

# Causes of Variation Order and the Impact on Project Cost Building in Sudirman

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**Abstract:-** Variation order on the construction project can negatively affect project implementation costs are swelling. This occurs due to the factors that cause variation work order. Data collection technique used observation and interview methods and then be made a factor analysis of causes and effects of variation order to the cost of implementation. These results indicate that the biggest factors causing variation work order is a design change with a percentage of 60%, while the smallest is the causative factor prime cost rate with the percentage of 2% of the total number of jobs variation order. The impact on costs due to the variation of work orders amounted to 4.78% of the amount of the initial contract with the percentage of 34.85% work structures and architectural work for 65.15% of the total variation work order.

**Keywords:-** Variation order, construction, contract, cost, etc.

## I. INTRODUCTION

Project construction is a temporary business that has a time limit of execution and budget and produce a product or service. The work of variation order or added work is less common in the implementation of construction projects. Variation order work is a form of refinement of existing designs in a contract work. Variation order due to change of plan by owner, material change from owner and design change by owner. In the application of variation order job claims, the contractor shall furnish the requirements documents in order for the claim to be received by the owner. The document is a recap of work variation orders, site intruction, minutes of meetings, quantity calculations, shop drawing, contracts, documentation. In the contract work between the contractor and the owner has arranged issues regarding changes and work variation order. Variation orders are written agreements signed by owners and contractors.

Planner to modify or give change to work which has been arranged in contract document. Where such changes may result in adjustments to the Cost and Time of the Implementation.

As happened in one of the Project Office Building Sudirman Central Business District. The project is experiencing cost overruns as a result of variation work order. The largest percentage of variation orders included work on the project is the kind of work structure and architecture.

This is the underlying writer take the topic of the variation order on the Project Office Building Sudirman Central Business District. By knowing the factors that cause variation orders and the impact on the cost of the project is expected to minimize and anticipate the variation work order. Based on the description of the background issues raised above, taken the problems that can be formulated as follows:

- The largest percentage variation work order on the Project Office Building Sudirman Central Business District is a structural and architectural work.
- The existence of various factors that cause the variation order on the Project Office Building Sudirman Central Business District.
- Project Office Building Sudirman Central Business District are experiencing cost overruns as a result of variation work order.

The objectives of this research are:

- Analyze how much percentage of the work structure and architecture in order variaron work Project Office Building Sudirman Central Business District.
- Identify what are the factors that cause variation orders on the Project Office Building Sudirman Central Business District.
- Analyzing how big the impact of a variation order to the cost of the Project Office Building Sudirman Central Business District.

## II. LITERATURE

Change order (Variation / change order) is a change in the scope of the contract, confirmation of the revised scheduling, collection of other modifications and in the form of a standard form that includes a summary of the description of the changes and the impact of such changes to the contract, both in time and cost of the project (Barrie & Paulson, 1992).

Variation / change order to change the details and conditions of employment, resulting in the addition of jobs (Extra Work) or a reduction in employment. A formal request to the contractor by the project owner to do extra work because the contractor find errors (omissions) of the project owners or planners. Construction change according to (Fisk & Reynolds, 2006), consisting of:

- The imperfection of the planning and specification
- Interpretation of the engineer different
- Standart higher performance than the specified

- Impropriety inspection and rejection of
- Changes in the method of implementation of
- Changes in the circuit construction
- Things are not specified by project owners
- The impossibility and impracticability in the implementation.

In order variation there are two basic kinds of change, namely the Direct Change or a change in formal and informal Construction Change or alteration.

#### ➤ *Direct Change*

Direct change or formal changes are proposed changes in writing, proposed to the contractor to change the scope of work, execution time, costs or other things different that has been specified in the contract (Gilbreath, 1992).

#### ➤ *Constructive Change*

Constructive change is informal action to order a modification of the contract on the ground that occurs because of the request of the planner or contractor. Constructive Change is also described as an agreement between the owner and the contractor changes in terms of cost and time (Barrie & Paulson, 1992), therefore, should the contractor should submit the changes in writing.

### III. METHODOLOGY

Researchers used data collection based on primary data, secondary data and literature data. Collecting data using primary data in the form of observation. An observation method claims data variation made to order, so it can be retrieved analysis of causes of variation orders and the impact of variation in the order against the implementation of the project. An observation method is observation of variation orders against the contract. The contents of the contract procedures are in accordance with the implementation on the ground. So the analysis of observations of writing material. And using secondary data such as data projects, for example: a contract, shop drawings, minutes of meetings, and other data. Literature data can assist and compare the existing theories to the reality on the project.

The data collection of this thesis is as follows:

#### ➤ *Points Research*

Points research in this thesis is one of the Project Office Building located at the Sudirman Central Business District, South Jakarta.

#### ➤ *Time Research*

This research was conducted in July 2017 to October 2017 is divided into two stages:

- The first stage is conducted observations and interviews bertepatan at the project site development.
- The second stage is the stage of data processing which is a variation order of data where the research project.

#### ➤ *Data Collection Methods*

Data collection methods to be done to complete the final task of this manuscript there are two primary data and secondary data. Primary data and secondary data to complement this research are as follows:

##### • *Primary Data*

Primary data is data obtained directly from the subject of research as a source of information sought. Field observations are direct observation project to observe, see, record important information, and conduct a question and answer with the project (contractor) to obtain information and data about the project.

##### • *Secondary Data*

Secondary data is data obtained by the other party, not directly obtained by the researchers of the subject of research. Secondary data is generally tangible documentation data or data reports are already available. Secondary data in this thesis is derived from the data obtained that contains the project management of project data and the data of the project. Secondary data needed for this final task, among others, the data variation orders, contracts, and Site Instruction.

After getting the results of data collection techniques. The writer can process data and make analyzes. So the identification of factors causing variation orders and the impact of a variation order to the cost of the project can be analyzed and observation based methods research by the author.

Conclusions is the final step in this research that it relates to the goals to be achieved. Conclusion to get the factors causing variation orders and variation orders to get the amount of the amount of the type of work structure and architecture.

### IV. ANALYSIS

The study was conducted in the Office Building project Sudirman Central Business District, located on the road Tulodong Up, Kebayoran Baru. Type of project is the construction of an office building that will be used by the tenant. The building is constructed of 48 floors consisting of basement, podium and tower.

The contract, which is used in this project is the Development Contract with Fixed Price Per diems types. This contract type is where the contractor agreed to implement all of the scope of work that is offered in accordance with the conditions agreed with the total price of the entire work or the unit price of each kind of work has been set from the beginning. The contract amount to work and architectural structures contained in the Office Building project Sudirman Central Business District is Rp. 1,187,701,101,231.

The amount of variation orders that occur based Project Manager Instruction (PMI) is 53 work items with a

total amount of Rp. 56,796,807,199. Here is a list of variation orders occur:

No.	Description	Amount (Rupiah)	Causative Factor	Instructed by	Scope of Work
1	Supply and Installation of Starter Bars into the Existing Dwalls	3,856,614,187	Add. Works	Owner	Structure
2	Supply and Installation of Additional Rebars to Mat Foundation	147,963,652	Add. Works	Owner	Structure
3	Supply and Installation of Additional Rebars to Basement 6 (B6) Slab due to misplacement of Bored Pile P63	135,475,003	Add. Works	Consultants	Structure
4	Reinforced Concrete (RC) corbels, plinths, Beams and Steel Hooks to Lift Machine Room at Level 19	87,679,214	Design Change	Owner	Structure
5	Reinforced Concrete (RC ) Work after Forcon Drawing Issued on or before 31 December	12,432,164,900	Design Change	Owner	Structure
6	Gypsum Ceiling to the perimeter at Curtain Box and Corewall	1,919,544,000	Add. Works	Owner	Architecture
7	- Steel Grating at 42Floor Level	2,972,884,947	Design Change	Consultants	Architecture
8	Steel Stair Type P2 Ground Floor to 5th Floor	162,628,705	Design Change	Owner	Structure
9	Additional Fire Proofing from Ground Floor to 41st Mezzanine Floor Level (On Steel Structure)	5,618,483,000	Change Material Specifications	Owner	Architecture
10	Entrance Mat (Dust Control) at BOH area, B6-B1 Mezz and 3-5 FL	794,076,000	Add Works	Owner	Architecture
11	Suspended Glass Partition to Entrance Hall at GF - 3rd Floor Level	11,352,169,719	Change Material Specifications	Consultants	Architecture
12	Structural and Architectural Works for Bench at Basement Area	47,175,190	Add. Works	Owner	Architecture
13	Changes in the Location and Quantity of Fire Shutters in Basement	1,901,590,200	Design Change	Owner	Architecture
14	Reduction in Depth of Lifts Pits	163,569,305	Design Change	Consultants	Structure
15	RC stiffeners to Edge Beam / Cantiveler Slab at GL 10 / BE at Mezanine Level to Level 5	453,193,195	Design Change	Owner	Structure
16	Changes in Beams to Air Shaft at Basement 1 Mezz at GL 1 / AB	23,033,533	Design Change	Owner	Structure
17	Changes in Shafts and Beams to Panel Rooms at Basement 5 - Basement 1 Mezz	66,409,872	Design Change	Owner	Structure
18	Revised Structural Layout Plan for Ground Floor	196,643,655	Design Change	Owner	Structure
19	Revised layout of Locker Room and Shower Room at Level B3 (Builder Works)	(5,381,000)	Design Change	Owner	Architecture
20	Revised layout of Female Toilet, Janitor, and Pantry at B1 Level (Builder Works)	51,369,000	Design Change	Owner	Architecture
21	omission of Beams at VIP and HZ Elevator Lobby on Transfer Floor Level	(15,842,106)	Design Change	Owner	Structure
22	Changes to Mid Zone Lift Motor Room at Level 32 (Structure works)	161,367,890	Design Change	Owner	Structure
23	Changes to Mid Zone Lift Motor Room at Level 32 (Architecture works)	(11,934,000)	Design Change	Owner	Architecture
24	RC Works for Revision to Service Lift Motor Room at Level 42 ( MEP 2nd Floor)	56,566,286	Design Change	Owner	Structure
25	Structural & Architectural Works for the Revised Parapet Walls of Podium Floor (Mezz to Level 7)	97 1,076,910	Design Change	Owner	Structures

26	RC Structure in 7th Floor Level	79,194,211	Design Change	Owner	Structure
27	Enlargement to Column at the Shear Wall on Level 19th and 20	212,472,245	Design Change	Owner	Structure

No.	Description	Amount (Rupiah)	Causative Factor	Instructed by	Scope of Work
28	Design Changes to MEP Room Layout at Level 41	609,055,931	Design Change	Owner	Architecture
29	Steel Stair P6, P7, P8 and P9 at 41st Floor Level	274,903,710	Design Change	Owner	Structure
30	Adjustments to LPG Room on Ground Floor - RC Works	32,546,205	Add. Works	Owner	Structure
31	Adjustments to LPG Room on Ground Floor - Architecture Works	85,568,000	Add. Works	Owner	Architecture
32	Dog House on Level 41	18,590,760	Add. Works	Owner	Structure
33	Revised Lightweight Brickwall Thickness to Typical Lift Lobbies (LZ, MZ and HZ)	206,099,000	Design Change	Owner	Architecture
34	RC Slab to AHU Room at Lev 41	6,295,629	Design Change	Owner	Structure
35	Topping Up of Inner Core Slab to Level 18	403,086,000	Add. Work	Owner	Structure
36	Peephole Door and Gutter Cover to Cavity Wall at Basement 06 - Basement 02	659,520,000	Design Change	Owner	Architecture
37	Structural Construction Drawing (For Con) of MEP floor (level 6)	437,614,576	Design Change	Owner	Structure
38	Thermal Insulation of Floors and Walls	4,166,600,000	Design Change	Owner	Architecture
39	coring Test to Floor Slab of Level 6 and 8	53,569,000	Add. Work	Consultants	Structure
40	Typical Pantry sink and <b>Cabinet</b>	676,100,479	Design Change	Owner	Architecture
41	Dog Houses Type 5A and 5B on Level 42	39,714,770	Add. Works	Owner	Structure
42	Mobile Network Room on Level 1 Mezzanine and RRU Room on Levels 6,9, 41and	160,092,270	Design Change	Owner	Architecture
43	Revised Retail and Mail Room on Basement 1	11,775,000	Design Change	Owner	Architecture
44	Redundancy and Air Lock Rooms on Level 5	7,456,000	ChangeDesign	Owner	Architecture
45	Unit Rates for homogenous and Ceramic tiles	1,785,467,000	Prime cost rate	Owner	Architecture
46	Galvanized railing to around 19 th Floor Level (External)	255,200,000	Add. Works	Owner	Architecture
47	Change in the Material of Louvres in 6F to MEP Floor	602,300,000	Change Material Specifications	Owner	Architecture
48	Revision to Fan Room at Basement 6	33,036,139	Design Change	Owner	Architecture
49	Roller Shutters in Ground Floor and Revision to Loading / Unloading Area	795,379,575	Add. Works	Owner	Architecture
50	Waterproofing to Corridor on Level 2	300,525,000	Add. Works	Owner	Architecture
51	Paint Materials for Core Wall and Car Park	4,292,379,000	Add. Works	Owner	Architecture
52	Roof Structure for Water Pump at Level 41	33,955,410	Add. Works	Owner	Structure
53	Glass Door to the Banking Hall 2 at GF	551,743,000	Design Change	Owner	Architecture

Table 1:- Summary of Variation Order

Based on data released in Table 1, it can be graphed the relationship between the number of orders per year variation in the type of work to figure out the type of work the most and the largest amount of variation orders for the year.

The results of data processing relationship between the amount of variation order with the type of work contained in the Project Office Building Sudirman Central Business District showed that the percentage of 51% is the architectural work that is then followed by the work structure with a percentage of 49%.

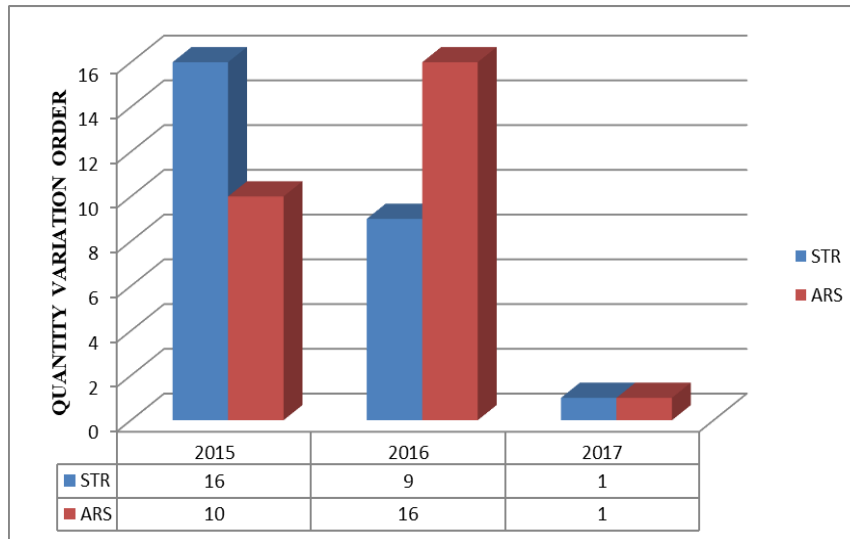


Chart 1:- Correlation Between Variation Orders per Year with Scope of Work

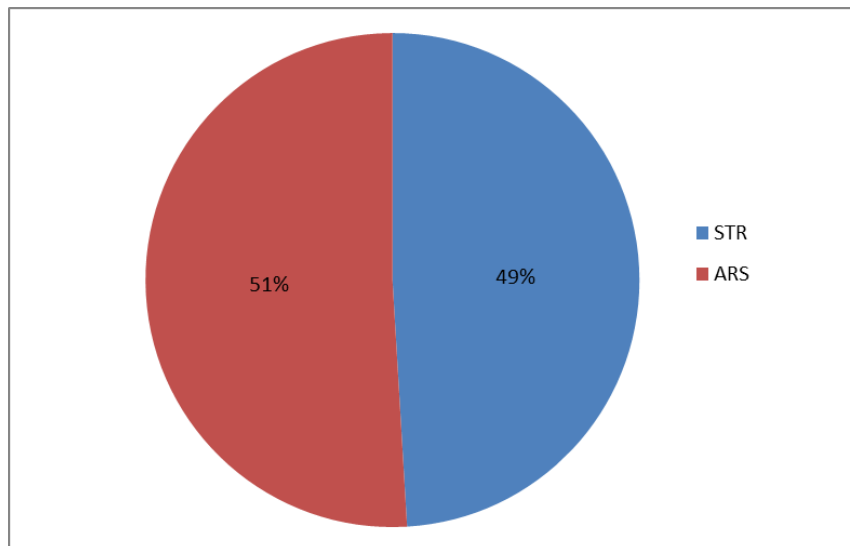


Chart 2:- Percentage of Total Variation Order by Scope of Work

Based on Table 1. recapitulation variation order on the Project Office Building Sudirman Central Business District, there are 53 items less additional work that can be divided into four by a contributing factor. These factors are:

- Additional Work
- Design Change
- Specification Material Change
- Prime Cost Rate

Of the four factors, can be analyzed which factors most likely to cause the onset of variation order. This analysis is as follows:

➤ *Analysis of Causes Based on the amount of PMI*

Based Project Manager Instruction (PMI) issued in table 1, it can be graphed the relationship between the causes of variation order by the number of PMI issued to find out what factors most likely to cause the onset of jobs variation order ,

The results of data analysis the relationship between the number of Project Manager Instruction (PMI) with the causes of variation orders contained in the Project Office Building Sudirman Central Business District showed that the factors causing the most cause variation work order is a design change with a percentage of 60%. While the causes of the most rarely cause variation order is the prime cost rate with a percentage of 2%.

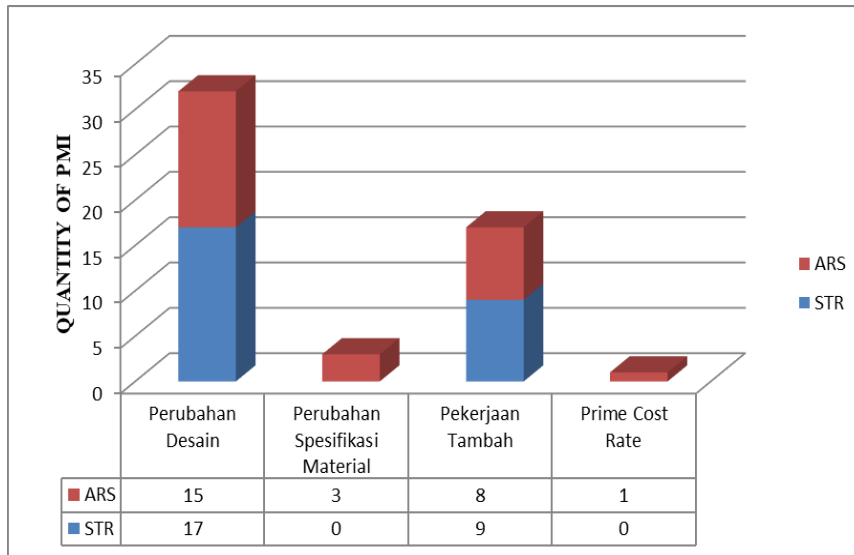


Chart 3:- Correlation between Causative Factors with Total PMI

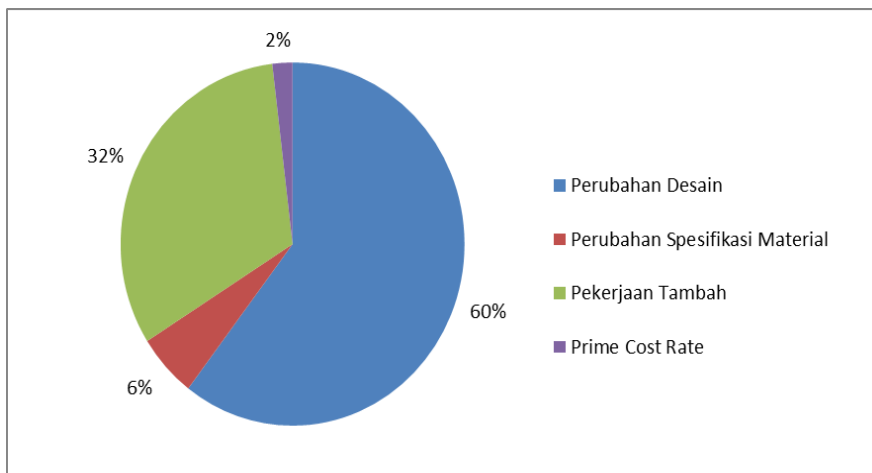


Chart 4:- Percentage Causative Factors of Variation Order by Total PMI

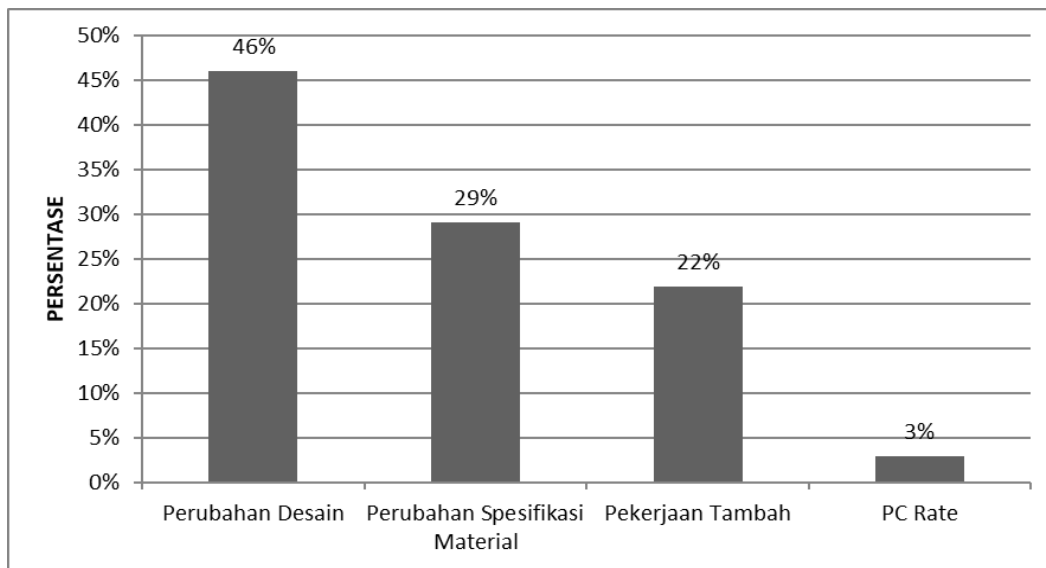
➤ *Causes Analysis Based on Amount of Variation Order*

Based on the amount of variation order issued in Table 1 may be made recapitulation tables and graphs the relationship between a factor with amount of variation order to determine what is causing the greatest amount of variation orders and variation orders smallest amount.

The results of the data analysis of the relationship between the amount of the order variation caused by factors that cause variation orders contained in the Project Office Building Sudirman Central Business District showed that the factors that cause variation amount of the highest order is a design change to the percentage of 46%. While the factors that cause variation amount of the low order is prime cost rate with the percentage of 3%.

No.	Causative Factor	Amount (Rupiah)
1	Add. Works	13,211,361,753
2	Design Change	27,758,978,698
3	Specifications Material Change	17,572,952,719
4	Prime Cost Rate	1,785,467,000

Table 2:- Summary of Amount Variation order by Causative Factor



Graph 5:- Percentage of Causative Factor of Variation Order by Amount

In this study, the variation work orders have increased the impact of the implementation costs of the existing amount in the contract. Added costs can be analyzed by comparing the amount of a contract with a amount after the variation work order.

From the list of variation orders on the Project Office Building Sudirman Central Business District, it can be analyzed that the percentage increase costs as a result of variation work order is as follows:

Structural & Architectural Contract Amount  
= Rp. 1,187,701,101,231, -

Amount Cost Variation Order  
= Rp. 56,796,807,199, -

Amount Variation Order Cost Structure  
= Rp. 19,796,041,781, -

Percentage of Variation Order Structure  
= (Rp. 19,796,041,781 / IDR. 56,796,807,199)  
x 100% = 34.85%

Variation Order Cost Amount Architecture  
= Rp. 37,000,765,418, -

Percentage of Variation Order Architecture  
= (Rp. 37,000,765,418 / IDR. 56,796,807,199)  
x 100% = 65.15%

Percentage of cost variation order to the amount of the contract structure and architecture  
= (Rp. 56,796,807,199 / Rp. 1,187,701,101,231)  
x 100% = 4.78%

## V. CONCLUSION

After doing research on the causes of variation orders and the impact on the cost of the project implementation Office Building Sudirman Central Business District, it can be summed up as follows:

- Based project Manager Instruction (PMI) jobs variation order is the largest is the work.
- Factors causing the variation work order is additional work, change in design, material specification changes and prime cost rate. Based on the number of instructions issued, the most common cause factor causing variation work order is a design change.

Based on the research and analysis of the causes of variation orders and the impact on the cost of the implementation of the Project Office Building Sudirman Central Business District that has been done, there are some things that can be used as suggestions, as follows:

- Planning the design and concept of the building should be planned well and perfect , so that the implementation can minimize any variation work order.
- To perform the calculation of the budget plan at the beginning of the project should be done well ,, recording of data for identification of variation orders that compares employment data based on image, volume, technical specifications and materials.
- Tim quantity surveyor must study the contract properly and carefully because in the contract consists of chapters and chapters which contain many rules on the implementation of the project. So it could be used as a reference and consideration for the manufacture of variation orders and conduct negotiations with the consultant quantity surveyor.
- In the processes and stages in applications, calculations and rules in order variation agreement should be agreed in writing between the contractor and the consultant quantity surveyor and owner so far misunderstanding in the result agreements variation order.

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