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METHOD OF IMPLEMENTATION AND QUALITY CONTROL OF SHEARWALL IN PODOMORO GOLF VIEW APARTMENT PROJECT

Vigie Priantika Putra Hutama
Institut Sains dan Teknologi Nasional, South Jakarta, Indonesia
Email : vigiepriantikaputra@gmail.com

ABSTRACT

Shearwalls are an important structural element used in high-rise buildings to withstand lateral forces due to earthquakes, serving as a building reinforcement and stabilizer. This study aims to understand the stages of shear wall implementation and quality control processes in the field, especially in the Podomoro Golf View Apartment project on Dahoma Tower, 15th floor, zone D4, with SW3 shear wall type. Data is collected through field reviews, interviews, and documentation, as well as additional data from the project. The results of the study show that the implementation of SW3 shear wall is in accordance with the schedule and standards, using BJTD 40 threaded steel that has been tensile tested according to the requirements. The casting and dismantling method of formwork speeds up the binding time of concrete. Although some defects were found on the side of the shear wall, repairs were made immediately, and concrete treatment was carried out to ensure quality. The quality of concrete on the shear wall reaches Fc 30 with a slump test value of 12 ± 2 cm, in accordance with the provisions of PBI 1971. The entire construction project of Podomoro Golf View Apartment is going according to the plan and requirements, although there are some minor issues that can be tolerated and overcome.

Keywords: Implementation Method, Shear wall, Quality Control

INTRODUCTION

Shearwalls are an important structural element commonly used in high-rise buildings to withstand lateral forces arising from earthquakes (Casagrande et al., 2021; Pan et al., 2020; Simon et al., 2023; Wasey et al., 2022). This element serves as a reinforcement and stabilizer of the building, ensuring that other structural elements have a balanced strength and do not undergo excessive deformation during earthquake events (Khajehpour et al., 2022; Mestar et al., 2021; Mo et al., 2021; Polastri & Casagrande, 2022; Wenzel et al., 2022). With its important role, the determination of the location of the shear wall is greatly influenced by the symmetry of the building structure, the height of the building, and the perception and experience of the structural planner (Koohfallah et al., 2024; Rinaldi et al., 2021; Yenidogan et al., 2021; Zhang et al., 2021).

In the Podomoro Golf View Apartment project, special attention is paid to the implementation of the shear wall in Dahoma Tower, especially on the 15th floor, zone D4, with the SW3 shear wall type. This observation aims to understand more deeply about the

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stages of shear wall implementation and how the quality control process is carried out in the field. In its implementation, the shear wall must meet various strict technical requirements to ensure its strength and ability to withstand lateral forces effectively.

One of the main objectives of this observation is to study each stage of the observed shear wall implementation in detail. These stages include initial preparation, formwork installation, repetition, concrete casting, and concrete treatment after casting. Each step has procedures and standards that must be followed to achieve optimal final results.

In addition to studying the implementation stages, this study also focuses on the quality control process of shear walls. This quality control is very important to ensure that the quality of the shear wall produced in the field is in accordance with the requirements that have been set. This process involves various material quality tests, visual inspections, and structural tests to ensure that no defects can affect the shear wall's performance in the face of lateral forces. Through careful observation, this study is expected to provide a clear picture of the effectiveness of the quality control process and the quality conformity of the shear wall with existing requirements.

This observation aims to understand more deeply about the stages of sliding wall implementation and how the quality control process is carried out in the field. Research by Polastri & Casagrande (2022) supports the importance of strict quality control in maintaining structural integrity. One of the main objectives of this observation is to study each stage of the observed sliding wall execution in detail. These stages include initial preparation, formwork installation, repetition, concrete casting, and concrete treatment after casting. Each step has procedures and standards that must be followed to achieve optimal final results. The novelty of this study lies in the detailed examination of the quality control measures specific to SW3 sliding walls in the context of tall buildings. Through careful observation, this study is expected to provide a clear picture of the effectiveness of the quality control process and the quality conformity of sliding walls with existing requirements.

RESEARCH METHODS

The project location is at the Cimanggis Toll Exit, Bojongnangka Village, Gunung Putri, Bogor Regency. The main route of the Jagorawi toll road in the Jakarta area to Bogor. It is a residential area surrounded by a golf sports area. It is adjacent to the Cikeas River and a complex adjacent to public facilities, including supermarkets, banks, traditional markets, and LRT stations. The following are the boundaries of the direction boundary at the project site:

North direction : Golf Area
West : Jagorawi Toll Road
East : Residential Area
South direction : Residential Area

Figure 1.
Project Location Map
(Yellow shows from the direction of Tapos Raya, and blue from the direction of the Cimanggis toll exit)

Data Collection Methods

The main data collection was obtained from field reviews, questions and answers, and documentation (Wallwey & Kajfez, 2023). Then the complementary data comes from the project data. The data is collected and then processed to get answers for the purpose of writing. Then, conclusions are drawn, and suggestions are given to maintain the quality of the upper structure to meet the requirements. The observation time was quite short, from February 25 to May 25, 2018.

RESULTS AND DISCUSSION

Project Observation Results

The shear wall structure observed in the Podomoro Golf View Apartment Project is on the 15th floor, zone D4, and SW type 3.

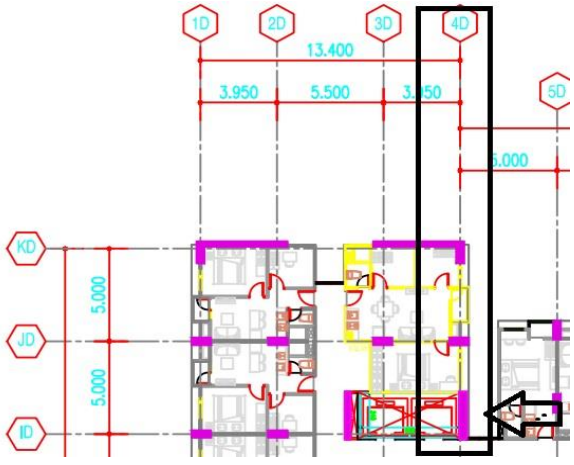

Figure 2.
Position of SW3 on the 15th floor

The characteristics of the Shear Wall observed in this project are:

- Concrete Quality : FC' 30
- Reinforcement Quality : BJTD 40
- Rebar diameter : Main reinforcement wears D16 steel
  Reinforcement using D13 steel
  Reinforcement ties wear D10 steel

Shear Wall Implementation Method

Making a shear wall is basically like making a column. Good quality control affects the strength of the shearwall itself. In order to produce a high-quality shear wall, the method must be correct. The following is the method of implementing the shear wall at the Podomoro Golf View Apartment (Guan et al., 2024):

Determination of As (Marking)

Marking is one of the surveyor's jobs, and it involves measuring and making markers that function as a positioner for formwork and reinforcement from the shear wall. The position of the AS shear wall from a vertical angle refers to as the shear wall on the previous floor. The way to shift the as point from the bottom up is to perforate the floor slab, which will later be closed again when it is finished (Mo et al., 2021). The location of the shear wall should not be tilted to the previous floor. Therefore the straightness must be checked using a shear. Straight stakes make it easier for us to determine the location of other shearwalls according to the initial plan. Check as using a theodolite tool attached to the marking and then check the straightness of the marking.

Shearwall Ironing

Shearwall reinforcing is composed of main reinforcement, reinforcing shearing, and reinforcing ties. Fabrication of the reinforcement is carried out in a separate area. This project consists of 6 types of shear walls, namely SW 1 to SW 6. Steel with diameters of D16 and D19 is used as the main reinforcement. D13 diameter steel is used for the screed, and D10 steel is used for the reinforcement ties. Each use is adjusted based on shop drawings. The standard hook bends on the bridge at least 60 mm or 6 db, the angle is 1350, and the radius (r) is 40 mm or 4 db. The overlap distance between the shearwalls is 80 cm to 95 cm. The joints should be fastened securely using bent wire. The distance of the shear wall is divided into segments, namely the platform, field, and pedestal, which are 1/4, 1/2, and 1/4 of the span of the shear wall. When the reinforcement is completed, the reinforcement is brought to the project site using a tower crane.

Formwork

Formwork is a support construction that accommodates and converges the concrete being cast to avoid shifting angles or points that may cause damage to the structure and also affect the strength of the structure. The stages of shear wall formwork in the Podomoro Golf View Apartment Project are as follows:

a. Installed shear wall shoes using an elbow steel profile and then welded them to the shear wall shear crossbar. This elbow profile is useful for marking and maintaining the position of the formwork to keep the elbow.
b. Formwork that previously had to be cleaned with foam oil and placed next to the reinforcement with a tower crane, then workers will position the formwork on the shear wall reinforcement.
c. Tie rods are installed between the two formwork panels. Then turn the wing nut to tighten.
d. Install push-pull props (diagonal plumbing braces) on both sides when the shearwall formwork is upright.

e. The next step is to insert the base plate into the iron cuttings planted on the floor and put it together with a push-pull prop (diagonal plumbing brace).
f. Check the verticality of the formwork using unting-unding.
g. If the formwork is less vertical, then the push-pull prop is set to the correct position.
h. At the bottom of the formwork, a stucco is applied to prevent cement water from escaping from the formwork.

Formwork Cast

The casting uses a ready mix with the help of concrete buckets and tower cranes. The quality of the concrete used is fc' 30 on the 14th floor to the roof. When the casting stage occurs, a concrete bucket operator, a vibrator operator, and a tower crane operator are required. The cast stage begins with an order for ready-mix cement which is 500 m from the project site. After arriving, the Quality Control checks the quality, volume, and slump test. For vertical work, a slump test is carried out on every truck mixer that comes. The slump test value is 12 ± 2 cm. Concrete pouring is carried out through a tramway pipe so that there is no segregation. Then, the compaction process uses a vibrator so that the concrete that has been poured does not have air cavities, which can reduce the quality of the concrete. This casting stage stopped when the 1.25 m long pipe contained in the formwork began to be lifted up during the casting.

Formwork Demolition

According to PBI 1971, the demolition of the formwork can only be done after the concrete is two weeks old, but in the Podomoro Golf View Apartment Project, the dismantling of the formwork can be done after 8 hours during the casting of the last shear wall. This is because, in this project, concrete uses admixture materials to accelerate the time of concrete binding. The first step in dismantling the shear wall formwork is to remove the push-pull props from the base plate. Then loosen the wing nut. Then the formwork is shifted outward and lifted with a tower crane. If the concrete has an uneven surface, it can be repaired with mortar. But if the crack is severe, it is not enough to do so.

Shear wall treatment

This method is commonly called (curing) which is carried out using compounds. The step is to wet the sides of the shear wall with rollers and add addictive materials. The goal is to prevent water evaporation on the open side of the concrete maintain the cement water factor and the concrete's moisture so that cracks do not occur.

Table 1. Comparison of PBI 1971 with Field Implementation

Work	Theory	Implementation	Information
Ironing	Steel for main reinforcement uses threaded steel with a minimum tensile stress (Fy) value of 4000 kgf/cm2 (BJTD 40) while for plain reinforcement must have a minimum value (Fy) of 2400 kgf/cm2 (BJTP 24) (SNI Beton 03-2847-	The steel used in this project uses BJTD 40 threaded rebar steel and has been tested at BPPT (Center for Structural Strength Technology)	Appropriate Because this project uses BJTD 40 threaded rebar steel and a rebar tensile test has been carried out at BPPT and what is required is threaded steel with a minimum Fy of 4000 kgf/cm^2 (BJTD 40); (SNI Beton 03-2847-2002)

	2002)		
Slump Test Scores	Max 15 cm Min 7.5 cm	12±2 cm	It is appropriate because the Slum value in this project of 12±2 cm still meets the requirements, namely with a max of 15cm and a min of 7.5cm
Thick Concrete Blanket	Protected parts are at least 2 cm, outer blankets are 2.5 cm, and invisible ones are 3 cm	Protected parts 5 cm, outer blankets 5 cm, while invisible parts 5 cm	Fulfilled, because the thickness in the field is 5 cm and the required minimum is 2 cm for the protected part, the outer blanket is 2.5 cm, and the invisible part is 3 cm
Formwork Demolition	Formwork can be dismantled if the age of the concrete is 3 weeks if it is not made, test objects determine the time of dismantling	8 hours	It is not suitable, because in theory the formwork can only be dismantled when the concrete is 3 weeks old, while in concrete projects it has been dismantled 8 hours after casting. This is because concrete uses admixture materials (Accelerating admixtures) at the project site so that it can speed up the time of concrete binding

Table 2. Problems in the Field

Problems	Solution
Concrete on several sides of the shear wall is deformed which results in the appearance of gaps such as holes in the concrete.	The patching method is carried out by: 1. Removing porous concrete until it finds a solid surface 2. Clean the concrete from the remnants of dirt, then wet the concrete using NV bond sikha and wait for ± 30 minutes. 3. Patch the defective spot using a sika 4. The last step is to curing the repaired area

CONCLUSION

Based on the results of observations in the Podomoro Golf View Apartment project

regarding the implementation of shear wall work on the 15th floor, several conclusions can be drawn. The implementation of the SW3 shear wall work at Dahoma Tower, Zone D4, 15th floor, is running according to schedule. The quality of the reinforcement has met the standards because this project uses BJTD 40 threaded reinforcement that has been tensile tested according to the requirements, with a minimum melting strength of 4000 kgf/cm2. Formwork is assembled in a separate place to avoid interference with other work, and shear wall casting is done using buckets and tram pipes to prevent concrete segregation. Formwork can be dismantled after 8 hours due to the use of additives that accelerate the binding power of concrete. Some defects were found on the side of the shear wall, but they were immediately repaired, and concrete treatment was carried out. The quality of concrete on the shear wall on the 15th floor, zone D4, SW3 is Fc 30, with a slump test value of 12 ± 2 cm, in accordance with the provisions of PBI 1971, which requires a maximum slump test value of 15 cm and a minimum of 7.5 cm. Overall, the construction of the Podomoro Golf View Apartment project is in accordance with the work plan and requirements, although there are some minor problems that can still be tolerated and overcome.

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