

PILE DRIVING WITH JACK-IN PILE AT BUILDING PROJECT

Sentosa Limanto
Civil Engineering
Petra Christian University
Jln. Siwalankerto 121-131,
Surabaya, 60236
Telp: (031) 8439040
leonard@petra.ac.id

Jonathan H. Kusuma
Civil Engineering
Petra Christian University
Jln. Siwalankerto 121-131,
Surabaya, 60236
Telp: (031) 8494830
jkusuma@petra.ac.id

Agustine, W. and Ricky, G.
Alumni of Civil Engineering
Petra Christian University
Jln. Siwalankerto 121-131,
Surabaya, 60236
Telp: (031) 8494831

Abstract

Piling on building projects in urban or densely populated areas is done by a jack-in system by using a jack-in pile type hydraulic static pile driver to be free of noise, vibration and pollution. In residential area, it should be used jack-in pile to minimize disturbance to the environment because it does not cause vibration and noise compared other piling tool. Globalization which is happening in the construction bussines requires its main actors are in an invironment of increased competiton so it have to used a competitive piling tool. Construction of deep foundation have an very complex structure, one type of tool that is often used stake is Jack-in Pile. That is piling system which implementation is pressed into the ground using hydraulic jack. The analysis conducted with how long piling activity takes time at one point piling. It is showed the ranking of each activity at one point piling and the mobilization activity need 3 hours and 48 minutes.

Key Words: deep foundation, hydraulic jack, jack-in pile, mobilization, time

INTRODUCTION

Globalization which is happening in the construction business requires its main actors are in an environment of increased competition. One of the fundamental factors that influence competitive ability in the construction business is goodwork. Therefore, the measurement and improvement of work's quality in each construction project are very important to achieve the objectives and results expected [1].

One type of work that plays an important role in determining the fast or slow a project and need to be considered the result of goodwork is foundation. It is part of a building structure which relates directly to the ground and serves to transfer the load to the ground by the structures [2].

For piling in residential areas, should be used jack-in pile to minimize disturbance to the environment because it does not cause vibration and noise when compared with other piling tool [3].

This study therefore was designed to know the productivity of piling a point and a single pile with a jack-in pile. It also expected to be useful for researchers to know one point activity of piling with the condition of the soil type is clay [8]. Construction project is successful if the project is running and completed in accordance with planned schedule.

Piling activity is affected by many factors [4], as follows:

Labor

Projects may not be able to do without the human resources involved in it. Productivity can be obtained with appropriate management workers. Factors affecting workers' performance are skill, experience, age, discipline, motivation, education, ethnicity, health, and initiatives

Conditions of Work Projects :

- a). Job and the degree of difficulty scale
- b). The type of soil on the project and overcome it
- c). The accessibility of jobs in the field (haul road).
- d). Utility equipment (tools) and machine working efficiency.
- e). Local weather.

Unproductive Work Activities :

- a). Rework
- b). Suspension of project work.
- c). Absentee time, including the late start and early quits.
- d). Holiday (Idul Fitri holidays, etc.).
- e). Work accident

Construction of deep foundation have a very complex structure than the shallow foundation construction [5]. One type of tool that is often used stake is Jack-in Pile. Jack-in pile is a pile piling system which implementation is pressed into the ground using hydraulic jack. This tool has several types on the basis of how to move such as Jack-in type Hydraulic Static Pile Driver and Jack-in Pile type crawler.

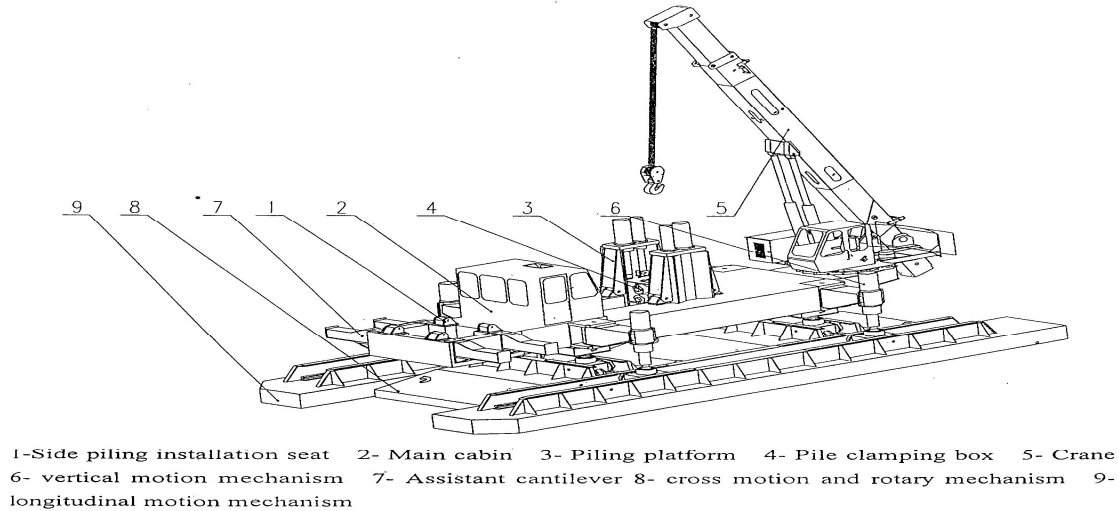


Figure 1 ZYJ240A hydraulic static pile driver

Jack in Pile type Hydraulic Static Pile Driver has four legs which is called the support sleeper. This tool has the ability to mobilize that tends to slow compared to Jack-in Pile-type crawler, but is able to stake a large diameter pile. This tool is supported by mobile cranes and generators.

Implementation of a jack-in pile is done in several stages:

- a) Lifting piles with the aid of mobile crane if there is no service crane in that machine.
- b) Slowly entering the pile into grip
- c) Jack-in system will be up and clamp pile. When the pile was held tightly by the grip, then the pile began to be pressed by a hydraulic system.
- d) After finishing piling the first pile (lower), crane will take the second pile and repeat back as the first stage.
- e) Then for combining the pile, workers using welding system
- f) After finishing piling the second pile, for pressing pile to the same level with ground, workers using another pile which is called "ruyung".

RESEARCH METHODOLOGY

This research done by observation and data collection at project. The study was conducted at three floor building project, that serves as a showroom, repair shop and car rental, located at West Surabaya. Data collection from the building project, that sampling's pile as much as 90 points from 258 points of piling

The activities reviewed for piling one point pile, among others:

- a) Mobilization of equipment
Piling equipment moves from one point to another piling point that have been previously marked. Dimensions large enough tools, methods of tool motion and soil conditions affect the speed of motion.
- b) Binding of Pile 1 (Lower)
Binding of pile made by worker using a rope sling, or steel. Binding done approximately 50 cm from the head.
- c) Intake of Pile 1
Piles tied to the anchor of mobile cranes, then slowly lifted the pile and brought close to the machine. Workers who have standby, helping for direct pile into well positioned as a point in alignment with the mark piling.
- d) Emphasis Pile 1
After the setup process is completed, the pile can be emphasised. Emphasis is controlled by the operator within the cabin.

- e) Intake of Pile 2 (Upper)
While machine emphasis the pile, mobile crane took the next pile which is already bound for lifted into the machine.
- f) Initial emphasis Pile 2
When the second pile has been held tightly by the grip, then pile pushed up to the limit workers doing welding.
- g) Welding Connection
Welding began to do if piles have exactly coincide and there is no cavity. Iron bars will be added if there is cavity
- h) Continued emphasis Pile 2
If welding has been completed, the pile continued emphasis. Pile Continued to be pressure until it reach the base of the grip hole machine.
- i) Taking “Ruyung” (Tool Push)
Ruyung usually made by iron and it dimension is equal to the pile. Ruyung was taken with the aid of mobile crane and inserted as the pile-taking process
- j) Emphasis “Ruyung”
If ruyung has been in contact with the pile connection, then the emphasis was continued until the pile’s head flat with ground. If the pile can not be suppressed again, then the emphasis was stopped.

Besides these activities, there is idle time that also include to be count in this research such as delay, unemployment, smoking, taking a rest, etc.

While activities are reviewed for piling one pile that is at the lower pile section, include:

- a) Mobilization of equipment
- b) Binding of Pile 1 (Lower)
- c) Intake of Pile 1
- d) Emphasis Pile 1

Data obtained from the observation in the field will be displayed using Microsoft Office Excel software and then processed with the program Statistical Package for Social Scientist (SPSS 16). For the analysis used the mean analysis, ranking analysis and Kolmogorov-Smirnov test.

Mean Analysis aims to identify whether the average value of each of the existing piling activities. To find the mean you can use the following formula:

$$S = \sqrt{\frac{\sum_{i=1}^N (X_i - \bar{X})^2}{N - 1}} \quad (1)$$

S = standard deviation

X_i = the data to - i (sequence data)

\bar{X} = average (mean)

N = number of data

Procedure One-Sample Kolmogorov-Smirnov with SPSS 16 [6], used to test the hypothesis of a sample of a particular distribution. The good news is no need to lose information due to merger of the categories, and this test can still run even if the number of samples small. This test was conducted to determine validity of a data obtained can be used whether or not, judging from the results confirming the normal distribution.

Rank analysis aims to identify the most decisive factor is the mean value of the largest and most factors did not determine the smallest mean values based on parameter influence.

ANALYSIS AND DISCUSSION

Table 1. - Table 4. displays the analysis results of research carried out by using excel and SPSS16 assistance programs, where from all the results of that analysis can be known duration, rating, mean, standard deviation for fixing a point piling.

From Table 1. Result of one-sample test analysis, mobilization take 3 hours 35 minutes.

From Table 2. Ranking analysis for each activity at one point piling, mobilization is ranking one (3 hours and 48 minutes).

From Table 3. Case types that cause idle which release ruyung is the activity that often occurs and causes delay (ten piece)

Table 1. Results of One-Sample Test Analysis with SPSS 16 for 1 Point Piling

Information	Mobilization	Bind Pile 1	Take Pile 1	Press Pile 1	Take Pile 2	Initial Press Pile 2	
No	1	2	3	4	5	6	
N	79	90	90	90	90	90	
Normal Parametersa	Mean	03:35	00:32	02:15	02:30	01:01	00:24
	Std. Deviation	03:32	00:09	00:48	00:24	00:29	00:07
Kolmogorov-Smirnov Z	1,954	1,113	1,646	1,484	1,332	1,781	
Asymp. Sig. (2-tailed)	0,001	0,168	0,009	0,024	0,057	0,004	

a. Test distribution is Normal.

Table 2. Results of One-Sample Test Analysis with SPSS 16 for 1 Point Piling (continuation)

Information	Weld Pile 2	Continued Press Pile 2	Take Ruyung	Press Ruyung	Idle-Time	
No	7	8	9	10	11	
N	90	90	89	89	37	
Normal Parametersa	Mean	01:45	03:04	00:38	01:53	02:16
	Std. Deviation	00:55	00:33	00:19	00:48	02:13
Kolmogorov-Smirnov Z	1,837	0,718	2,294	2,264	1,328	
Asymp. Sig. (2-tailed)	0,002	0,681	0,000	0,000	0,059	

a. Test distribution is Normal.

Table 3. Ranking Analysis for Each Activity at One Point Piling

No	Activity	a) Mean	Rank
1	Mobilization	03:48	1
2	Bind Pile 1	00:32	10
3	Take Pile 1	02:16	5
4	Press Pile 1	02:30	3
5	Take Pile 2	01:01	8
6	Initial Press Pile 2	00:24	11
7	Weld Pile 2	01:47	7
8	Continued Press Pile 2	03:05	2
9	Take Ruyung	00:38	9
10	Press Ruyung	01:56	6
11	Idle Time	02:16	4

Factors of piling condition on project are:

Conditions of equipment :

- a). Age of tool (never done maintenance)
- b). Grip welding performed on a nearly off
- c). Jack Removal
- d). Damage to the mobile crane (as a broken axle)
- e). Conditions at around project
- f). Poor soil conditions
- g). Unfriendly weather (rain, lightning)

- h). Access in and out of the project
- i). Complaints from residents (project was delayed a few months)

Human resource factors :

- a). Workers less coordinated.
- b). Machine operators are not held by the experts.
- c). Unemployed workers.
- d). Workers fatigue due to working late into the night.
- e). Lack of ability to make decisions quickly and accurately.
- f). Workers who are not spirited and impressed relaxed.

Table 4. Case Types that Cause Idle and The Percentage occurrence

No.	Case Types	Quantity (piece)	Percentage (%)
1	Remarked for piling	7	18.421
2	Release Ruyung	10	26.316
3	Bad Weather	2	5.263
4	Refuel	1	2.632
5	Discussion	3	7.895
6	Unemployed Workers	9	23.684
7	Repair Soil Condition	3	7.895
8	Repair Tools	1	2.632
9	Preparation Pile	2	5.263
	Total	38	100

From Table 3, known that release ruyung is the activity that often occurs and causes delay, while the rare is refueling and repairing tools.

CONCLUSION

Based on test data observations on piling project with non-parametric statistical method of one sample Kolmogorov-Smirnov test conducted on two kinds of the above conditions can be seen that the data distribution is normal, so the data observations are valid and can be used

From the analysis of ratings that have been made to all activities, found that the mobilization of equipment to the destination point is the most influential events for the two observation conditions. The analysis conducted with how long piling activity takes time at one point piling, it is showed mean of the mobilization activity need 3 hours and 48 minutes.

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