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COST ANALYSIS BASED ON RISK OF CONTRACT FOR THE PRIVATE PROJECTS IN BADUNG, BALI

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Abstract. *The implementation of construction projects cannot be separated from risks. Risk can come from human, environmental, political, planning, marketing, economic, technical, natural, and financial sources. Based on these risk sources, project risks can be identified, so that preventive actions can be taken. The identified risks are analyzed against the cost risks that arise. In this study an analysis of the costs incurred as a result of these risks, especially those incurred due to contracts. The type of contract reviewed in this study is the FIDIC Red Book contract. This research was conducted by interview, literature study and contract data analysis. The results of this study obtained 25 identified risks based on the results of interviews and literature. The risk costs incurred in accordance with the identified risks are varied. The total cost incurred due to the identified risks is IDR 2,208,800,920*

Keywords: *contract documents, risks, construction project*

1. INTRODUCTION

Every stage or activity in a construction project always poses a risk and preventive and countermeasures must be considered. Project risk has an impact on project success, planned time and budget, and ability to meet technical specifications (Abdelrahman, 2019). Construction contracts are made to distribute the risks in the process of carrying out construction work to the parties who can bear the greatest potential risks. If the contract is made without an understanding of this risk, in general this can increase the potential risk of failure, work delays and cost overruns (Hansen, 2015). Problems that occur related to contracts are delays in handover because the owner involves a third party in evaluating the repair of work defects, there are many work items that are provsum, and there is a cost overrun, there is an inconsistent design and there is a loss of SBO material (supplied by owner), difficulties in claiming force majeure and variation orders and procuring materials that are not on schedule. Other problems that occur are delays in work due to indent construction materials, and unclear document hierarchy, delays in contract document processing, and delays in handing over of work. Based on this, it is necessary to analyze the project costs due to contract risk.

2. LITERATURE REVIEW

Risk is an event that is likely to occur and can have a negative impact in the form of losses on a company. In essence, risk is a risk that has a negative impact on the company's goals and strategies. The possibility of risk and its consequences for a business is fundamental for identification and assessment (Sirait, 2016). Risk relates to the possibility of an unwanted or unexpected adverse outcome (loss). Risk is acceptable

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2.1 Risk Analysis

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2.2 Type Of Construction Contracts Risk Analysis

Based on the cost calculation, the contract is divided into two, namely Fixed Lump Sum Price and unit price. Fixed Lump Sum Price is a fixed and fixed price, all risks are borne by the Service Provider as long as the drawings and specifications do not change. Unit Price, namely the completion of work based on a definite and fixed unit price with the volume of work based on the results of joint calculations of the work actually carried out. Based on the aspect of contract payment, it is divided into 3, namely monthly, term, and pre-funding from service providers.

2.3 FIDIC Contract

FIDIC is an international standard contract that is usually used in EPC (Engineering Procurement Construction) projects. The Conditions of Contract document in the FIDIC standard is an important document which regulates the rights, obligations and responsibilities of the parties as a whole. The significant difference between the standard FIDIC contract and the contract that was prepared without standards (bespoke) is that there is a separation of contract terms into two parts, namely: the specific conditions of the contract (particular conditions) and the general conditions of the contract (general conditions). The general terms document consists of detailed clauses that govern the entire content of the contract. The general conditions consist of a definition clause, a work payment mechanism, calculation of work progress, termination of the contract, and clauses for further implementation of the contract agreement document and special conditions. One of the most frequently used document standards for global construction projects, including in Indonesia, is The Conditions of Contract for Construction for Building and Engineering Works Designed by the Employer or called the FIDIC Red Book. The parties involved in the general provisions are service users (employers), service providers/contractors and engineers (engineering). The Red Book or FIDIC Conditions of Contract for Construction provides contract terms for construction work where almost the entire design is prepared by the service user or a planning consultant appointed by the service user.

3. RESEARCH METHODS

Risk identification is obtained through a literature study on the risks of construction contracts, especially for building construction. In this study, an analysis was carried out on 5 private construction projects in Badung Regency. Methods of data collection are done by interview, brainstorming and analysis of contract documents. Interviews were conducted to determine the risks that occur related to contract documents, data analysis was carried out to calculate the risk costs caused by contract documents. The research concept is as shown in Figure 1.

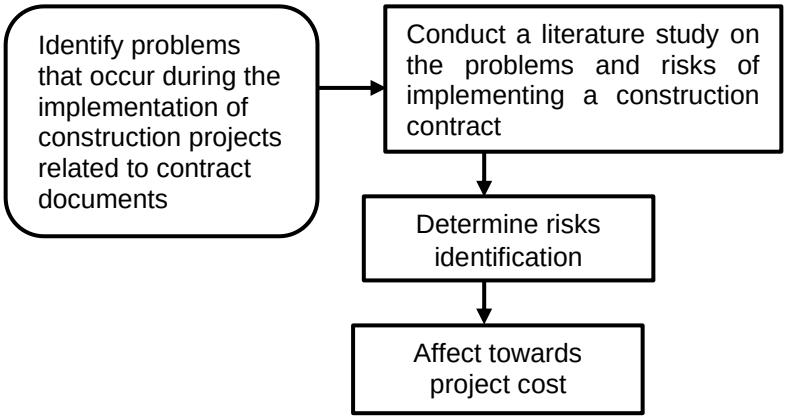

Figure 1. Research concept diagram

4. RESULTS AND DISCUSSION

4.1 Risk Identification of Construction Contract

Based on the results of interviews and literature studies obtained 17 identified risks. The identified contract risks are as shown in Table 1.

Table 1. Risk Identification of Construction Contract

Risk No	Risk Identification	Source of Literature
R1	Conflicts occur due to incomplete and unclear hierarchy and order of documents	Yuliana, 2017 Simanjuntak, 2020
R2	Failure payment by the owner due to limited fund	Simanjuntak, 2020 Nurlela, 2012
R3	Delayed in payment from the contractor to the sub-contractor/supplier	Brainstorming
R4	Increased in preliminary costs due to the termination of work that takes place during the construction period	Brainstorming
R5	Delay in payment by the owner	Brainstorming
R6	Fines due to late payment from the contractor to the subcontractor/supplier	Brainstorming
R7	Adjustment in costs due to an increase in foreign currency exchange rates/fuel prices	Simanjuntak, 2020
R8	Work that has been done based on the site instruction (SI) by the engineer, not approved by the owner	Brainstorming
R9	Non updated datas provided by the engineer	Brainstorming
R10	Material procurement that does not adjust to the updated schedule	Brainstorming
R11	The contractor must be responsible for damage, installation errors and losses for SBO materials (by owner)	Brainstorming
R12	A test failure occurred due to the absence of the party responsible for approving the test results	Brainstorming

R13	Temporary suspension due to design changes/improvements	Brainstorming
R14	A test failure occurs due to inadequate or non-compliant test equipment	Brainstorming
R15	Targeted handover of the first work is not achieved due to failure to repair quality defects	*Brainstorming*
R16	Losses for materials not installed on work items that are removed from the contract during the construction period	*Brainstorming*
R17	Owner intervention in changing, adding, and subtracting designs during construction	Simanjuntak, 2020 Yuni, 2016
R18	Limited insurance limit for work that is damaged due to external factors	*Brainstorming*
R19	Results of the work of the sub-contractor appointed by the owner, do not reach the predetermined standard	*Brainstorming*
R20	Discrepancy between the tender/contract data and the conditions in the field	Yuni, 2016 Astisi, 2014 Rumimper, 2015
R21	The existence of uncertainty due to work that is provisional in nature	Simanjuntak, 2020 Yuni, 2016
R22	Soil conditions around the project area are prone to landslides due to excavation work	Simanjuntak, 2020
R23	Force majeure during the construction period	Yuliana, 2017
R24	Robbery of material belonging to the contractor during the construction process	Yuliana, 2017
R25	Insufficient or inappropriate OHS procedures and management	Rumimper, 2015

Based on the risk identification in table 1 above, 17 construction contract risks were obtained. Each construction project has various contract risks. The source of the most risk comes from project risk. The results of the research conducted (Yuliana, 2017). stated that there was a conflict due to differences in the interpretation of the contents of the contract, there was a delay in the process and signing of the contract by the owner, poor coordination and delivery of information between stakeholders, a prolonged worker's homecoming culture occurred on certain holidays, and theft occurred. materials belonging to the contractor during the construction process, are included in the undesirable category. Payment failure by owner due to limited funds, and cost adjustment due to increase in foreign currency exchange rates/fuel prices is included in the undesirable category (Simanjuntak, 2020). The discrepancy between tender/contract data and conditions in the field is in the undesirable category (Astisi, 2014). The existence of uncertainty due to work that is provisional sum is included in the undesirable category. The risk of force majeure during construction, incompetent subcontractors, intervention from the owner to change the design, fines for late payments, all affect cost and time. Meanwhile, the risk of an unclear or incomplete document hierarchy will affect costs (Simanjuntak, 2020).

4.2 Impact of Risks Towards Construction Cost

The cost due to dominant risk is obtained through in-depth interviews with the project manager and site manager. Resource persons provide information on work items or construction activities that experience problems due to the identified dominant risks. The informants also showed data such as VON (variation order notification) for work added

less, records of damage events, material losses, estimates of cost overruns that occurred due to swelling of preliminary costs caused by dominant risks, and notes on fines borne. by the contractor due to late payments to sub-contractors/suppliers. Thus, the dominant risk influence on costs can be determined for structural, architectural, interior and utility (MEP) works. The resource persons also provided information on the cost components that were affected by the dominant risk. The impact of risk on construction costs is as shown in table 2 below.

Tabel 2. Impact of Risks Towards Construction Cost

No	Cost Identification	Description	Cost (IDR)	Risk Cost	%
R1	The costs that are affected are direct costs. Problems that arise in the field are that there are work items that are not listed in the BQ, but are listed in the drawings or technical specifications so that they are not offered at the time of the tender.	Civil works	43.631.371	134.766.977	6%
		Interior works	39.267.113		
		Utility works	51.868.493		
R2	Failure to pay by the owner will cause losses to the contractor, both direct costs and preliminary costs during construction. It also causes strikes by subcontractors/suppliers that are not paid by the contractor.	Civil works	29.461.213	107.630.493	4,90%
		Interior works	37.000.000		
		Utility works	41.169.280		
R3	The impact of late payments to subcontractors or suppliers is the emergence of late fines, and strikes or material production by suppliers.	Civil works	4.860.000	26.037.000	1,20%
		Interior works	10.767.000		
		Utility works	10.410.000		
R4	Costs that have an effect on the existence of a prolonged shutdown are preliminary costs (wataff salary, power supply, warehouse rent, security and cleaning).	Civil works	44.500.000	128.485.000	5,80%
		Interior works	36.000.000		
		Utility works	47.985.000		
R5	Delay in work can result in losses in preliminary costs, as well as strikes by subcontractors/suppliers that are not paid by the contractor.	Civil works	18.900.000	58.570.000	2,70%
		Interior works	13.670.000		
		Utility works	26.000.000		
R6	Late fees in accordance with the agreement in the contract, as well as strikes by subcontractors/suppliers.	Civil works	1.820.000	15.400.750	0,70%
		Interior works	3.170.750		
		Utility works	10.410.000		
R7	If the escalation value agreed by the owner is less than that offered by the contractor, the profit from the contractor will decrease.	Civil works	42.000.000	130.800.000	5,90%
		Interior works	36.800.000		
		Utility works	52.000.000		
R8	Claims for additional work issued by the engineer are not approved by the owner. Claims of work that have been done are not approved, the costs are directly borne by the contractor)	Civil works	21.106.968	68.261.220	3,10%
		Interior works	18.646.761		
		Utility works	28.507.491		

R9	The data provided by the engineer does not match the adjustments in the field, resulting in rework, and repair costs are borne by the contractor.	Civil works	31.702.766	87.220.766	3,90%
		Interior works	27.622.000		
		Utility works	27.896.000		
R10	Procurement of materials that are not in accordance with the schedule, causing additional costs for preliminary (maintenance and storage in warehouses))	Civil works	16.000.000	71.500.000	3,20%
		Interior works	27.000.000		
		Utility works	28.500.000		
R11	There was a loss of SBO material, which was stored in the warehouse or in the field. The cost of the loss is the responsibility of the contractor as the installer.	Civil works	60.429.014	197.828.008	9%
		Interior works	137.398.994		
R12	Test failure caused by the absence of the party responsible for approving the test, may result in additional testing costs for the next test (re-schedule).	Utility works	10.000.000	10.000.000	0,50%
R13	The final cost is the preliminary cost. Preliminary costs are: employee salaries, rental of machinery/tools, fuel, security and project cleanliness.	Civil works	40.000.000	121.879.000	6%
		Interior works	36.000.000		
		Utility works	45.879.000		
R14	Test failure caused by inadequate test equipment, may result in additional testing costs for the next test (re-schedule)	Utility works	17.500.000	17.500.000	1%
R15	There was a delay in the handover/handover of stage I work causing additional preliminary costs (security & cleanliness)	Civil works	36.780.000	110.430.000	5%
		Interior works	26.754.000		
		Utility works	46.896.000		
R16	The costs that have an effect on the material are not fixed due to the write-off, namely the costs of supply, delivery, and production of materials.	Civil works	19.276.275	61.017.275	3%
		Interior works	21.091.000		
		Utility works	20.650.000		
R17	The occurrence of variation orders + (addition of work items), can cause additional preliminary costs, if the processing time increases (staff costs, power supply costs, warehouse rental costs, equipment rental costs, cleaning costs, security costs).	Civil works	37.000.000	136.639.000	6%
		Interior works	43.829.000		
		Utility works	55.810.000		
R18	There is damage to the building or installed materials due to external factors, and if the repair costs are less than the insurance limit, the repair work is borne by the contractor.	Civil works	35.699.031	75.699.031	3%
		Utility works	40.000.000		
R19	Costs that affect the repair of defects / defects carried out by subcontractors, are direct costs.	Civil works	35.006.800	79.499.945	4%
		Interior works	26.170.895		

		Utility works	18.322.250		
R20	The discrepancy between the tender data and the reality on the ground may result in additional direct costs, which are borne by the contractor (payment system: fixed price lumpsum)	Civil works	28.670.000	75.670.000	3%
		Interior works	20.000.000		
		Utility works	27.000.000		
R21	The impact of the provsum is that the contractor's profit increases or decreases depending on the unit price used (unit price follows the contract), so the costs that are affected are direct costs.	Civil works	35.678.000	117.076.000	5%
		Interior works	48.709.000		
		Utility works	32.689.000		
R22	Design improvements result in work delays, and will cause preliminary cost overruns	Civil works	68.698.000	68.698.000	3%
R23	The impact of force majeure such as a volcano erupting, causing an increase in material prices (sand & stone). Force majeure can cause work delays, which affects preliminary costs.	Interior works	55.600.000	111.400.000	5%
		Utility works	55.800.000		
R24	Loss of material can cause a loss in the cost of the material itself.	Civil works	13.300.000	124.292.456	6%
		Interior works	50.962.056		
		Utility works	60.030.400		
R25	OHS management development needs to be carried out with more in-depth training during the evaluation process	Civil works	25.000.000	72.500.000	3%
		Interior works	13.500.000		
		Utility works	34.000.000		

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CONCLUSION

The identified contract risks are 25 risks, which causes a total risk cost of IDR 2,208,800,920

REFERENCES

Abdelrahman, A., Mohammed, A. 2019. The impact of Risk Management Plan on Projects Success. (April 2013).

Astiti. N.P.M. 2014. Analisis Risiko Pelaksanaan Pembangunan Jalan Tol Benoa-Bandara-Nusa Dua. Denpasar: Universitas Udayana.

Hansen, S. 2015. Manajemen Kontrak Konstruksi. Jakarta: PT. Gramedia Pustaka Utama

Norken, I., Purbawijaya, I., Suputra, I. 2015. Pengantar Analisis Manajemen Risiko Proyek Konstruksi. Denpasar: Udayana University Press

Nurlela dan Suprapto, H. 2012. Identifikasi dan Analisis Manajemen Risiko pada Proyek Pembangunan Infrastruktur Bangunan Gedung Bertingkat.

Rumimper, R.R. 2015. Analisis Resiko Pada Proyek Konstruksi Perumahan Di Kabupaten Minahasa Utara. Jurnal Ilmiah Media Engineering, 5(2): 381–389.

Simanjuntak, M. 2020. Analisis Risiko Pada Pelaksanaan Proyek Konstruksi Yang Menggunakan Kontrak FIDIC Di Bali. Spektran, 8: 74–83

Sirait, N.M. 2016. Analisis Risiko OPerasional Berdasarkan Pendekatan Enterprise Risk

Management (ERM) Pada Perusahaan Pembuatan Kardus Di CV Mitra Dunia Palletindo. C Industrial Engineering Online Journal, 5.

Yuliana, C. 2017. Manajemen Risiko Kontrak Untuk Proyek Konstruksi. Rekayasa Sipil, 11.

Yuni. 2016. “Analisis Risiko Dokumen Tender Pada Pelaksanaan Pekerjaan Konstruksi Swasta Di Kabupaten Badung.”