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Overview Implementation of Precast U-Ditch Drainage Construction on Jalan Otto Iskandardinata Samarinda

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Abstract – Drainage is an important part of stormwater management in urban areas. With the rapid growth of the city of Samarinda, the number of hard surfaces such as roads, buildings and other built-up areas is increasing, causing rainwater to not be able to soak into the ground properly. Precast U-Ditch helps channel rainwater from the road surface into the drainage system, preventing flooding and puddles that can be detrimental. The application of precast U-Ditch in drainage construction offers an effective, efficient and durable solution for managing rainwater in urban environments. With this technology, flooding, puddles and other drainage problems can be minimized, improving the overall quality of the environment and urban infrastructure. The Drainage Project aims to improve the drainage system to reduce the risk of flooding and waterlogging while maintaining water quality, accommodating population growth and supporting infrastructure needs such as housing, schools and health facilities. In the Otto Iskandardinata Samarinda Road Drainage Construction Project, the precast concrete method was used with dimensions of 100x70x20. The implementation of the U-Ditch Precast Drainage Project on Jalan Otto Iskandardinata is expected to alleviate flooding problems. Before starting work, various tests are carried out such as Slump Test, Compressive Strength Test, Hammer Test and Tensile Strength Test to ensure compliance with the required specifications. Occupational Health and Safety (OHS) measures have been implemented on the Drainage Project. Each stage of project implementation must be supervised by a field supervisor to ensure the project runs smoothly and meets the required quality standards

Keywords: Drainage , Precast Concrete , Facilities and Infrastructure

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1. Introduction

Drainage is an important part of stormwater management in urban areas. With the rapid growth of the city of Samarinda, the number of hard surfaces such as roads, buildings and other built-up areas is increasing, causing rainwater to not be able to soak into the ground properly. Precast U-Ditch helps channel rainwater from the road surface into the drainage system, preventing flooding and puddles that can be detrimental. The application of precast U-Ditch in drainage construction offers an effective, efficient and durable solution for managing rainwater in urban environments. With this technology, flooding, puddles and other drainage problems can be minimized, improving the overall quality of the environment and urban infrastructure [1].

Drainage is action or the process of drying / disposal of tub water produced by the activity process man like waste water House stairs, waste water industrial and natural processes like rain, puddles, floods, and lowering groundwater level [2].

Based on its type, drainage can be divided into open drainage and closed drainage. Open drainage is used to channel rainwater in large areas. Additionally, it serves as a means to safely direct water flow without endangering the environment. On the other hand, closed drainage consists of channels designed to carry away water containing waste. It is enclosed to prevent harm to public health and the environment. Closed drainage also functions as channels within urban areas [3].

In the field of civil engineering, drainage is defined as a series of water structures designed to reduce or remove excess water from a specific area or land, enabling the land to be optimally utilized according to its purpose. Drainage plays a crucial role in managing water supply to prevent flooding [4].

Road drainage aims to control water on road pavement structures, thereby minimizing adverse effects on the pavement structure by directing water to predetermined

discharge points. There are two types of road drainage systems surface drainage and subsurface drainage. Surface drainage systems typically consist of open or closed channels [5].

In the implementation of a construction project, there are several alternatives in its execution, such as precast concrete, where the construction is planned in advance, and all concrete work is designed manually by arranging reinforcements in the structure being built. Concrete placement requires costs for formwork and labor, which can be quite substantial. On the other hand, pre-cast concrete (fabrication) is produced through a manufacturing process where the production location is different from the location where the structural elements will be used [6].

Project Otto Iskandardinata Road Drainage has a section length of 600 m, using U–Ditch type 100x70x120, 12 cm thick (Precast Concrete), with thick closing Reinforced Concrete U–Ditch drainage 25 cm thick.

Which becomes problem main in drainage urban is dealing with water caused by rainwater runoff because of waste water house ladder as well as waste water industry whose contribution in drainage urban relatively small [7].

In several developed countries like Japan, use precast U-Ditch has become standard construction for drainage. Standard standards has developed for ensure quality products and construction. With exists standard standard, then diversity quality product and quality construction No happened. Industry preprint in Japan has equipped with various standards (JSCE, 2012; JIS A, 5345; JIS A, 5362; JIS A, 5363; JIS A, 5365) [8].

Each is preprinted local domestically produces concrete precast U–Ditch with different designs. This thing caused because not yet exists system standardization of standard design and construction processes for system U-Ditch channel in Indonesia. Meanwhile in several developed countries like Japan, standard standards has developed for ensure quality products and construction so that use of precast U-Ditch has become standard construction channel drainage [9].

2. Research Methods

In a place activities, data collection is carried out in natural settings (natural conditions), primary data sources and more data collection techniques lots of observation role as well as (participant observation), interviews in depth interviews, and documentation [10].

In doing activity work practice, author do a number of method in data collection for resolved report work practice this, among others are

1. Primary data collection
   a. Observation method direct
      Observation in a way direct to activities that occur in the field and study in a way direct with follow activities carried out at the time practice field. Things that are observed in a way right on time work practice between other :
      1) Stages implementation Otto Iskandardinata Road Drainage Development project
      2) System coordination and communication, as well solution problem between all parties involved in Otto Iskandardinata Road Drainage Development project.
   b. Interview method (interview / discussion)
      Interview method is also a process of obtaining information for objective study with method ask answer while stare advance between interviewer with respondent / person interviewed , with or without use interview guide [11] .
   c. Documentation
      Documentation used as attachment to the report work practice this is what it looks like photos.
2. Secondary data collection
   In the form of direct data collection about required project in report work practice this. For example, results data picture plan work, quantity list, schedule implementation, method implementation, and other possible data required in reporting work practice.

3. Result And Discussion

Based on implementation work practice in such a time short this, then here writer give report implementation work practice in accordance with given time, so can give report implementation work in a way comprehensive. At the moment work practice started work has running +30%, therefore that for other jobs that have been held previously no reported in detail inside report this. Overview project in full detail about description work seen and observed from STA 0+100 to STA 0+200 at time implementation work practice. In case this writer observe work that includes land work, work piling, precast concrete work, work partner, job foundry.

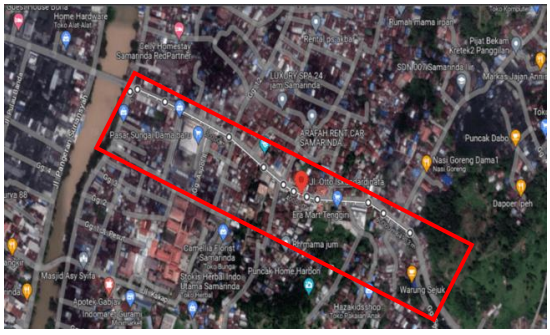

Figure 1 Project Location Jalan Otto Iskandardinata, Samarinda City

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Table 1Elevation Data 0+100 to 0+200.

STA	Elevation (MDPL)	
	Existing AS Jalan	Plan
0+100	7,500	5,880
0+125	7,500	5,880
0+150	7,396	5,776
0+175	6,976	5,536
0+200	6,560	4,490

3.1 Implementation Method for U-Ditch Drainage Construction

1) Earthworks (Soil Excavation and Waste)
   Work excavation can started with elevation excavation controlled based on existing elevation saved. Excavation land using an excavator. Within 1 day long target minimum excavation is 12 m and deep excavation is 1.42 m for fulfill capabilities tool heavy in installing U–Ditch Precast, namely 10 units. While the excavator is working excavation, 1 dump truck unit ready on the side excavation For accommodate land used excavation. Used land excavation the direct thrown away to outside project and on the side plan channel prepared some used materials excavation For used backfill back. With so is the area on the side excavation relatively clean and every moment ready occupied by U–Ditch Precast stock.
2) Work Erection
   Work erection can started after work excavation land finished work. Erection use Galam wood diameter 8 – 10 cm, L = 4 m.
3) Precast Concrete Work
   U–Ditch precast concrete 100x70x120, 12 cm thick (Precast Concrete) which has been aged more than 7 days from fabrication sent to location and in stock at the location near installation. Installation precast U–Ditch concrete using an excavator depending on the weight of the material being lifted. Usually excavator capacity 5 x the weight of the material being lifted. Installation done after installation stake. Installation target every day average 10 units.
4) Work Reinforcement and Work Formwork
   Work reinforcement done start from STA 0+100 to STA 0+200, monitoring in the field reinforcement done as many as 10 people. Reinforcement used consists from walls and floors lower use iron 10 Quality 320 Mpa and floor on use iron 12 quality 320 Mpa . On this U–Ditch job use system formwork made from wood rafters and plywood with 9mm thick. Selection of materials for baking This Because the material no rare and easy to get. At stage work formwork moreover formerly cleaned from dust and other materials. Construction channel drainage become more easy and fast with use U–Ditch Precast concrete.
5) Work Casting
   Work casting is work pouring concrete liquid to in existing mold made previously something structure that has been installed iron reinforcement. Before processing casting done inspection and testing to work For ensure mold and iron reinforcement has installed in accordance plan. Casting use Fc 30 Mpa concrete (Ready Mix K-350).
6) Work Hoard
   Spreading stage heap done with method materials brought to location that has been prepared, then spread out using a dump truck. After that flattened with using an excavator. This thing The aim is to stockpile material equally so at the moment implementation mobilization embankment materials furthermore can walk more easy again. Compaction stage heap performed by Stamper. Compression heap carried out layer by layer which has height 30 cm per layer. Time and level density heap no uncertain because can not use tool heavy special compactor and also not do testing For determine density heap

3.2 Test Results and Volume Calculations

Test results and calculation of the U–Ditch drainage volume are important for determine exact dimensions and material requirements for U–Ditch construction. Testing includes Slump Test (Ready Mix K 350), Compressive Strength Test of 14 day old concrete, Hammer Test, and Iron Tensile Strength Test. Drainage volume calculated based on U–Ditch dimensions and capabilities measured drainage. All results testing and calculations must consulted with standards and regulations local before used in construction.

1) Slump Test (Ready Mix K 350)
   Technique for monitor homogeneity and workability of the mixture fresh concrete with something viscosity specifically stated with One mark slump. In condition laboratory, with controlled concrete materials in a way tight, general slump value increase comparable with mark mixed water content concrete, with thereby compare backwards with strength concrete. The purpose of slump testing is for know level convenience processing stated concrete in mark certain [12].
   But in implementation in the field must be careful, because lots influencing factors to change stir concrete on achievement specified slump value, so slump results obtained in the field can not in accordance with strength expected concrete. The slump testing process can be done in a way laboratory in the field (ready mix testing in the field). Test results concrete form slump value. The value stated in form unit international and has standard [13].
   Slump testing process is based on SNI 1972-2008 and ICS 91.100.30. There is a slump test process a number of stages among them includes :

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1. Wetting print cone Abrams and the plate with use cloth wet.
2. Put print is on the plate.
3. Fill in cone Abrams with 1/3 fresh concrete then compacted with use stem metal in a way equally with do stabbing. layer that is pierced on the part edge with use slanted iron accordingly wall mould. Make sure the iron used touch on part basic, and stabbing around 25-30 punctures.
4. Fill in return print cone with 1/3 part fresh concrete (2/3 fresh concrete inside print in a way thoroughly), then do stabbing as many as 25 – 30 x punctures . Try For stab iron on the coating first.
5. Fill 1/3 fresh concrete into in print in accordance step previously.
6. After doing compaction, next flatten surface test object, and wait range time 1/2 minute. Clean excess concrete outside mold and plate during the waiting process.
7. Lift print in a way slowly upright straight to on.
8. Measure slump value with method reverse cone Abrams beside him use different average height of test object.
9. Tolerance value for fresh concrete is less more than 2 cm.
10. If slump value already in accordance with standard, then fresh concrete can used.

Generally, range slump value used ranges from 8 – 12 cm. If The slump value is around 0 cm then mark workability concrete ugly. This value usually intended for non- sand concrete. The slump value can be influenced by several factor like mark fas and comparison straight. That is, if small ace value, then small slump value nor vice versa. Slump testing is useful cone Abrams. Apart from that, there are a number of necessary tools in testing among them includes :

1. Steel Funnel

   Usually, size funnel used 20 cm in diameter in section underneath. Whereas The top diameter is 10 cm and the height is 30 cm. Second side of the funnel the face and have handle. Function handle the for raise cone.
2. Stick

   Apart from usage funnel steel, slump testing also wears stick. Size the diameter around 16 mm and 60 cm long made from steel. Stick tip the own hemispherical shape. Form thereby own function for convenience compression dough existing concrete filled to cone Abrams

Measurements in the slump testing process have objective to know size tall derivatives in dough concrete after lift container. Usually, stir it concrete will poured into the mold and done compaction. During the compaction process fresh concrete requires tool vibrate to reach slump value 7 – 12 cm. Meanwhile, the concrete slump value can reaches more than 12.5 cm moment the compaction process is carried out. Basically, the compaction process concrete with tool vibrate need avoided so as not to There is segregation aggregate or bleeding. This thing need done to get results dough have sturdiness and power stand good.

2) Concrete Compressive Strength Test

Testing to concrete can be done on fresh concrete material shaped cube or representative cylinder mixture concrete. Implementation casting with always fresh concrete supervised start from mixing until with pouring. For pouring fresh concrete usually do slump testing with slump test tool first formerly before pouring done. If mark slump exceeds from provisions that have been set so the fresh concrete can not poured for casting because worried quality concrete decreased [14]. Concrete is an artificial stone that is made with mix a number of material choice is aggregate fine, aggregate rough and cement are mixed and formed become structure for building. From the results testing on samples cylinders that are 15 days old obtained 34.25 MPa, results the has fulfil SNI requirements 03-1975-2011. Testing strong press concrete carried out by the ready mix PT. Dita Anugrah Perkasa Beton.

3) Hammer Test

A Hammer Test tool inspection quality concrete without damage concrete (non-destructive test), where method testing This done with give impact load (collision) on the surface concrete with use something activated mass with use great energy certain, as for distance reflections that arise from mass at that time happen collision with surface concrete test object can be give indication violence. By general tool this normal used For inspect uniformity quality concrete on the structure and get estimation strong press concrete [15]. This tool very useful for know uniformity of concrete material in the structure, because simplicity, testing use tool this very fast so that can covers a wide testing area in short time. This tool very sensitive to variations on the surface concrete for example existence stone particles in parts certain near surface. Therefore that required taking several measurements around location later measurements the result averaged [16]. British standards (BS) require taking between 9 and 25 measurements for every area testing wide maximum 300 square mm.

By general tool this can used for :

1. Inspect uniformity quality concrete in structures
2. Get estimation strong press concrete

4) Iron Tensile Strength Test

Strength pull is one characteristic very mechanical important and dominant in something planning construction and manufacturing processes. Any material or material own different properties (hardness, flexibility, etc.). For characteristic

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mechanic from a material then required something testing, one most frequent testing done namely the tensile test. Testing this own function to know level strength a material and recognize characteristics of the material [17].

There is a number of specimen in tensile test. Tensile test (tensile test) is something method used for test strength (tensile strength) of a material with method give load (static force) which is axes and is applied in a way slow or fast. Obtained results characteristic mechanic from testing this form strength and elasticity from materials/ ingredients.

Assess strength and elasticity from the test material can be seen from curve tensile test results. Apart from strength and elasticity, other properties can be is known is as following [18] :

1. Strength melted from materials
2. Tenacity from materials
3. Resilience from a material

Testing done with objective for complete information design base strength a material/ ingredients and also as reference supporter for material/ingredient specifications. It is a number of kind, depending on the type working load, strength tensile, strength shear, strength press torque and strength curved.

5) Volume Calculation

1. Calculation of Excavated Volume

V_{galian} = L x W x H
= 13.2 x 1.64 x 1.42
= $30.74 m^3$

$V_{U-Ditch}$ = 4.8 x 1.24 x 0.82
= $1.22 m^3$

2. Calculation of Floor Concrete Volume

V_{lantai} = L x W x H
= 4.8 x 1.24 x 0.25
= $1.49 m^3$

Calculation of Wall Concrete Volume

$V_{dinding}$ = L x W x H
= 6 x 0.3 x 0.12
= $0.216 m^3$

Calculation of the Volume of Concrete Angles

$V_{siku-siku}$ = 4.8 x 0.12 x 0.12
= $0.069 m^3$

Total Volume

V_{tot} = $V_{lantai} + V_{dinding} + V_{siku-siku}$
= 1.49 + 0.216 + 0.069
= $1.775 m^3$

3. Calculation of Left and Right Embankment Volume (6 m)

V_{kiri} = L x W x H
= 6 x 0.39 x 0.40 x 1
= $0.94 m^3$

V_{kanan} = L x W x H
= 6 x 0.18 x 0.33 x 1
= $0.36 m^3$

Total Volume of Stockpiles

V_{tot} = $V_{kiri} + V_{kanan}$
= 0.94 + 0.36
= $1.3 m^3$

3.3 Observation Problems that Occur at the Project Site

By general, system network drainage in the area urban divided into 2 system major drainage and systems drainage micro. System major drainage or also called system channel disposal main is system functioning water pipe for holds water and drains water from area rainwater catchment. System this accommodate Genre scale big like canals and rivers. Planning system network this usually used for period long between 5 years up to 10 year. Therefore, the planning must be detaile [19].

Whereas system network drainage micro works as complement drainage that holds water and drains water from area catch rain. For example just channel or gutters on the sides road, ditch around buildings, culverts and channels drainage kind others. System network drainage This generally used for environment residential and planned for period short 2 years, 5 years up to 10 years.

Although system network drainage in residential areas congested resident has planned based on knowledge drainage, however problem drainage in the area congested resident can not avoided. Problem drainage in residential areas congested resident so complex. Density and diversity resident city be one source the problem [20].

Identification to problems drainage in residential areas congested resident very important for done for the sake of discovery the right solution. Identification problems drainage in residential areas congested residents are also needed for planning drainage in the area congested future residents so can made with more good. Following This frequent problems faced system drainage on Jalan Otto Iskandardinata.

1. Increasing amount resident

   Increase amount residents in the Jalan Otto Iskandardinata Samarinda area far more fast compared to the region rural. Amount increasing population certain followed by increasing amount waste, fine form rubbish nor waste liquid. Otherwise accompanied with addition drainage, then naturally inconvenience will felt.

2. Management trash that isn't noticed

   Management rubbish must get more attention lots along increase amount population. Because rubbish role big to shallowing and narrowing channel drainage and also rivers. Shallowing and narrowing cause channel drainage not capable accommodate water discharge so appear puddle or even flood.

3. Lack of coordination and synchronization with other infrastructure

   One example lack of intended coordination and

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synchronization is often found it pole electricity in the middle channel drainage. Example Another is the presence of a PDAM water pipe that cuts through channel cross section wet, or excavation channel later drainage damage existing infrastructure There is previously because minimal information.

4. Level of awareness low society
   Awareness public still spelled out so low about the problems faced A Jalan Otto Iskandardinata area. For example just about management waste House stairs.

Problems drainage on Jalan Otto Iskandar Samarinda can not left. This problem will give rise to discomfort and even disturbance health. But repair or build drainage in the area congested resident not the only one solution for overcome problem drainage in the area congested population. There are several solution for handle problem mandatory drainage on Jalan Otto Iskandardinata done.

1. Give counseling to society to be aware importance throw away trash in its place. Channel drainage and rivers it's not place for throw away rubbish.
2. Giving strict sanctions to those who throw away rubbish carelessly, including in rivers and drainage
3. Build tub controls and filters so rubbish in the drainage can thrown away with fast.
4. Repair conservation natural
5. Arrange runoff through possible facilities hold rainwater, store rainwater and make water absorption.

4. Conclusion

From the results review and observation during work practice in Otto Iskandardinata Road Samarinda Precast U–Ditch Drainage Construction project, then writer take conclusion as following :

1. With exists Project Precast U–Ditch Drainage on Jalan Otto Iskandardinata expected can reduce problem flood.
2. While in the field writer see that all procedure fulfil procedure specification technical.
3. Before do work moreover formerly do testing for compliance with Required specifications, for example: Slump Test, Compressive Strength Test, Hammer Test, and Tensile Strength Test are met required conditions.
4. Occupational Safety and Health (K3) has applied to Drainage Development projects.

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