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SAINSTEK

| ISSN (Print) 2337-6910 | ISSN (Online) 2460-1039 |



Design Reviews On Cost Efficiency Of Mosque Foundation Work Of Pekanbaru Qur'an Center Project

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INFORMASI ARTIKEL

Sejarah Artikel:

Diterima Redaksi: 02 Desember 2024
 Revisi Akhir: 30 Desember 2024
 Diterbitkan *Online*: 31 Desember 2024

KATA KUNCI

cost efficiency, engineering design reviews

KORESPONDENSI

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ABSTRACT

One of the regional government-owned structures, Pekanbaru Qur'an Centre consists of three building masses: the Qur'an Center Building, the Mosque Building, and the Male and Female Dormitory Buildings. The Covid-19 epidemic caused a substantial delay between planning and execution, which means that cost estimates from 2020 initial planning are not applicable to 2022 construction. The significant time lag between planning and execution resulted in cost escalation of 19.79%, which exceeded contingency costs, which represent a subjective percentage value of 5–10% of the expected final project cost. Since the Qur'an Center Pekanbaru is a one-year project, less than 18 months will pass before it is fully operational. Price modifications are prohibited, as stated in Presidential Regulation Number 16 of 2018 Article 37. Doing a design review is the efficiency step taken to ensure that implementation costs do not vary too much. Efficiency was achieved after Design Review on Detail Engineering Design (DED) of Qur'an Center Project in 2019, based on material and labour costs in 2022, up to 37.48% of the Foundation Work cost, or an efficiency value of up to 3.75% of the mosque building's project standard cost.

1. INTRODUCTION

Qur'an Center Pekanbaru is one of the buildings owned by the local government which is currently planned and has entered the construction development period. Qur'an Center Pekanbaru has 3 (three) building masses, that is Qur'an Center Building, Mosque Building, and Male and Female Dormitory Building. As a building owned by the local government, the construction of the Qur'an Center Pekanbaru must meet all administrative and technical requirements contained in the regulations of Law Number 28 year 2002 [1] and Minister of Public Works and Housing Regulation Number 22/PRT/M/2018 [2].

The government's appeal for people to limit interaction / social distancing during the Corona Virus Disease (Covid) 19 pandemic has paralyzed various industries, including the construction industry. Work activities on construction projects that have risks, namely external risks, internal

risks that are technical and non-technical, and legal or legal risks [3]. Risks will accumulate along the length of the project duration, especially with the emergence of the Covid 19 outbreak. This is due to changes in government regulations during the Covid-19 pandemic and constraints on material and manpower mobilization [4]. Price escalation became an issue that arose during the Covid-19 period due to the disruption caused to the construction process.

The difference in the planning and implementation time of the Pekanbaru Qur'an Center construction due to the Covid 19 pandemic is far enough to result in the estimated costs that have been calculated in the initial planning in 2020 cannot be used for construction development in 2022. This is the case with the foundation work, where there was a change in the initial design by changing the building load of 80 tons and the foundation bearing capacity of 127 tons, to a building load of 36 tons and a foundation bearing capacity of 58 tons. Adjustments to the Quran Center

project cannot be made considering that this project is a single year project while Presidential Decree Number 16 of 2018 Article 37 regulates that price adjustments / escalations are given for projects with an implementation period of more than 18 months [5]. Adjustment or efficiency measures through design redesign are needed in order to overcome the problem of price escalation due to the emergence of the Covid 19 outbreak.

2. LITERATURE REVIEW

Project design according to Dhanardono aims to provide provisions in specifications and other provisions that can meet production operational needs [6]. The parameters obtained in the design scenario stage will be a limitation in exploring or varying the design. Assessment of design efficiency is not only influenced by needs, but also influenced by conditions at the time the design was made. Construction project financing includes direct and indirect costs, which in indirect costs include overhead costs, profits, taxes, and others [7] [8]. Conceptually, it can also be explained in Figure 1.

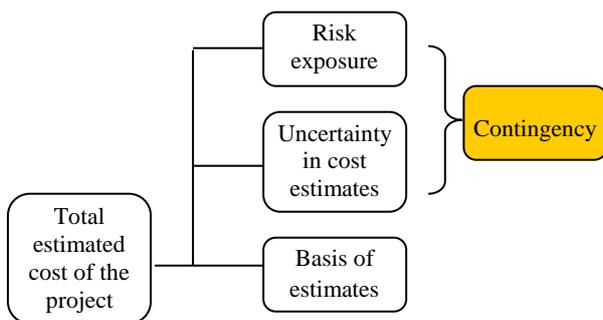


Figure 1: Contingency Concept [9]

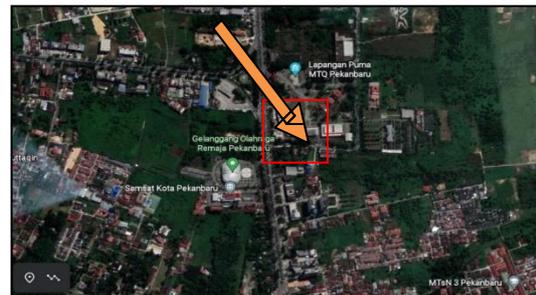
The allocation of indirect costs (contingency) described in Project Management Body of Knowledge (PMBOK) is intended to cover the costs incurred by risks due to uncertainty caused by lack of information and errors in interpreting the information / project data obtained [10]. Risks in each job on a construction project should be identified and classified properly so that the amount of project costs can be known and service providers can measure their ability to handle risks according to their level of difficulty. The dominant risk factors on the project as well as the attitude of the service provider in response on planning, implementation and risk monitoring will affect the contingency fee. Project risk management aims to ensure the project is completed on time, effectively and efficiently [11]. The practical phenomenon of most project owners in determining the amount of contingency costs in a subjective percentage value of 5-10% of the estimated total project cost [9].

3. PROPOSED METHOD

Location and Research Scope

Research location is at Bandar Seni Raja Ali Haji on Jalan Jendral Sudirman, Kelurahan Simpang Tiga, Kecamatan Bukit Raya, Pekanbaru.

This research focuses on evaluating the calculation of the Budgeted Plan Cost of the mosque foundation work that based on Review document of existing planning Design . The location and site plan of the Mosque construction project at the Qur'an Center can be seen in Figure 2 and 3 below.



(1)

Figure 2: Project Location [12]



Figure 3: Project Site plan [13]

Research Phase

Data collection is carried out, including drawings, unit prices of wages and materials and guidelines in the form of regulations governing the preparation of unit prices. The data is processed to obtain a budget estimate of the cost of foundation work both before Covid 19 and after.

1. Volume Calculation

Volume calculations are carried out based on planning drawings including plan drawings, several cuttings and detailed drawings where all three must complement each other.

2. Analysis of Works Unit Price

In general, the calculation of the Analysis of Works Unit Price has been regulated in Minister of Public Works and

Housing Regulation Number 1 Year 2022 concerning guidelines for the compiling of construction work cost estimates. The calculation of the work unit price analysis of the Unit Price of Materials and Wages refers to the Unit Price of Wages and Materials within the Public Works and Housing Service of Pekanbaru for the 2022 Year Budget. If the analysis is not contained in the rules, the unit price analysis of the work is calculated based on construction drawings.

3. Estimated Budget Cost

The Estimated Budget Cost is the final recap of the total work done. This cost will be used in the bidding process for a construction job. So it can be said that the cost budget estimate is also an important component in a project implementation.

4. RESULT

The Unit Price of Materials and Wages refers to the Unit Price of Wages and Materials within the Public Works and Housing Service of Pekanbaru for both Financial Year 2020 and 2022. The percentage of cost increase/escalation in both wages and materials and work units due to differences in planning time and construction implementation can be calculated using the following formula.

$$\% \text{ Cost Escalation} = \frac{\text{Estimated Budget Cost 2022} - \text{Estimated Budget Cost 2020}}{\text{Estimated Budget Cost 2020}} \times 100\% \quad (1)$$

The results of the calculation can be presented in the form of following table 1. and table 2.

Table 1. Labor Cost Escalation 2020-2022

Job Title	unit	Price 2020 (Rp)	Price 2022 (Rp)	Wages Escalation (%)
(1)	(2)	(3)	(4)	(5)
Foreman	Day	140,200	161,900	15.48
Master	Day	126,200	145,700	15.45
Worker	Day	112,200	129,500	15.42
General Laborer	Day	105,100	121,300	15.41
Operator	Day	140,200	161,900	15.48
Co Operator	Day	112,200	129,500	15.42
Driver	Day	112,200	129,500	15.42
CoDriver	Day	105,100	121,300	15.41
Mekanik	Day	140,200	161,900	15.48
Pembantu Mekanik	Day	112,200	129,500	15.42

Table 2. Materials Cost Escalation 2020-2022

Materials	Unit	Price 2020 (Rp)	Price 2022 (Rp)	Wages Escalation (%)
Pile 25x25 cm	no (6m)	1,710,000	1,863,900	9.00
	M'	285,000	310,650	9.00
Extention Pile	no	150,000	163,500	9.00
Pile Handling	M'	50,000	54,800	9.60
Driving Pile 25x25 cm	M'	160,000	174,500	9.06
Pile Cutting	no	135,000	147,150	9.00
PDA Test	no	5,000,000	5,450,000	9.00
Fee Engineer PDA Test	no	750,000	817,500	9.00
Accommodation	day	750,000	817,500	9.00
Mob-Demob crew	ls	1,000,000	1,090,000	9.00
Renting Hammer 3 T	no	3,500,000	3,815,000	9.00
Setting Hammer	no	1,000,000	1,090,000	9.00
Mob-Demob Hammer and Crane	ls	10,000,000	10,000,000	0.00

The price escalation of wages and materials from 2020 to 2022 shown in table 1. and table 2. shows an average increase of 15% for materials and 9% for wages.

Existing Design at Year 2020 Price

The Detail Engineering Design (DED) of the Quran Center was proposed in the 2019 Revised Regional Budget /APBD-P and planned for construction in 2020. The foundation plan when proposed can be seen as in picture no.4 However, the implementation of the construction was delayed due to the Covid 19 Virus pandemic that hit almost the entire world.

The initial design of the foundation for the Quran Center Mosque is designed to withstand a building load of 80 tons on the ground with a foundation bearing capacity of 127 tons. The planned cost based on the 2019 DED and the Unit Price of Wages and Materials within the Public Works and Housing Service of Pekanbaru for the 2020 Budget Year is Rp. 1,046,087,500.00.

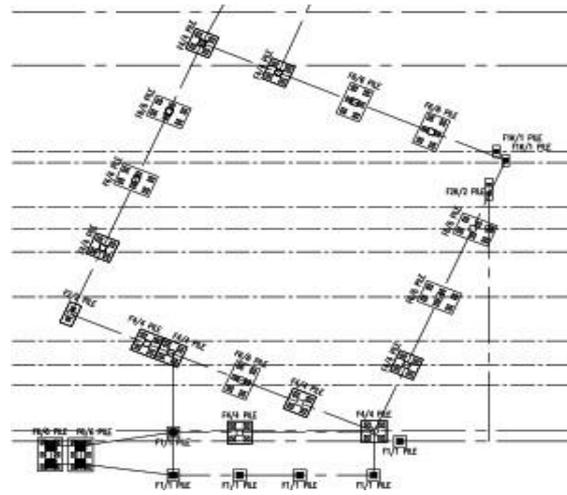
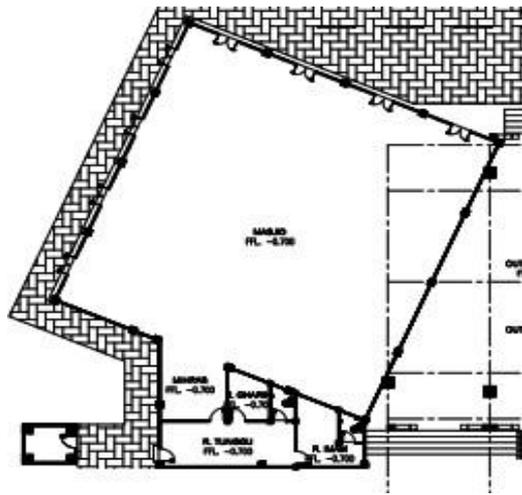


Figure 4: Foundation of the Qur'an Center Mosque in the Initial Planning [13]

Details of foundation work items, volumes and price calculations can be seen in table 3 below.

Table 3. Estimated Budget Cost Foundation at the Initial Planning

Description	Unit	Volume	Unit price(Rp)	Price(Rp)
Supply mini pile 25x25 cm				
Mini	m'	1942.50	285,000	553,612,500
Pile 25x25 cm Supply Pile extension	no	210	150,000	31,500,000
Pile handling	m'	1942.50	50,000	97,125,000
Driven Pile	m'	1942.50	160,000	310,800,000
Pile extension	no	210	100,000	21,000,000
Cut off pile	no	105	135,000	14,175,000
PDA test	no	1	17,875,000	17,875,000
TOTAL				1,046,087,500

Existing Design at Year 2022 Price

The budgeted cost based on the 2019 DED use the Unit Price of Wages and Materials within the Public Works and Housing Service of Pekanbaru in Financial Year 2022, also using market prices for materials that are not included in the list of Unit Prices for Wages and Materials.

The analysis of the unit price of work based on the Regulation of Minister of Public Works and Housing Regulation Number 1 Year 2022 or commonly called an analysis based on the Indonesian National Standard / SNI 2022. Details of volume, unit price and total price calculations of foundation work can be seen in table 4. following

Table 4. Estimated Budget Cost on Foundation Existing Design at the 2022 unit price

Description	Unit	Volume	Unit price(Rp)	Price(Rp)
Supply mini pile 25x25 cm				
Mini	m'	1942.50	368,500	715,811,250
Pile 25x25 cm Supply Pile extension	no	210	163,500	34,335,000
Pile handling	m'	1942.50	54,800	106,449,000
Driven Pile	m'	1942.50	174,500	338,966,250
Pile extension	no	210	109,000	22,890,000
Cut off pile	no	105	147,150	15,450,750
PDA test	no	1	18,907,100	18,907,100
TOTAL				1,252,027,850

Cost Escalation on Foundation Work on DED 2019

The results of the calculation of Foundation Work Cost based on analysis of Works Unit Price in 2020 and 2022 show an increase for the same design. The lowest sub and total cost escalation of Foundation Work is on the PDA Test work, which is 5.77% and the highest is 29.30% on the mini pile supply work. More complete escalation of sub-job costs and Foundation Work can be seen in Figure 5. below.

Cost Escalation on Foundation Work

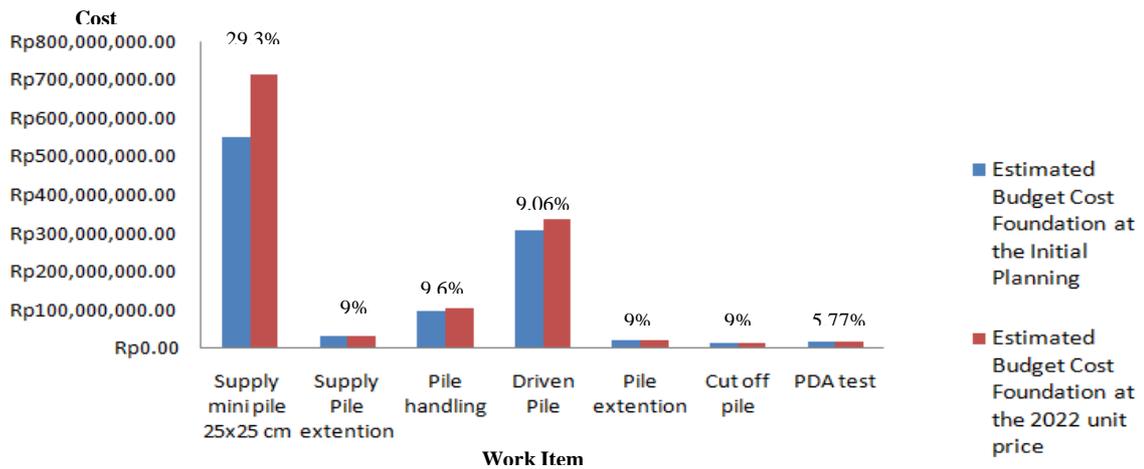


Figure 5: Cost Escalation on Foundation Work on DED 2019

The amount of labor cost escalation in Figure 5, which is 19.79%, exceeds the amount of contingency costs in a subjective percentage value of 5-10% of the estimated total project cost [9]. The implementation period is less than 18 months with reference to Presidential Decree Number 16 of 2018 Article 37, it is not justified to make price adjustments [5]. Design revision without changing the function of the building is the right step for these conditions.

Review Design at year 2022 price

Revision of the design without changing the function of the building is an appropriate step for a single year project condition with cost escalation that exceeds the contingency cost. Changes were made to the building loads which affected the number of piles. The initial design of the foundation is able to withstand 80 tons building load with the foundation bearing capacity of 127 tons, change into a building load of 36 tons and a foundation bearing capacity of 58 tons. Because of that, impact on the number of piles in a pilecap, there is a change from 6 piles in 1 pilecap to 4 piles in 1 pilecap. The foundation design changes can be seen in Figure 6 below.

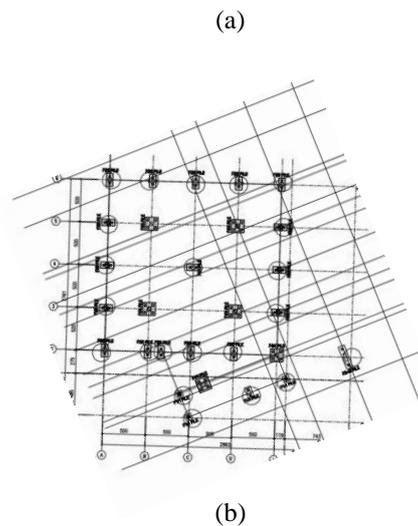
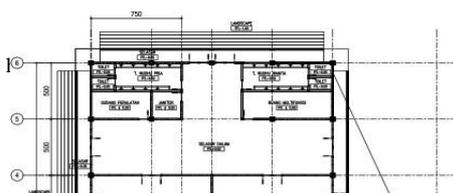


Figure 6: (a)(b) Mosque Foundation Review Design Plan

The calculation of the cost budget based on the Review Design uses the Unit Price of Wages and Materials within



the Public Works and Housing Service of Pekanbaru list in Financial Year 2022, also uses market prices for materials that are not exist in the list. Details of costs per item of deep foundation work, volume and price calculations can be seen in table 5 below.

Table 5. Estimated Budget Cost on Foundation Review Design at the 2022 unit price

Description	Unit	Volume	Unit price (Rp)	Price(Rp)
Supply mini pile 25x25 cm				
Mini	m'	1942.50	368,500	443,121,250
Pile25x25 cm				
Supply Pile extention	no	210	163,500	21,255,000
Pile handling	m'	1942.50	54,800	65,897,000
Driven Pile	m'	1942.50	174,500	209,836,250
Pile extention	no	210	109,000	14,170,000
Cut off pile	no	105	147,150	9,564,750
PDA test	no	1	18,907,100	18,907,100
TOTAL				782,751,350

Changes to the design resulted in a change in the cost value of Foundation Work which amounted to Rp. 782,751,350, - so that as presented in the graph in Figure 7 below.

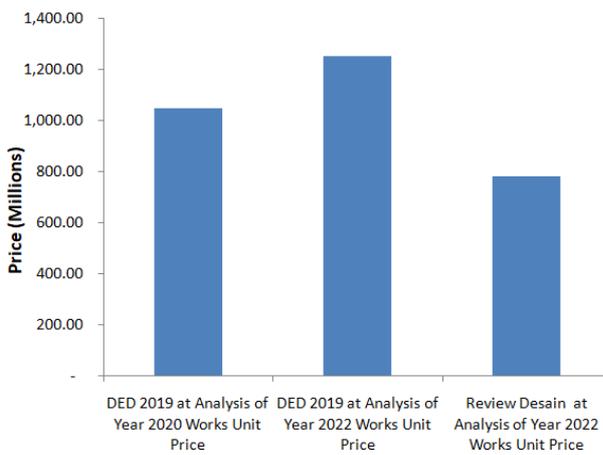


Figure 7: Cost Escalation on Foundation Work

The resulting efficiency is 37.48% of the cost of Foundation Work based on DED 2019 using Analysis of Year 2022 Works Unit Price. Referring to Minister of Public Works and Housing Regulation Number 22/PRT/M/2018 concerning Technical Guidelines for the Construction of State Buildings, the percentage requirement for foundation work is 5% - 10% of the standard cost [2]. Thus, the review design for foundation work is expected to provide efficiency of up to 3.75% of the total standard cost of the mosque.

5. CONCLUSION

The above discussion can be concluded that:

- The cost escalation due to time difference between the approved DED in 2019 and Implementation in 2022 is 19.79%, exceeding the cost contingency amount within the subjective percentage value of 5-10% of the estimated total project cost.
- The Qur'an Center project is a single year project so referring to Presidential Decree Number 16 of 2018 Article 37, it is not justified to make price adjustments.
- Review Design in DED 2019 of the Qur'an Center Project results in efficiency with Analysis of Year 2022 Works Unit Price of 37.48% of the cost of Foundation Work in DED 2019 or an efficiency value of up to 3.75% of the total standard cost of the mosque building.

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