

# Implementation Method of U-Ditch Drainage Installation on M. Yamin Road in Samarinda

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**Abstract** – Drainage systems are essential structures designed to remove excess water from specific areas, allowing optimal land use. In road infrastructure, drainage channels are crucial complementary structures to meet technical requirements. From July 2023 to December 2023, a drainage channel construction project is planned for M Yamin Street in Samarinda, with a contract value of IDR 8,515,000,000 (Eight Billion Five Hundred Fifteen Million Rupiah) funded by the Public Works and Spatial Planning Department. This project addresses the frequent overflow issues of the drainage system on M Yamin Street, a concern highlighted by the community due to numerous flood points along the road. The implementation of the Drainage Construction Project on M Yamin Street includes several steps: preparatory work, excavation, piling, installation of precast U-ditch using excavators and cranes, reinforcement work, formwork, and concreting. The U-ditch, measuring 300 x 165 x 100 cm, utilizes D16 - 200 mm and D13 - 200 mm steel reinforcement with concrete quality of Fc 30 MPa. The concreting work employs K 350 quality concrete with a width of 300 cm and thickness of 30 cm, reinforced with  $\Phi$ 16 - 200 mm and  $\Phi$ 13 - 200 mm steel bars, with a steel grade of Fy 350 MPa. Observations indicate that the K 350 MPa concrete has a slump value of 11.8 cm, which is within the planned range of 7.5 cm to 15 cm for slab concrete work.

**Keywords:** *Drainage, Installation of Precast U-Ditch, Slump Test*

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## 1. Introduction

Some urban and environmental observers argue that inundation is considered one of the consequences of conflicts of interest and needs between humans and water. These conflicts include conflicts between built-up areas and open spaces, conflicts between building spatial planning and water spatial planning, and conflicts between spatial arrangement and water resource management. To minimize these issues, there is a need for synergy in planning between spatial planning and drainage system planning in an urban area [1]. Flood is defined as the inundation of an area due to the overflow of water exceeding the drainage capacity in a specific region, resulting in physical, social, and economic losses [2][3]. Flood is a seasonal threat that occurs when bodies of water overflow their existing channels and inundate the surrounding areas. Floods are the most frequent natural threat and are the most damaging, both in terms of human and economic impact. Drainage is a series of water structures designed to reduce and/or remove excess water from a particular area, allowing the land to be used

optimally. Drainage channels are one of the supplementary structures on road sections to meet one of the technical requirements for road infrastructure. Road drainage channels serve to channel water that could disrupt road users, ensuring that the road remains dry. Typically, highway drainage channels are open channels that use gravity to direct water towards an outlet[4][5]. The distribution of flow in the drainage channel towards the outlet follows the contour of the road, making surface water flow more easily by gravity. From July 2023 to December 2023 (180 calendar days), a drainage channel construction project is scheduled to take place on M Yamin Street in Samarinda City, with a contract value of IDR 8,515,000,000,00 (Eight Billion Five Hundred Fifteen Million Rupiah) funded by the Public Works and Spatial Planning Department. The aim of this project is to effectively manage excess water along M Yamin Street. This drainage system plays a crucial role in preventing surface water flooding. The construction project is prompted by a common issue, which is the overflow of the drainage system on M Yamin Street. This can be observed through the community's concerns about the numerous flood points occurring on that road.

## 2. Research Method

The working method used in this drainage project is participatory observation, which involves researchers actively participating in drainage work, either as part of the working team or as participants involved in day-to-day activities [6]. The goal of participatory observation in the context of drainage work is to gain a deep understanding of the processes, challenges, and practices involved in this task. As a researcher, I participate in assisting with elevation measurements during the installation process of the U-Ditch. In collecting data from the field or observing work on-site, both Primary and Secondary Methods are used. Students directly observe what is happening in the ongoing project, including the materials, tools, and equipment being used. They also gather indirect observations from various project-supporting data sources. Field observation method is a technique of data collection that involves direct observation of ongoing activities at a specific location or area. This type of observation allows the observer to witness and record various aspects, behaviors, or events occurring in a real-life situation.

### a. Primary Data Collection

Here's how Collect Primary

- 1) Field observation methods are commonly used in various fields, including scientific research, performance evaluation, project monitoring, and field studies. These observations can provide valuable insights and accurate data about the observed situation [7].
- 2) An interview form of verbal communication with the aim of obtaining information. Interview is an event or a process of interaction between the interviewer and a source of information or the person being interviewed through communication [8].
- 3) The documentation used in this research includes collecting data from existing documents as well as obtaining them directly, which are related to the research, such as the general description of the Drainage Construction Project.

### b. Secondary Data Collection

The collection of secondary data involves obtaining data directly related to the Drainage Construction Project that is required. Secondary data refers to data that does not directly provide data to the data collector, for example, through other people or through documents.

- 1) A Work Plan Diagram is a reference that is prepared to turn an idea into a physical realization and must be understood by all related workers [9].
- 2) A Time Schedule is a plan that specifies the scheduled sequence of performing specific tasks or activities. Time schedule is a term used to refer to a schedule that contains information about the chronological sequence of implementation as a reference in completing a work project [10].

## 3. Result And Discussion

Because the fieldwork practice is of a short-term nature, I will report on the practice within the predetermined time frame, so I cannot provide a comprehensive report. The progress of the fieldwork practice has reached 16%, which is why this report does not detail the previous work. A detailed project review includes a description of the work observed during the Internship. In this case, I observed work involving excavation, piling work, U-Ditch installation, and concrete work. However, I will focus more on explaining the stages of installing Precast U-Ditch in the Drainage Construction Project on M. Yamin Street.

### a. The installation of Precast U-Ditch

The installation of Precast U-Ditch uses an excavator and a crane. The U-Ditch dimensions are 300 x 165 x 100 cm, and it utilizes D16 - 200 mm and D13 - 200 mm steel reinforcement with concrete quality of Fc 30 Mpa. The installation of U-Ditch, from progress field 16% to 59%, between STA ± 0+25 and STA ± 0+225, involves 200 units. The daily target for installation is an average of 5 units, typically performed at night. In general, the knowledge of Precast U-Ditch for drainage channels offers the following advantages:

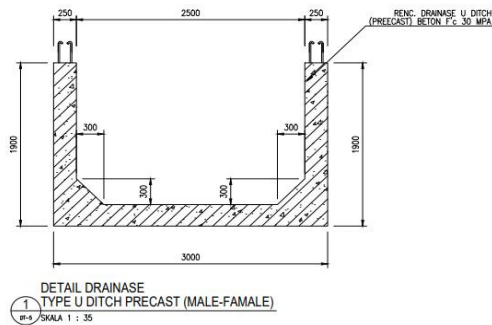
- 1) Guaranteed quality due to the fabrication process carried out in the casting field and supervised by the authorities.
- 2) High-quality concrete usage, resulting in a more compact and straightforward shape and thickness.
- 3) The installation process can be faster because U-Ditch is precise in its form.
- 4) Smooth and even finishing.

Here are the steps for the U-Ditch installation procedure carried out in the field:

- 1) The excavator prepares to lower the U-Ditch to be installed.
- 2) Next, the crane chain is attached to the top of the U-Ditch for lowering it into place.
- 3) The U-Ditches are arranged in rows and neatly placed in the excavation.
- 4) Elevation measurements of the road and U-Ditch are taken, with a height difference of 30 cm.
- 5) The U-Ditches are adjusted and set in place to fit snugly with the previous installation. U-Ditch details can be depicted in **Picture 2**.



**Picture 1.** Installation of Precast U-Ditch  
(Source : Personal documentation, 2023)



**Picture 2.** U-Ditch Details  
(Source : Plan drawing documentation, 2023)

b. Formwork

The formwork used is made of casings and plywood with a thickness of 12 mm in several parts. Before installing the formwork, it is essential to ensure that the formwork used does not experience deformation and that it is thick and securely fastened. The installation of the formwork must be done accurately and reinforced according to the designated design and standards to ensure it can effectively support and produce the required concrete. The following are the steps for formwork construction performed on-site:

- 1) Cut the casings with a manual saw to a width of 3 meters and a height of 30 cm on the left and right sides to match the plan drawing to support the floor slab formwork.
- 2) Next, cut the plywood sheets according to the width of the planned formwork on the right and left sides of the floor slab, as well as to match the floor slab width.
- 3) Then, join the cut casings and plywood sheets using nails and a hammer with a width of 3 meters and a height of 30 cm on the left and right sides. Can be depicted in **Picture 3**.



**Picture 3.** Formwork  
(Source : Personal documentation, 2023)

c. Reinforcement Work

Reinforcement work is a part of structural work. This work plays a crucial role in terms of execution quality due to the significant function of reinforcement bars

in structural strength. Reinforcement bar work is carried out from Station (STA)  $\pm 0+25$  to STA  $\pm 0+100$ , using reinforcement bar sizes ranging from  $\Phi 16$  to 200 mm and supports with  $\Phi 13$  to 200 mm, with a yield strength ( $F_y$ ) of 350 MPa. Can be depicted in **Picture 4**.



**Picture 4.** Reinforcement Work  
(Source : Personal documentation, 2023)

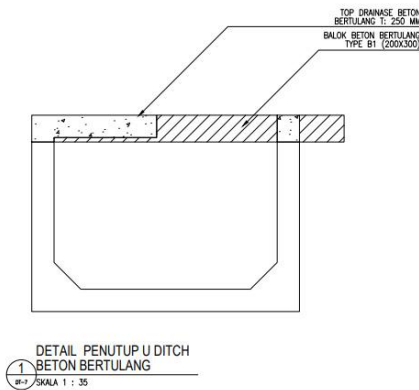
d. Concreting Work

The casting of a floor slab using the in-situ method involves pouring fresh concrete into the mold of a structural element that has been fitted with reinforcement bars[11][12]. The concrete used has a quality of K-350, with a thickness of 0.30 meters and a width of 3 meters. The longevity and load-bearing capacity of concrete structures are paramount for their overall safety. Strengthening components is a critical approach to enhancing their durability [13][14]. Here are the steps to be taken during the casting:

- 1) Perform a slump test using an Abrams cone and obtain a value of 11.8, which is in accordance with the standard.
- 2) Take three-cylinder samples for compressive strength testing.
- 3) Wet the planks or provide a release agent on the formwork to facilitate removal after reaching 21 days of curing.
- 4) Cast the floor slab using a truck mixer with a capacity of 6 m<sup>3</sup>, with a thickness ( $t$ ) of 0.30 m and a width ( $b$ ) of 3 m. You can calculate the length ( $L$ ) by using the formula:  $L = \text{Capacity} / (t * b) = 6000 / (0.30 * 3) = 6.6$  m. Therefore, in one casting, a length of 6.6 meters can be achieved.
- 5) Level the concrete using a vibrator and a screed.
- 6) Maintain the concrete (curing) to prevent it from cracking. U-Ditch cover details can be depicted in **Picture 6**.



**Picture 5.** Concreting Work  
(Source : Personal documentation, 2023)



**Picture 6.** U-Ditch Cover Details  
(Source : Plan drawing documentation, 2023)

e. Work Related to Concrete Quality

Quality control is carried out in the form of monitoring and checking to ensure that the quality produced conforms to the Work Plan and Specifications (RKS) to achieve structural work results that meet the standards and are accountable[15]. Here are quality tests for concrete, starting with the Hummer Test, Slump Test, and Compressive Strength Test. Due to data limitations, this discussion focuses only on the Slump Test for the floor slab casting work of the U-Ditch cover in the Drainage construction project on M. Yamin Street:

**Slump Test**

The purpose of the slump test is to determine the workability of concrete, which is expressed as a specific value [16][17]. Slump is defined as the drop in height at the center of the top surface of concrete immediately measured after lifting the slump test mold [18]. The slump value is influenced by the water-to-cement ratio. The higher the water-cement ratio, the higher the slump value, indicating the use of more water and less cement, resulting in a more fluid cement paste and a higher slump value. A larger slump value means that the concrete mix is easier to work with. The Slump test process can be conducted in the field (on-site ready-mix testing). The test result provides the slump value, which is expressed in international units and has a standard range of values

used for floor slab casting, typically ranging from 7.5 cm to 15 cm. Based on observations, the slump value obtained from the K 350 Mpa concrete quality is 11.8 cm, which falls within the planned slump range. Slump test can be depicted in **Picture 7**.

**Tabel 1.** Slump Test

No	Element of Structure	Max Slump (cm)	Min Slump (cm)
1	Foundation Slab, Reinforced Footing Foundation	12,5	5
2	Unreinforced Footing Foundation, Caisson, Underground Construction	9	2,5
3	Slab, Beam, Column, and Wall	15,0	7,5
4	Reinforced Concrete Pavement	7,5	5,0
5	Mass Concrete	7,5	2,5

(Source : Documentation google PBB1, 1971)



**Picture 7.** Slump Test  
(Source : Personal documentation, 2023)

In addition, there are several tools required for conducting a slump test [19], including:

- Steel Funnel Typically, the funnel used has a 20 cm diameter at its base. It has an upper diameter of 10 cm and a height of 30 cm. The two sides of the funnel face each other and have handles. The handles serve to lift the cone.
- Rod Apart from using a steel funnel, the slump test also involves the use of a rod. It has a diameter of approximately 16 mm and a length of 60 cm, made of steel. The end of the rod has a hemispherical shape, which serves the purpose of facilitating the compaction of the concrete mixture that has been filled into the Abrams cone.

The slump testing process is based on SNI 1972-2008 and falls under [20]. The slump test involves several stages, including:

- Dampening the Abrams cone mold and its base with a wet cloth.
- Placing the mold on the base.
- Filling the Abrams cone with 1/3 of fresh concrete



and compacting it evenly by using a metal rod with uniform penetration, particularly around the edges of the mold. Make sure the rod touches the base of the mold. You should perform approximately 25-30 penetrations.

- d. Refilling the cone mold with another 1/3 of fresh concrete (2/3 in total in the mold) and conducting 25-30 penetrations. Ensure that you penetrate the same layer as the first one.
- e. Filling the cone mold with the final 1/3 portion of fresh concrete.
- f. After compacting, level the surface and wait for approximately ½ minute. You can clean any excess concrete outside the mold and base during this waiting period.
- g. Gently lift the mold vertically.
- h. Measure the slump value by placing the Abrams cone next to it and determining the average height difference between the test specimen and the 11.8 cm reference value.
- i. The tolerance for the slump value in fresh concrete is approximately 2 cm.
- j. If the slump value meets the standard, the fresh concrete can be used.

#### Observation of work-related impacts

Construction projects frequently encounter issues related to work quality failing to meet expectations, necessitating rework. Rework adversely affects project performance by causing cost overruns and delays, thereby reducing work efficiency. Observations during practical work reveal several factors impeding progress, such as lack of coordination among stakeholders, inadequate on-site supervision, worker errors, and materials failing to meet specifications. For instance, the presence of numerous network cables in the drainage channel requires prior allocation, and delays in the delivery of U-Ditch components from BRM PILE Balikpapan further exacerbate these challenges.

#### 4. Conclusion

From the observations made during the internship in the implementation of the drainage channel construction on M. Yamin Street, several conclusions can be drawn, including:

- a. The drainage work on M. Yamin Street involves the installation of precast U-Ditch concrete, which includes several tasks such as preparation, excavation, piling, precast U-Ditch.
- b. Installation, formwork for the floor slab, and concrete pouring.
- a. For the concrete work on M. Yamin Street, precast U-Ditch with a concrete quality of  $F_c$  30 MPa is used. The precast U-Ditch has dimensions of 300 x 165 x 100 cm and is reinforced with steel D16 - 200 mm and D13 - 150 mm, with a steel quality of  $F_y$  350 MPa. For the floor slab casting, concrete quality K 350 is

used with a width (b) of 300 cm and a thickness (t) of 30 cm, reinforced with  $\Phi 16$  - 200 mm for reinforcement and  $\Phi 13$  - 200 mm for support, with a steel quality of  $F_y$  350 MPa. Based on the observations, the slump value obtained for the K 350 MPa concrete is 11.8 cm, which falls within the planned slump range. The planned slump for the floor casting work is between 7.5 cm and 15 cm.

- b. Several challenges affecting the drainage project on M. Yamin Street include delays in the delivery of precast U-Ditch and the presence of numerous network cables inside the existing drainage channel that need to be relocated.

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