load so that it has to be corrected or divided by the factor value of 1.2 – 1.4.

![Figure 1. Graph of ultimate bearing capacity, using Chin method [4]](image)

1.3. Element Method
In calculating the settlement of square pile foundation by using a program, we need to know about the theory of modeling soil which can be selected. Errors in selecting its model will cause the mistake in the output of the calculation. In this research, the needed data were about soil parameter which was being obtained from the result of soil investigation performed in the Civil Engineering Laboratory of the University of Indonesia in the construction of Rusunawa project, Jatinegara, Jakarta. The gathered data were being processed by using Mohr-Coulomb modeling with Slow Maintained Load Test and Quick Maintained Test.

2. Method
The research has been conducted at the construction project of Rusunawa, West Jatinegara, Kampung Melayu – East Jakarta, as shown in Figure 2.

![Figure 2. Map of the Location of Rusunawa Project at Jatinegara, Jakarta](image)
The data for square pile could be seen in Table 1:

| Location                        | Value          |
|---------------------------------|----------------|
| Bore Hole -2/ S-2               |                |
| Type of Pile Foundation         | Concrete       |
| Pile Size (m)                   | 0.4            |
| Length of Pile (m)              | 15.4           |
| Area of Pile Section (m²)       | 0.16           |
| Elasticity Module (kN/m²)       | $f'_c = 42$    |
| Inertia Moment (m⁴)             | $2.133 \times 10^4$ |
| EA (kN)                         | $4.874 \times 10^6$ |
| EI (kNm²)                       | $6.498 \times 10^5$ |
| Poisson's Ratio                 | 0.2            |

### 3. Results and Discussions

From the result of loading static test, it was found that the data of loading test reading at P-321 is at the following Table 2.

| Holding Time | Day | Load | % of Design Load | Settlement Average |
|--------------|-----|------|------------------|--------------------|
| 0 minutes    | 0.000 | 0.000 | 0.000 | 0.000 |
| 60 minutes   | 0.042 | 35.000 | 43.541 | 350.000 | 25% | 1.330 |
| 60 minutes   | 0.042 | 70.000 | 87.082 | 700.000 | 50% | 3.120 |
| 20 minutes   | 0.014 | 35.000 | 43.541 | 350.000 | 25% | 2.230 |
| 60 minutes   | 0.042 | 0.000 | 0.000 | 0.000 | 0% | 0.290 |
| 0 minutes    | 0.000 | 0.000 | 0.000 | 0.000 | 0% | 0.000 |
| 20 minutes   | 0.014 | 70.000 | 87.082 | 700.000 | 50% | 3.030 |
| 60 minutes   | 0.042 | 105.000 | 130.623 | 1050.000 | 75% | 4.750 |
| 60 minutes   | 0.042 | 140.000 | 174.164 | 1400.000 | 100% | 6.360 |
| 20 minutes   | 0.014 | 105.000 | 130.623 | 1050.000 | 75% | 6.020 |
| 20 minutes   | 0.014 | 70.000 | 87.082 | 700.000 | 50% | 4.690 |
| 60 minutes   | 0.042 | 0.000 | 0.000 | 0.000 | 0% | 0.930 |
| 0 minutes    | 0.000 | 0.000 | 0.000 | 0.000 | 0% | 0.000 |
### 3.1. Calculating the Bearing Capacity of Piling, based on Load Test

#### 3.1.1. Calculating the bearing capacity of Piling from the load data, using Davisson M.T. Method

The procedure of determining ultimate load from the piling foundation by using Davisson M.T. method was as follows:

1. Based on the equation, it was plotted in the diagram of load - settlement as OO’ to get the best scale of line slope of OO’ about 20% (see the Graph below).
2. The deformation of X, calculated by the following formula:
   \[ X = 0.15 + \frac{D}{12} \text{ (inch)} \]
   
   with \( D \) = size of piles (inches).
3. Plotting CC’ line, make it parallel with OO’ line which crosses in the settlement pivot in the meaning of X inch.
4. Crossing line is the amount of the tip pile settlement to get the bearing capacity. Loading Limit \( (Q_{ult}) \) was defined as load in which CC’ line crosses the curve of settlement load.

**Calculation:**

\[ X = 0.15 + \frac{D}{12} \text{ (inch)} \]
\[ = 0.15 + \frac{40/2.54}{120} \]
\[ = 0.281 \text{ inch} = 7.1374 \text{ mm} \]
By drawing this line in the load-settlement curve, it was found that the maximum load ($Q_u$), using Davisson M.T method, was 260 tons as shown in Figure 4.

3.1.2. Calculating the Bearing Capacity of Piling from the Loading Data, using Mazurkiewicz Method
The procedure of determining ultimate load from the piling foundation by using Mazurkiewicz method is as follows:
   a. Plotting the load curve test given to settlement;
   b. Drawing the line from several points of the chosen settlement so that they cross the curve, and drawing a vertical line so that it crosses loading pivot.
   c. From the secant of each load, make a line with the angle of 45° toward the next secant, and so on.
   Connect these points so that they produce a straight line. The intersection line of this straight line with the load is its final load.

By drawing this line in the load-settlement curve, it was found that the maximum load ($Q_u$), using Mazurkiewicz method is 270 tons as shown in Figure 5.

3.1.3. Calculating the bearing capacity of piling from the loading data, using Chin method
The procedure of determining ultimate load from the piling foundation by using Chin method is as follows:
   1. Calculating S/P value from the settlement data (S) and load (P);
   2. Describing S value in x pivot and s/P value in pivot to get the points as shown in Figure 6;
   3. Connecting the points which have been made with step 2 to get a linear line;
4. Drawing the linear equation with regression analysis;
5. Determining P_{ak} of (1/b).

![Figure 6. Equation of linear line in S/P versus S](image)

In the calculation of piling through load test data by using Chin method, it is necessary to calculate the ratio of settlement toward the load, as it is shown in Table 3 below:

| No | Load (Ton) | Cycle % | Settlement (mm) | Settlement/Load (mm) |
|----|------------|---------|-----------------|----------------------|
| 1  | 0.000      | 0       | 0.000           | 0.000                |
| 2  | 70.000     | 50      | 2.830           | 0.045                |
| 3  | 140.000    | 100     | 5.630           | 0.047                |
| 4  | 210.000    | 150     | 9.210           | 0.054                |
| 5  | 280.000    | 200     | 12.020          | 0.067                |

![Figure 7. Soil bearing capacity, based on Chin method](image)

From the equation of linear regression in the graph, the correlation of comparison of settlement and load with the settlement is that Q_{ak} = 250 tons or 2451.66 kN as in Figure 11.

3.2. Finite Element Modeling
Calculating the settlement of square pile foundation with finite element program in which soil layer is divided into seven soil layers, as it can be seen in Table 4 below:
Table 4. Input of soil parameter for finite element modeling in bore hole -2

| No. | Lap | Type of Soil                  | Depth (m) | N-GPT | Subsurface Condition | Land Surface (m) | ? wet (kN/m²) | ? dry (kN/m²) | Ks (m/h) | Ky (m/h) | ε | O | ? | Mode-Continum Model |
|-----|-----|-------------------------------|-----------|-------|----------------------|------------------|--------------|--------------|-----------|----------|---|---|---|---------------------|
| 0   | 0   | Silty Clay, reddish brown     | 0         | 0     | medium stiff         |                  | 0.0000       | 0.0000       | 0.0000    | 0.0000    | 0.0000 | 0.0000 | 0.0000 |                     |
| 1   | 1   | Silty Clay, reddish brown     | 1         | 2     | medium stiff         | 17.5000          | 12.7500       | 8.0000       | 0.0000    | 0.0000    | 0.0000 | 0.0000 | 0.0000 |                     |
| 2   | 2   | Silty Clay, reddish brown     | 2         | 2     | medium stiff         | 17.5000          | 12.7500       | 8.0000       | 0.0000    | 0.0000    | 0.0000 | 0.0000 | 0.0000 |                     |
| 3   | 3   | Silty Clay, reddish brown     | 3         | 11    | stiff                | 17.5000          | 12.7500       | 8.0000       | 0.0000    | 0.0000    | 0.0000 | 0.0000 | 0.0000 |                     |
| 4   | 4   | Silty Clay, reddish brown, gre | 4         | 16    | stiff                | 17.5000          | 11.9300       | 8.0000       | 0.0000    | 0.0000    | 0.0000 | 0.0000 | 0.0000 |                     |
| 5   | 5   | Clayey silt, reddish brown    | 5         | 14    | medium stiff         | 17.5000          | 11.9300       | 8.0000       | 0.0000    | 0.0000    | 0.0000 | 0.0000 | 0.0000 |                     |
| 6   | 6   | Clayey silt, reddish brown    | 6         | 2     | medium stiff         | 6.00            | 17.5000       | 11.9300       | 8.0000    | 0.0000    | 0.0000 | 0.0000 | 0.0000 |                     |
| 7   | 7   | Clayey silt, reddish brown    | 7         | 5     | medium stiff         | 6.00            | 17.5000       | 11.9300       | 8.0000    | 0.0000    | 0.0000 | 0.0000 | 0.0000 |                     |
| 8   | 8   | Silty brown                   | 8         | 5     | medium stiff         | 6.00            | 17.5000       | 8.59000      | 0.0000    | 0.0000    | 0.0000 | 0.0000 | 0.0000 |                     |
| 9   | 9   | Silty brown                   | 9         | 6     | medium stiff         | 6.00            | 17.5000       | 8.59000      | 0.0000    | 0.0000    | 0.0000 | 0.0000 | 0.0000 |                     |
| 10  | 10  | Silty brown                   | 10        | 8     | medium stiff         | 6.00            | 17.5000       | 8.59000      | 0.0000    | 0.0000    | 0.0000 | 0.0000 | 0.0000 |                     |
| 11  | 11  | Silty brown                   | 11        | 9     | medium stiff         | 6.00            | 17.5000       | 8.59000      | 0.0000    | 0.0000    | 0.0000 | 0.0000 | 0.0000 |                     |
| 12  | 12  | Silty brown                   | 12        | 12    | medium stiff         | 6.00            | 17.5000       | 8.59000      | 0.0000    | 0.0000    | 0.0000 | 0.0000 | 0.0000 |                     |
| 13  | 13  | Silty brown                   | 13        | 23    | medium stiff         | 6.00            | 17.5000       | 8.59000      | 0.0000    | 0.0000    | 0.0000 | 0.0000 | 0.0000 |                     |
| 14  | 14  | Silty brown                   | 14        | 12    | medium stiff         | 6.00            | 17.5000       | 8.59000      | 0.0000    | 0.0000    | 0.0000 | 0.0000 | 0.0000 |                     |
| 15  | 15  | Silty sand brown              | 15        | 42    | dense               | 6.00            | 14.5500       | 8.59000      | 0.0000    | 0.0000    | 0.0000 | 0.0000 | 0.0000 |                     |
| 16  | 16  | Clayey silt, brown            | 16        | 44    | fluid               | 6.00            | 14.5500       | 8.59000      | 0.0000    | 0.0000    | 0.0000 | 0.0000 | 0.0000 |                     |

This modeling according to the field soil parameter as it is seen in Table 2 and outline it can be seen in Figure 8.

Figure 8. Soil Layer and Square Pile Modeling

The magnitude of settlement as the result of loading with element modeling was seen in Table 5.

Table 5. The Correlation of Loads and Settlements with Finite Element Modeling

| No. | Remark | Load (Ton) | Settlement Loading Test (mm) | Settlement FEM (mm) | Time (Minute) |
|-----|--------|------------|------------------------------|---------------------|---------------|
| 1   | 0%     | 0          | 0.00                         | 0.00                | 0             |
| 2   | 25%    | 35         | 1.33                         | 2.22                | 60            |
| 3   | 50%    | 70         | 3.12                         | 4.73                | 60            |
| 4   | 25%    | 35         | 2.23                         | 2.60                | 20            |
| 5   | 0%     | 0          | 0.29                         | 0.05                | 60            |
| 6   | 0%     | 0          | 0.00                         | 0.00                | 0             |
| 7   | 50%    | 70         | 3.03                         | 4.73                | 20            |
| 8   | 75%    | 105        | 4.75                         | 7.54                | 60            |
| 9   | 100%   | 140        | 6.56                         | 12.25               | 60            |
| 10  | 75%    | 105        | 6.02                         | 9.98                | 20            |
| 11  | 50%    | 70         | 4.69                         | 7.57                | 20            |
| 12  | 0%     | 0          | 0.93                         | 1.24                | 60            |
| 13  | 0%     | 0          | 0.00                         | 0.00                | 0             |
| 14  | 50%    | 70         | 3.41                         | 5.55                | 20            |
| 15  | 100%   | 140        | 6.76                         | 10.53               | 20            |
| 16  | 125%   | 175        | 9.05                         | 13.18               | 70            |
| 17  | 150%   | 210        | 11.43                        | 18.68               | 60            |
| 18  | 125%   | 175        | 10.79                        | 16.45               | 20            |
| No | Remark | Load (Ton) | Settlement | Time (Minute) |
|----|--------|------------|------------|---------------|
|    |        |            | Loading Test (mm) | FEM (mm) |           |
| 19 | 100%   | 140        | 9.61       | 14.19        | 20         |
| 20 | 50%    | 70         | 6.66       | 9.10         | 20         |
| 21 | 0%     | 0          | 2.22       | 1.21         | 60         |
| 22 | 0%     | 0          | 0.00       | 0.49         | 0          |
| 23 | 50%    | 70         | 4.91       | 4.92         | 20         |
| 24 | 100%   | 140        | 6.49       | 9.62         | 20         |
| 25 | 150%   | 210        | 11.78      | 17.09        | 20         |
| 26 | 175%   | 245        | 14.87      | 17.91        | 90         |
| 27 | 200%   | 280        | 18.74      | 21.00        | 720        |
| 28 | 150%   | 210        | 17.80      | 17.09        | 60         |
| 29 | 100%   | 140        | 14.87      | 13.05        | 60         |
| 30 | 50%    | 70         | 11.69      | 7.75         | 60         |
| 31 | 0%     | 0          | 6.72       | 1.78         | 120        |

3.2.1. Curve of the Correlation of Loads with Loading Settlement 50% (Cycle I)

The curve below shows the correlation of loads and settlement which occur when the load is 50% of the working load, as it was shown in Figure 9.

![Figure 9. Curve of Correlation of Loads with Settlement 50%](image)

3.2.2. Curve of the Correlation of Loads with Loading Settlement of 100% (Cycle II)

The curve below shows the correlation of loads and the settlement which occurs when the load is 100% of the working load as it seen in Figure 10.

![Figure 10. Curve of the Correlation of Loads with Settlement 100%](image)
3.2.3. Curve of the Correlation of Loads with Loading Settlement of 150% (Cycle III)
The curve below shows the correlation of loads and settlement which occurs when the load was 150% of the working load, as shown in Figure 11.

![Figure 11](image1.png)

**Figure 11.** Curve of the Correlation of Loads with Settlement 150%

3.2.4. Curve of the Correlation of Loads with Load Settlement of 200% (Cycle IV)
The curve below shows the correlation of loads with the settlement which occurs when the load was 200% of the working load, as shown in Figure 12.

![Figure 12](image2.png)

**Figure 12.** Curve of the Correlation of Loads with Settlement 200%

3.2.5. Comparison between the Result of Load Test in the Field and Finite Element.
The total result of the correlation of loads with the settlement as the result of Finite Element Modeling will yield the graph as shown in Figure 13.
The result of the comparison of N-SPT bearing capacity with finite element can be seen in Table 6 below:

**Table 6. The comparison between N-SPT bearing capacity with the finite element**

| Depth (m) | Qult N-SPT (kN) | Qult FEM (kN) |
|-----------|-----------------|---------------|
| 3         | 304.53          | 563.22        |
| 5         | 493.33          | 887.74        |
| 7         | 527.47          | 1046.64       |
| 9         | 654.40          | 1389.64       |
| 14        | 1452.27         | 1815.00       |
| 15.4      | 1898.13         | 2273.60       |

3.3. Finite Element Modeling in Soil and Pile Layer, based on Quick Load Test
Modeling is the same as modeling in the type of Slow Maintained Load Test, but in the Quick Load Test modeling, the load test was modeled until 300% of the planning. However, because the result of the Quick Load Test modeling will being compared with Slow Maintained Load Test, at the time the result of modeling was taken into the input, its maximum is in 200% so that its disparity could be evaluated.

3.4. Correlation of Loads with Settlement, Using Finite Modeling with Quick Load Test
The amount of settlement as the result of load with finite modeling can be seen in Table 7. The following is the comparison between both of it from 0% - 300% by using Quick Load Test which seen in the Graph of Figure 14 below:
3.5. Correlation of Pore Water Pressure with the Time between Slow Maintained Load Test and Quick Load Test in Finite Element

The pore water pressure which will dry gradually can cause the incidence of secondary consolidation. The drying up of the pore water brings about the decrease in pore water toward the soil settlement behavior. The amount and the fluctuation of pore water depend on its content, the degree of saturation, permeability, solidity, elasticity, the possibility of lateral deformation, the amount of load, and the acceleration of loading. Figure 15 shows the comparison between pore water pressure in Slow Maintained Load Test and Quick Load Test.

![Figure 15](image)

**Figure 15.** Graph of the comparison of pore water pressure with time between Slow Maintained Load Test and Quick Load Test in Finite Element

3.6. Comparison of Finite Element Modeling between Slow Maintained Load Test and Quick Load Test Method

3.6.1. Correlation of Load and Slow Load Test with Quick Load Test

| Cycle | Percent (%) | Loads (Tons) | Settlement Slow Maintained Load Test (mm) | Time (Minute) | Settlement Quick Load Test (mm) | Cumulative Time (Minute) |
|-------|-------------|--------------|------------------------------------------|---------------|---------------------------------|------------------------|
| I     | 0           | 0            | 0.00                                     | 0             | 0.00                            | 0                      |
|       | 25          | 35           | 2.72                                     | 60            | 2.72                            | 5                      |
|       | 50          | 70           | 4.12                                     | 60            | 4.32                            | 10                     |
|       | 25          | 35           | 2.60                                     | 20            | 2.60                            | 15                     |
|       | 0           | 0            | 0.01                                     | 60            | 0.01                            | 20                     |
| II    | 50          | 70           | 5.02                                     | 0             | 4.96                            | 25                     |
|       | 75          | 105          | 7.54                                     | 20            | 7.48                            | 30                     |
|       | 100         | 140          | 12.25                                    | 20            | 12.20                           | 35                     |

Table 7. Correlation of Load and slow load test settlement with quick load test
Conclusions
1. The result of the calculation of the ultimate bearing capacity analysis on square pile foundation with 15.4 m length and the result of statistic load interpretation/loading test by using Mazurkiewicz method showed that it was the closest to the value of planning final load. The other methods which were also close to it were Davidson method, Chin method, and Calendaring method. The sequence of the result could be seen in Table 8 below:

Table 8. The Result of the analysis on Ultimate Bearing Capacity of Square Pile Foundation

| No. | Explanation               | Ultimate Pile Bearing Capacity (ton) |
|-----|---------------------------|--------------------------------------|
| 1   | N-SPT                     | 189.81                               |
| 2   | Calendaring               | 201                                  |
| 3   | FEM                       | 227.36                               |
| 4   | Chin Method               | 250                                  |
| 5   | Davidson Method           | 260                                  |
| 6   | Mazurkiewicz Method       | 270                                  |
| 7   | Loading Test              | 280                                  |

2. The result of the analysis of the settlement in Cycle IV at the load of 200% was the maximum value for static load test/load test of 18.74 mm. Finite elements modelling by using Slow Maintained Load Test was 21 mm and by Quick Maintained Load Test was 20.67 mm.

3. Pore water pressure was highly influenced by the Time so that it can be concluded that between Slow Maintained Load Test and Quick Load Test there was the disparity in the pressure level of pore water. From the result of the calculation, it was found that Quick Load Test showed that pore water pressure made pore water more dissipated.

Acknowledgements
The authors gratefully acknowledge that the present research is supported by Ministry of Research and Technology and the Higher Education Republic of Indonesia. The support is under the research grant BP-PTN USU of The Year 2016 Contract Number BT041.

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