

# Analysis of the Cost of Footplate Foundation Work in the Construction of the Exit Gate and Cafeteria of Delta Surya Hospital, Sidoarjo District, Sidoarjo Regency

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**ABSTRACT:** Cost is the main factor in a stage of a construction project that concerns the provision of funds that must be prepared by the project owner. Cost budgets have a crucial role in project implementation so they need to be taken into account to achieve efficiency and effectiveness in project implementation. In the cost analysis, a calculation of the unit price of wages, labor, materials and technical details of the work in detail has been determined for the planning of the total cost.

The implementation of the construction of the Exit Gate and Cafeteria of Delta Surya Hospital is divided into several works, starting from preparatory work to finishing. Among these types of work, one of them is footplate foundation work which is further divided into sub-work or job description, namely excavation work, formwork work, ironing work, and casting work. Every work in a project requires cost planning or a Cost Budget Plan (RAB) with high precision to determine the amount of funds that must be provided in the work of a project to avoid losses for the parties involved.

The discussion of this article will focus on cost analysis in the preparation of RAB which contains details of the cost of materials or materials, labor, equipment and overhead costs and a recapitulation of all costs for footplate foundation work by PT. Muliif Teknika Utama as a contractor from the description of the activity from the beginning to the end.

**KEYWORDS:** Cost Estimation, Cost Needs Analysis, footplat foundation

## 1. INTRODUCTION

Delta Surya Hospital is one of the private hospitals in Sidoarjo District, Sidoarjo Regency and is the destination hospital for Internship Work Practice (MPK) in Sidoarjo Regency. Geographically located at coordinates 7°26'50.24" S and 112°42'06.08" East. Its administrative boundaries are as follows:

1. North side borders with: Local Residents Settlement.
2. The eastern boundary: Pd. Jati.
3. Southern boundary: Jalan Jati Raya.
4. Western boundary: Open land.

The geographical condition of the Sidoarjo Delta Hospital consists of a land area with an area of 14,825 m<sup>2</sup>. Based on topographic conditions, Delta Surya Hospital is at an altitude of 0-25 meters above sea level (Sidoarjo Region) and for more complete area of Delta Surya Hospital Sidoarjo District Sidoarjo Regency. The land area for the Exit Gate and Cafeteria construction project is 241.78 m<sup>2</sup> with details of the division of the Exit Gate land area of 64.68 m<sup>2</sup> and the Cafeteria land area of 177.1 m<sup>2</sup>.

Delta Surya Hospital is one of the leading referral hospitals committed to providing better quality health services to the community. As a health institution, the hospital has its own characteristics that are influenced by science, technology, and the socio-economic life of the community. The lack of

integrated traffic in the Delta Surya Hospital area due to the use of a one gate system, as well as anticipation of damage to the gate parking barrier is the background for the construction of the exit gate. So that access to traffic transportation in the Delta Surya Hospital area can be comfortable and efficient. The cafeteria is a place where patients, visitors and hospital staff can obtain food and drinks. This is important because healthcare is not just about treatment, but also comfort and psychosocial support for patients and their families. The construction of the Delta Surya Hospital Cafeteria is due to the increase in patients so it is necessary to develop facilities at the Hospital by building a Cafeteria that is larger, spacious and comfortable for patients or patients' families.

The purpose of building the Exit Gate and Cafeteria at Delta Surya Hospital is to provide more efficient and integrated access so that traffic in the hospital area feels safe and comfortable, while for the construction of the Cafeteria as a place to relax, interact more comfortably, and a form of psychosocial support for patients, visitors, and hospital staff.

## 2. LITERATURE REVIEW

### 2.1. Cost Estimation

Unit price analysis is a method of calculating the unit price of construction work which is described by multiplying the need

for building materials, labor wages, and the need for tools with the price of buildings (Hanif and Firmanto, 2019).

According to Sumartini and Sanjaya (2022), there are several components in the calculation of the unit price of construction work which is a systematic planning of the cost budget plan consisting of materials or materials, labor wages, construction equipment, overhead, or unexpected costs, as well as profits or profits.

In the analysis of the unit price of work, there is an index value that refers to the Indonesian National Standardization Agency (SNI) which has the same concept as the Burgerlijke Openbare Werken (BOW) analysis. To obtain the unit price that refers to SNI, it is done by reading the technical drawings and RKS, which is then added to the index value or material coefficient with a tolerance value of 15%-20% to overcome the shrinkage of the volume figure (Sumartini and Sanjaya, 2022).

#### 1. Unit Price of Materials

The unit price of materials contains the amount of materials needed to complete the work. The calculation of the unit price analysis of materials is carried out by calculating each volume of materials and the amount of costs needed for each type of work. The calculation of the cost of materials or materials used must include the cost of transportation, handling, packaging, storage, quality control and administrative costs. The calculation of the unit price of materials is stated as follows:

Unit price of ingredients = koef. Material Analysis x Material Price

#### 2. Unit Price of Labor Wage

Construction equipment is a tool used to support the implementation of construction in the form of temporary buildings, hand tools and machines. To find out the amount of equipment operating costs, it is necessary to make calculations based on several aspects such as the duration of use of the tool and the amount of work that must be completed. This calculation is carried out to find out the number of tools used along with the amount of cost to complete each unit of construction work. The cost of construction equipment includes rental prices, transportation, equipment installation, dismantling, operational costs, and operator wages. The calculation of the cost of the tool is formulated as follows:

Unit price of equipment = duration x tariff

#### 3. Overhead or Unexpected Costs

a) General unexpected costs, which are office operational costs that are not directly burdened on the project such as costs for office rent, office stationery (ATK), water bills, telephones, electricity, etc. (Sumartini and Sanjaya 2022).

b) Project unexpected costs, which are costs that are directly burdened on projects related to project operations, including financing contract documents, survey fees, permit making costs, project telephone costs, etc. (Sumartini and Sanjaya 2022).

#### 4. Profit

According to Sumartini and Sanjaya (2022), the amount of profit or profit is generally taken at 8%-15% of the total cost budget which is the contractor or implementer by considering several aspects, namely the risk, level of difficulty, and payment method from the owner.

Regulation of the Government Goods/Services Procurement Policy Institution Number 9 of 2018 concerning Guidelines for the Implementation of Procurement of Goods/Services Through Providers, states that the amount of profit that can be taken is 15% of the work budget.

#### 2.2. Volume Calculation

Volume calculation is the activity of calculating the amount of work content in one unit or also referred to as work cubication which refers to bestek drawings and detailed drawings (Hanif and Firmanto, 2019). According to Fathurohman, et al. (2015), the calculation of the volume of footplate foundation work is carried out by calculating the material components ranging from formwork, work floors, reinforcement to concrete.

a) Calculation of footplate formwork (Multiplex formwork material)

Fathurohman, et al. (2015) explained that the use of multiplex material formwork is only used as tstemeng. The formwork requirements for footplates can be calculated using the following formula:

$$\text{Volume} = (\text{footplate thickness} \times \text{footplate circumference}) / (\text{Multiplex area})$$

b) Calculation of the working floor

Fathurohman, et al. (2015) stated that the working floor is a mortar or mixture of cement, sand and water on a standard ratio scale of 1:2,75:0,5 which is directly made in the field. The working floor is used as a bodeman footplate to level the surface to be cast. The calculation of the volume of the working floor can be calculated by the following formula:

$$\text{Volume} = (\text{thickness of the working floor}) / (\text{Width of the footplate})$$

c) Ready Mix concrete calculation

The need for Ready Mix concrete for footplate casting can be calculated by the following formula:

$$\text{Volume} = (\text{footplate thickness}) / (\text{Footplate area})$$

d) Calculation of reinforcement

Based on the calculation of the volume of reinforcement by Fathurohman et al. (2015), the reinforcement is classified first according to its diameter. The length of the rebar that is already known, then converted in units of weight (kilograms) according to the weight of iron per kilogram.

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## 2.3 Estimated Construction Costs (EBK)

Sumartini and Sanjaya (2022) explained that EBK or Cost Budget Plan (RAB) is defined as the calculation of the estimated cost for the completion of a project consisting of the cost of materials, wages, tools, profits and unexpected costs. According to Siregar et al. (2022), EBK is the amount of costs that include wages and materials in a construction project which contains volume, unit price, and total price obtained from the calculation of the volume of work carried out previously. The calculation of the unit price of each work is necessary in the implementation of a project so that an estimate of the costs that must be incurred to carry out a project can be obtained. The calculation of RAB can use the following formula:

$$RAB = \sum \text{Volume} \times \text{unit price}$$

In its calculation, the cost of construction work is divided into two types, namely:

### a) Direct Cost

Direct cost is the cost of resource needs that will be used for project completion, the amount of which is according to the duration of the project. Direct costs consist of material costs, labor wage costs, equipment costs, and subcontractor costs (Wijaya et al., 2022)

### b) Indirect Cost

Indirect costs are costs related to administrative supervision, consultants, work directors, interest and general expenses outside of construction costs. The amount of cost is not directly affected by the implementation time, where the longer the implementation takes, the more the cost increases. Indirect costs consist of employee salaries, general office costs, and public facility procurement costs (Wijaya et al., 2022)

## 2.4 Cost Budget Plan

According to Ibrahim (1993), what is meant by a cost budget plan (begrooting) of a building or project is the calculation of the amount of costs needed for materials and wages, as well as other costs related to the implementation of the building or project.

According to Niron (1992), the cost budget plan has the following meaning:

- 1) Plan: The planning set includes details and procedures for the implementation of the construction of a building.
- 2) Budget: Calculation of costs based on bestek drawings (plan drawings) on a building.
- 3) Cost: The amount of expenditure related to the wholesale listed in the existing requirements.

Cost (budget) is the sum of each of the estimated volume results with the unit price of the work in question. In general, it can be concluded as follows:

$$RAB = \sum \text{Volume} \times \text{Unit Price of Work}$$

The Gross Cost Budget Plan is a temporary cost budget plan where the work is calculated for each size of area. Work experience greatly affects the rough interpretation of costs, the

result of this interpretation when compared to a carefully calculated budget plan is obtained a slight difference.

## 3. RESEARCH METHOD

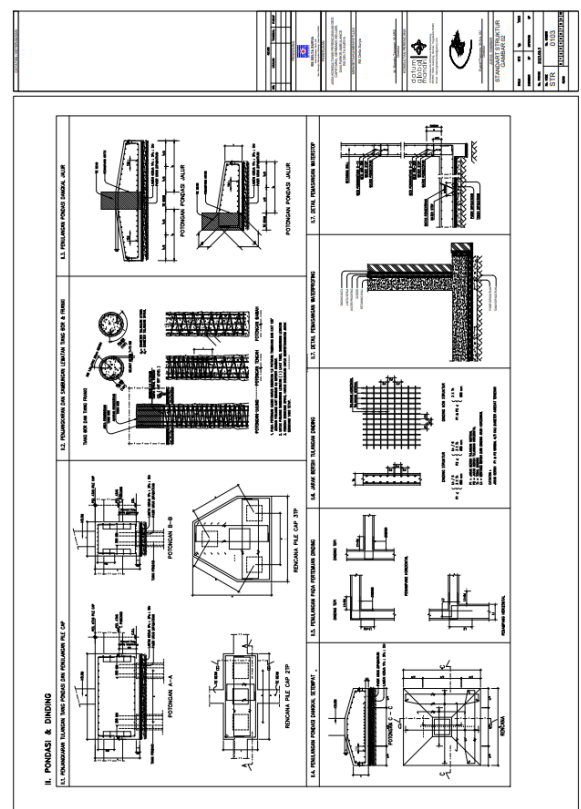
### 3.1. Cost Needs Analysis

In the footplate foundation work in the construction of the Exit Gate and Cafeteria of Delta Surya Hospital, an analysis of cost needs was obtained based on the details of the work contained in the footplate foundation work. The following is a list of job descriptions that exist in pile cap work.

1. Site Preparation Work
2. Soil Excavation Work
3. Formwork Installation Work
4. Work Floor Work
5. Reinforcement Installation
6. Concrete Casting Footplate
7. Concrete Treatment (Curing)
8. Formwork Dismantling
9. Backfill Work
10. Final Cleaning

### 3.2. Work Volume Analysis

The cost requirements for footplate foundation work in the construction of the Exit Gate and Cafeteria of Delta Surya Hospital can be determined from the need for the necessary materials. We can get this after doing calculations based on the reference of work drawings (Shop Drawing).



Footplate Foundation Working Drawing

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Based on the calculation of the volume of work, the volume of material work on the footplate foundation work in the construction of the Exit Gate and Cafeteria of Delta Surya Hospital is as follows.

RENCANA ANGGARAN BIAYA (RAB)					
PEKERJAA : TAMBAHAN PELAKSANAAN / RENOVASI GEDUNG KANTOR					
LOKASI : RUMAH SAKIT DELTA SURYA					
TAHUN : 2023					
NO. ITEM	URAIAN PEKERJAAN	SAT.	VOLUME	HARGA SATUAN (Rp.)	JUMLAH HARGA (Rp.)
<b>01 PEKERJAAN STRUKTUR</b>					
<b>01 PEKERJAAN PERSIAPAN</b>					
1	Pembersihan Bongkar Genteng + Plafon + Atap	m <sup>2</sup>	40,80	54,00	2.203,20
Sub jumlah PEKERJAAN PERSIAPAN					2.203,20
<b>02 PEKERJAAN BETON</b>					
1	Plat Beton Elev. +3.950	m <sup>2</sup>	10,66	6.573.232,00	70.070.653,12
2	Pas Balok 20x30	m <sup>3</sup>	22,50	416.500,00	9.371.250,00
3	Pas Kolom 20x20	m <sup>3</sup>	1,26	6.573.232,00	8.282.272,32
4	Pas Ring Balok 11x15	m <sup>3</sup>	24,00	134.000,00	3.216.000,00
Sub jumlah PEKERJAAN BETON					87.724.175,44
JUMLAH 01 PEKERJAAN STRUKTUR					89.726.378,64
<b>02 PEKERJAAN ARSITEKTUR</b>					
<b>01 ARSITEKTUR LANTAI 2</b>					
<b>01 Pekerjaan Dinding</b>					
1	Pas. Dinding Gata Ringan (10x20x60) cm, (Cliton)	m <sup>2</sup>	33,60	140.000,00	4.704.000,00
2	Pas. Plesteran & Acian dinding Dengan Mortar Sap Pakai, (Mortar Utama)	m <sup>2</sup>	67,20	132.000,00	8.870.400,00
3	Pas. Kolom Plastik 11x11 cm	m <sup>3</sup>	16,00	125.000,00	2.000.000,00
4	Pas. Balok Lantai 11x15 cm	m <sup>3</sup>	12,00	134.000,00	1.608.000,00
Sub jumlah Pekerjaan Dinding					17.182.400,00
<b>02 Pekerjaan Lantai</b>					
1	Pas. Homogeneous Tile Uk. 60x60, Indogres Polished TPZ (HT1)	m <sup>2</sup>	71,20	270.000,00	19.224.000,00

2	Indoor CCTV 6 MP (Hikvision)	unit	-	780.000,00	-
3	Instalasi Camera CCTV, pemasangan kabel UTP CAT 6 dalam PVC conduit HI Ø 20mm	tk	-	810.000,00	-
Sub jumlah PEKERJAAN SISTEM CCTV					-
<b>02 09 PEKERJAAN SISTEM FIRE ALARM</b>					
<b>EQUIPMENT &amp; RISER</b>					
1	Instalasi ROR Heat Detector dgn kabel NYA 2 x 1,5 mm <sup>2</sup> in conduit 20 mm	tk	4,00	225.760,00	903.040,00
2	Instalasi Break Glass dgn kabel NYA 2 x 1,5 mm <sup>2</sup> in conduit 20 mm	tk	-	225.760,00	-
3	Instalasi Alarm Bell dgn kabel NYA 2 x 1,5 mm <sup>2</sup> in conduit 20 mm	tk	-	225.760,00	-
4	Instalasi Indegring lamp dgn kabel NYA 2 x 1,5 mm <sup>2</sup> in conduit 20 mm	tk	-	225.760,00	-
5	Instalasi Flow Switch dgn dgn kabel NYA 2 x 1,5 mm <sup>2</sup> in conduit 20mm	tk	-	225.760,00	-
6	Addressable ROR Heat Detector AHP-D-101	tk	4,00	525.500,00	2.102.000,00
7	Addressable manual call point AWP-D-105A	tk	-	225.760,00	-
8	Addressable light strobe nom AW-D-105	tk	-	11.500.000,00	-
9	Terminal Box Fire Alarm (TB-FA)	sat	-	1.450.000,00	-
10	Receiver Fire Alarm (RAC) Terminal AHP-D-101	sat	6,00	372.000,00	2.232.000,00
Sub jumlah PEKERJAAN SISTEM FIRE ALARM					11.445.790,00
JUMLAH 02 ELEKTRIKAL					11.445.790,00
JUMLAH PEKERJAAN TAMBAHAN KEBERLURUHAN					213.443.736,64
PERSIAPAN					213.443.736,64

## Volume of Work

### 3.3. Unit Price Analysis

In addition to calculating the volume of work, to find out the cost needs, a unit price for each job is also needed. In addition to the coefficient, AHSP also lists the price of work units taken from the 2022 Surabaya City PUPR office. The amount of price in AHSP is obtained from the result of multiplying the coefficient by the unit price.

$$\text{Number of worker prices} = \text{coefficient} \times \text{unit price} = 0.500 \times 115,000 = 57,500.00$$

No	Uraian Pekerjaan	Satuan	Volume	Koefisien	Harga Satuan (Rp)	Jumlah Harga (Rp)
1	Pembersihan Lahan	m <sup>2</sup>	50	1,00	10.000,00	500.000,00

No	Uraian Pekerjaan	Satuan	Volume	Koefisien	Harga Satuan (Rp)	Jumlah Harga (Rp)
1	Galian Tanah Pondasi	m <sup>3</sup>	10	1,00	75.000,00	750.000,00
2	Pemadatan Tanah	m <sup>2</sup>	20	1,00	20.000,00	400.000,00

No	Uraian Pekerjaan	Satuan	Volume	Koefisien	Harga Satuan (Rp)	Jumlah Harga (Rp)
1	Bekisting Footplat	m <sup>2</sup>	15	1,00	150.000,00	2.250.000,00

No	Uraian Pekerjaan	Satuan	Volume	Koefisien	Harga Satuan (Rp)	Jumlah Harga (Rp)
1	Beton Ready Mix K-250	m <sup>3</sup>	5	1,00	1.200.000,00	6.000.000,00
2	Pengecoran Manual	m <sup>3</sup>	5	1,00	100.000,00	500.000,00

No	Uraian Pekerjaan	Satuan	Volume	Koefisien	Harga Satuan (Rp)	Jumlah Harga (Rp)
1	Pembesian (Baja Tulangan Ø12)	kg	400	1,00	15.000,00	6.000.000,00
2	Pembesian (Baja Tulangan Ø10)	kg	200	1,00	15.000,00	3.000.000,00

No	Jenis Tenaga Kerja	Satuan	Volume	Koefisien	Harga Satuan (Rp)	Jumlah Harga (Rp)
1	Mandor	OH	10	0,20	100.000,00	200.000,00
2	Tukang Batu	OH	10	1,00	90.000,00	900.000,00
3	Tukang Kayu	OH	10	0,50	90.000,00	450.000,00
4	Pembantu Tukang	OH	10	2,00	80.000,00	1.600.000,00

### Total Biaya Pekerjaan Pondasi Footplat

No	Uraian Pekerjaan	Jumlah Harga (Rp)
1	Pekerjaan Persiapan	500.000,00
2	Pekerjaan Tanah	1.150.000,00
3	Pekerjaan Bekisting	2.250.000,00
4	Pekerjaan Beton	6.500.000,00
5	Pekerjaan Tulangan	9.000.000,00
6	Tenaga Kerja	3.150.000,00
<b>Total</b>		<b>22.550.000,00</b>

## 4. CONCLUSION

1. In the footplate foundation work in the Construction of the Exit Gate and Cafeteria of Delta Surya Hospital, the cost needs are known based on the details of the work including:

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2. Based on the existing working drawings, the volume of material needs is analyzed.
3. After the calculation and analysis of the unit price of work with the volume of materials, a cost budget plan for the footplate foundation work is obtained of Rp 22,550,000

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