

Analysis of Variation order and Effect on Cost and Time at Highrise Building Project in Tangerang

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Abstract: *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 jobs affect the project cost plan, especially in the type of structural work and finishing work. Variation order jobs also affect the completion time of project implementation. Thus affecting the handover process by the contractor to the owner of the building. Research methods based on background and problem formulation. Data collection techniques used observation method and interview method, compared with literature study. After data collection is obtained, analysis of causes of variation order and impact of variation order is made. The conclusion is the final stage in this research whose contents relate to the objectives to be achieved.*

The result of the study on the cost is that the addition of the value of variation order to the contract cost of the structure and finishing work is 2.52%. Variation order structure value 50.50% of all variation order values, the outline consists of steel work, steel grating, machine foundation, and other structural work. Variation order finishing 49.50% value for all variation order, the outline consists of work Alumunium Composite Panel, Ceiling, Doors and windows, Marble, ceramic and other finishing work.

Keyword: *Variation Order, Contract, Cost, Time, Claim.*

1. 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.

2. Problem Identification

Based on the description of the background of the problems mentioned above, the following problems can be formulated:

1. Work Variation orders affect the cost of the project, ie on the type of structural work and Finishing.
2. Variation order jobs affect the completion time of project implementation. So that affect the process of handing over by the contractor to the owner of the building.

3. Problem Formulation

The formulation of the problem in writing this final assignment is:

1. What is the effect of the variation order work on the contract value based on the type of structure and finishing work as well as the porsentase value of the Variation order of structures and architect work?
2. How does variation order work affect project completion time?

4. Research Objectives

The purpose and purpose in writing this final assignment are:

1. Monitor the amount and value of Variation order, the value of Variation order to the value of the increase of the contract work, the value of Variation order based on the value of the type of structure and finishing work, and the value of Variation order based on the value of added work and the value of less work
2. Knowing the plan of the project completion time or handover to the owner due to the many variation orders.

5. Research Benefits

Analysis is done on the writing of this final assignment for the division of knowledge, especially for the author himself, colleagues, and readers are:

1. Monitor the number and value of Variation order based on the type of structure and finishing work, as well as the analysis of added work and less work.
2. Make a project completion time or handover to the owner.

6. Limitations and Scope Issues

In writing this thesis, the authors limit the scope of writing and discussion of the problem on several reviews as follows:

1. Implemented in the project of high rise building, in Alam Sutera Tangerang.
2. Variation orders or work added less done research is the work of the structure and finishing work.

7. Literature

7.1 Variation order

Variation orders or work added less is a common thing in the implementation of building construction projects. Variation order is a form of refinement of existing design in a Contract of Work.

Variation order is an agreement between the owner and the contractor to confirm the existence of the plan changes and the amount of compensation costs to the contractor that occurred at the time of construction.

According to the American Institute of Architect (AIA), the Variation order is a written request signed by the owner, architect and contractor created after the contract is issued, has the power to change the scope of work. Make adjustments to the contract value and the time of completion of the work.

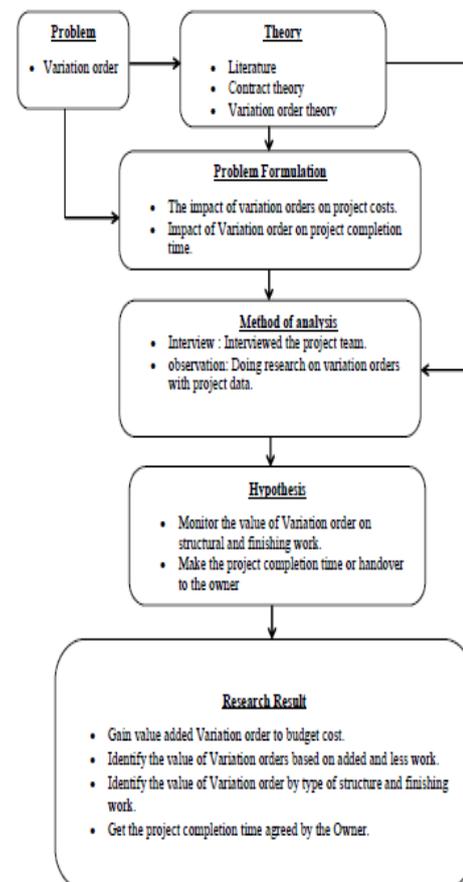
Variation orders are official documents signed by owners and contractors to compensate contractors for changes, additional employment, delays or other consequences of collective agreements contained in the contract.

From some opinions above, it can be concluded that Variation order is a written agreement signed by the owners, contractors and planners to modify or provide changes to the work set in the contract documents. Such changes may result in an adjustment to the cost and time of implementation.

7.2 Framework

In the implementation of construction projects are often faced with problems, one of which is the occurrence of changes. Changes or variation orders on construction projects as an event that result in the occurrence of modifications both on the scope of work, execution time, and costs.

The author takes issue in writing this is variation order. Obtained in the problem formulation is the



Picture1. Framework

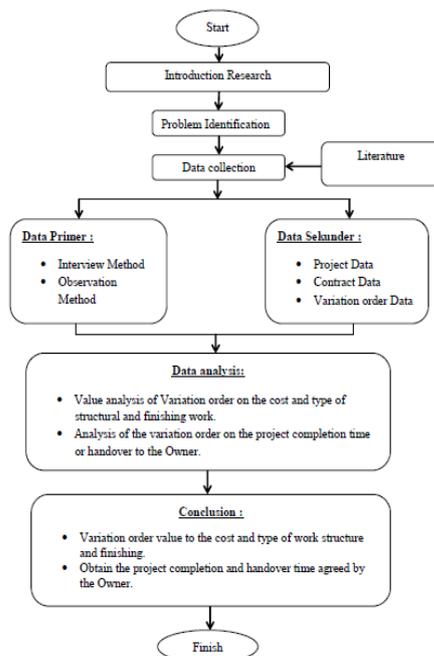
impact of variation orders on the project cost budget

and on the completion time of project implementation.

8. Research Methods

Judging from the background research and the formulation of the problem about the title of the final assignment "Influence of Variation Order to the cost and time of Project Building Prosperous Prosperous Natural Sutera". Researchers used data collection based on primary data, secondary data and literature data. Data collection using primary data in the form of interview method and observation method. Interview method is done with project team personnel, so that can be analyzed the cause of variation order and the effect of variation order for implementation in the project. Observation method is observation of variation order to contract. The contract content procedure is in accordance with the implementation in the field. So the author can make an observation analysis of the writing material. And use secondary data in the form of project data, for example: contract, shop drawing, minutes of meeting, site inspection and other data. The literature data can help and compare the existing theories with the reality in the project.

From all data analysis will be generated, that is the cause of the work variation order and the impact of variation order on the implementation of the project. Data analysis will be obtained so that it can be drawn conclusions and suggestions.



Picture 2. Flow Chart Of Research

8.1 Study of Literature

The literature study was obtained from various books and journals on variation order work. To know the theoretical basics of variation order work on construction projects.

8.2 Interview Method

Interview method is done to get the factors which usually become the cause of work process variation order and job impact of variation order to job implementation in project.

Interviews were conducted to project teams such as project leaders, field teams (Site Manager, Chief Inspector), Engineer team and Quantity Surveyor team. The results of the interview of the writer can take the result of different mindset and point of view from each team in the project.

8.3 Observation Method

Observation method is done by studying documents related to the object of research. The documents are: contracts, drawings, minutes of meetings, site instructions, other documentaries. Contract documents usually contain rules about project implementation procedures. The author will analyze and observe the work of variation order on the contents of the contract

8.4 Data Analysis

After getting the results from data collection techniques. So the writer can process the data and make the analysis. So the identification of the causes of variation order and the impact of variation order on the cost and time of project implementation, can be analyzed and observation based on research methods by the author.

8.5 Conclusion

The conclusion is the final stage in this research whose contents relate to the objectives to be achieved. The conclusion to monitor variation order on the project can be studied and anticipated as early as possible. To get the value of Variation order on value added and type of structure and finishing work. Value Variation order for project completion time and handover to Owner.

8.6 Place and Time of Research

This research was conducted in Prima Sejahtera Building project carried out by PT Total Bangun Persada Tbk in Alam Sutera, Tangerang.

This research was conducted in March 2017 until June 2017 which is divided into two stages:

1. The first stage is to make observations and interviews that are placed at the location of development projects.
2. The second stage is the implementation phase which includes data processing.

9. Analysis and Discussion

The Prima Sejahtera Building Project uses the Lump Sum Fix Price contract.

In general, the Lump Sum Fix Price contract is a contract in which the volume of work suspected in the contest can not be re-measured. And the unit price refers to the unit price in the contract.

Government Regulation (PP) No.29 / 2000 on the provision of construction services provides a definition of the form of contract of construction contract with the form of Lump Sum reward as mentioned in Article 21 paragraph 1 as follows. Contract of work of construction in the form of lump sum as referred to in article 20, paragraph 3, is a service contract on the completion of all work within a certain period with fixed and fixed amount of price. All possible job risks in the process of elaboration are fully borne by the service provider. As long as the images and specifications are unchanged.

The explanation of Article 21 paragraph 1 is a work with the form of Lump Sum, in the event of correction of the calculation of the bid price details. Due to an arithmetic error, the total bid price should not be changed. Changes may only be made on either one volume or unit price. All risks due to changes due to arithmetical correction are the sole responsibility of the service provider.

9.1 Analysis and Identification of Variation Order

Analysis and Identification of Variation Order can be done in while making initial cost budget plan and during project execution take place. Here the author based on experience, observations and interviews with several parties

a. Based on Drawing

Quantity Surveyor Division can compare tender drawings and image for construction. If the image changes shape between the tender image and for construction, it can be identified as a variation order. But the Quantity Surveyor division can learn in detail About the drawings and must coordinate with the Engineering Division.

b. Based on Volume

The volume calculation for the initial cost budget plan can be compared with the volume of the tender. If there is a difference between the volume of the tender and the volume for construction, it can be identified as a variation order. But it needs to be analyzed by drawing, coordinating with the Engineering division and coordinating with other parties.

c. Based on Technical Specification

If there is any change of technical specification in tender and actual plan in the field. It can then be identified as a variation order. But it needs to be supported by data tender, minutes of meeting, Site instruction or material approval.

d. Based on Material Specification

In the event of any material changes in the tender and actual plans in the field. It can then be identified as a variation order. But it needs to be supported by data tender, minutes of meeting, Site instruction or material approval.

e. Based on Time Specification

If the planned time becomes late, the contractor makes the analysis. The analysis is the result of many variation orders, it can be identified to be variation order. But it needs to be supported by minutes of meetings, and Site instruction. And the important thing is the correspondence.

9.2 Claim Data Variation order

The value of the project contract of Gedung Prima Sejahtera Alam Sutera = IDR.248,000,000,000 (incl Ppn), which consists of :

- | | |
|--------------------------|---------------------|
| 1. Preliminary | IDR. 23,350,222,670 |
| 2. Structure | IDR.85,941,276,590 |
| 3. Finishing | IDR.85,348,758,500 |
| 4. Mechanical&Electrical | IDR.53,359,750,000 |

Cost Analysis Variation order :

Value of cost Variation order = IDR. 4,315,794,000

Value of cost Variation order Structure work = IDR. 2,179,137,000 (50.50%)

Value of cost Variation order Finishing work = IDR. 2,136,657,000 (49.50%)

Value of contract cost Structure & Finishing = IDR. 171,290,035,090

Analysis of adding Percentage work Structure and Finishing of contract cost plus cost Variation order is to be = 2.52 %.

Table.4.1. Variation order recapitulation.

No	Description	Value (incl Ppn)	Date SI	Causes of Work	By Request	Work
1	Addition of Bore Pile Structure	97,129,000	18-Nov-15	Design Revision	Principal Consultant	Struktur
2	Revision of Beams 1 Fl. 3 Fl	66,077,000	11-Dec-15	Design Revision	Principal Consultant	Struktur
3	Addition Brick Wall Basement Fl. - Roof Fl	18,555,000	13-Jan-16	Design Revision	Principal Consultant	Asistek
4	Addition warehouse on the fire ladder 2 Lt Basement	79,862,000	26-Jan-16	Additional Design	Principal Consultant	Asistek
5	Addition Facade of ACP 1 Fl	1,487,407,000	2-Feb-16	Additional Design	owner	Asistek
6	Addition of Warehouse 1MFl -3Fl	323,728,000	23-Feb-16	Additional Design	Principal Consultant	Asistek
7	Addition of ACP wall R.LMR 12 Fl.	582,789,000	23-Feb-16	Additional Design	owner	Asistek
8	Mechanical Coupler for connecting blocks into shear wall	(472,183,000)	23-Feb-16	Design Revision	Principal Consultant	Struktur
9	Addition Ceramic Floor	(900,854,000)	4-Mar-16	Design Revision	Contractor	Asistek
10	Work Addition 1 Fl	191,462,000	13-Mar-16	Design Revision	Principal Consultant	Asistek
11	Work Change Layout 4 Fl	26,299,000	11-Apr-16	Design Revision	Principal Consultant	Asistek
12	Addition of ACP Parapet Roof Fl	966,632,000	18-Apr-16	Additional Design	owner	Asistek
13	ETFM Vertical Chassis of Spider Pipe 1 Fl	219,992,000	18-Apr-16	Design Revision	owner	Asistek
14	Work of Concrete Addition Lift Service 1Fl - 8Fl	95,180,000	4-May-16	Design Revision	Principal Consultant	Struktur
15	Plat Steel Coating Column 1 Fl	184,122,000	9-May-16	Design Revision	Owner	Asistek
16	Addid Kitchen sink toilet area as D/E/9 Basement Fl	1,207,000	13-May-16	Request by Owner	owner	Asistek
17	Addition of ACP at ceiling 7 Fl	38,436,000	13-May-16	Design Revision	Principal Consultant	Asistek
18	Addition of Sliding Wall P21 and Sliding Glass P22 1Fl and 4Fl	170,662,000	13-May-16	Design Revision	Owner	Asistek
19	Changes beam 1 Fl - LMR Fl	182,263,000	25-May-16	Design Revision	Principal Consultant	Struktur
20	Addition of Metal Roof R. Trafo Basement Fl	69,416,000	27-May-16	Design Revision	Owner	Asistek

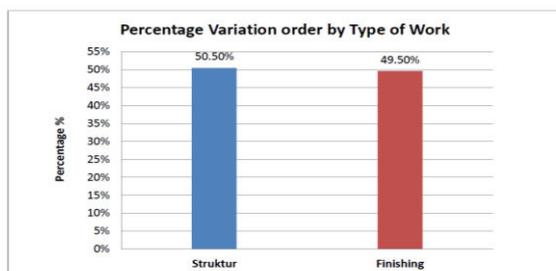
Table.4.1. Variation order recapitulation (Continue).

No	Description	Value (incl Ppn)	Date SI	Causes of Work	By Request	Work
21	Addition of ACP gutters 11th floor	393,380,000	30-May-16	Additional Design	owner	Asistek
22	Less Work Steel Grating 4 Fl - LMR Fl	(839,914,000)	1-Jun-16	Design Revision	Principal Consultant	Struktur
23	Paint Reduction Works due to ACP Installation	(61,235,000)	14-Jun-16	Design Revision	Principal Consultant	Asistek
24	Work of Stainless Steel Coatings on column	194,129,000	14-Jun-16	Design Revision	Owner	Asistek
25	Work Addition Other Structure Foundation Machine (PROV)	(177,588,000)	13-Jul-16	PROV SUM	Contractor	Struktur
26	Provisional Steel Lift Area	188,648,000	25-Jul-16	PROV SUM	Contractor	Struktur
27	Provision of Steel Stairs LMR Room	10,914,000	1-Aug-16	PROV SUM	Contractor	Struktur
28	Provisional Column of Spider Pipe 1 Fl	108,873,000	1-Aug-16	PROV SUM	Contractor	Struktur
29	Addition Structure Work Koi Pool 4 Fl	81,759,000	16-Aug-16	Design Revision	Principal Consultant	Struktur
30	Addition Finishing Koi Pool 4Fl	35,372,000	16-Aug-16	Design Revision	owner	Asistek
31	Addition Finishing Koi Pool 4Fl	11,507,500	16-Aug-16	Design Revision	Principal Consultant	Asistek
32	Strengthening Structure Works 3 Fl	218,975,000	16-Aug-16	Design Revision	Principal Consultant	Struktur
33	Brick Work and ACP Works on 11 Fl	273,713,000	16-Aug-16	Additional Design	Principal Consultant	Asistek
34	Compact Reduction Work Marble Coatings Floor and walls	(4,097,666,000)	18-Aug-16	Material by Owner	owner	Asistek
35	Roof Canopy steel Works	382,416,000	26-Sep-16	Design Revision	Principal Consultant	Struktur
36	Antenna Foundation Steel Works	491,231,000	26-Sep-16	Design Revision	Principal Consultant	Struktur
37	Provision Support Cat Walk Steel	759,525,000	1-Oct-16	PROV SUM	Contractor	Struktur
38	Provision Support Sunshading Facade	(154,696,000)	1-Oct-16	PROV SUM	Contractor	Struktur
39	Provisional Add Less Steel Fins Building	49,253,000	1-Oct-16	PROV SUM	Contractor	Struktur
40	Foundation Work of Exhaust Fan Ventilation	383,297,000	26-Nov-16	Design Revision	Principal Consultant	Struktur
41	Addition Listplank work 1 Fl	63,061,000	16-Dec-16	Additional Design	Principal Consultant	Asistek
42	Addition Window Wall At 11Fl	94,599,000	19-Dec-16	Request by Owner	owner	Asistek
43	Addition Ceiling Work	572,733,000	23-Dec-16	Design Revision	Contractor	Asistek
44	Add Wooden Door	249,047,000	9-Jan-17	Design Revision	Contractor	Asistek
45	Addition Iron Door	77,092,000	9-Jan-17	Design Revision	Contractor	Asistek
46	Addition Aluminum Door	(72,133,000)	9-Jan-17	Design Revision	Contractor	Asistek
47	Work Add Leader Roof Leaders, Stairs In The LMR Room	159,801,000	21-Feb-17	Design Revision	Principal Consultant	Struktur
48	Work Add Cat Walk Floor LMR	98,212,000	21-Feb-17	Design Revision	Principal Consultant	Struktur
49	Work on Placement Box Reduction on Fences	(127,281,000)	9-Feb-17	Design Revision	Principal Consultant	Asistek
50	LMR Grill Works	461,664,000	21-Feb-17	Additional Design	Principal Consultant	Asistek
51	Addition Garbage Works	49,253,000	21-Feb-17	Additional Design	Principal Consultant	Asistek
52	Work Add Partition Glass and Gypsum in Stairs-3 1Fl	442,820,000	21-Feb-17	Design Revision	Principal Consultant	Asistek
53	Work Change Front Fence Security	24,072,000	21-Feb-17	Request by Owner	owner	Asistek
54	Work Changes Home Genes External	32,459,000	21-Feb-17	Design Revision	Principal Consultant	Asistek
55	Pj19 Door Relocation Jobs In VIP Room 4Fl	16,511,000	21-Feb-17	Request by Owner	owner	Asistek
56	Work Handle Door Room Meeting 1Fl	41,514,000	21-Feb-17	Request by Owner	owner	Asistek
57	Work Add Trip Ladder in Bird Cage 4Fl (Sky Garden)	102,515,000	24-Feb-17	Additional Design	Principal Consultant	Asistek
58	Work Change Toilet Design 4Fl	46,392,000	2-Mar-17	Request by Owner	owner	Asistek
59	Cat Ceiling Change Work in the main lobby corridor	8,444,000	2-Mar-17	Design Revision	Principal Consultant	Asistek
60	HPL Main Floor Lobby Ceiling Work	19,312,000	8-Mar-17	Additional Design	Principal Consultant	Asistek
61	Addition Flagpole	37,653,000	8-Mar-17	Request by Owner	owner	Asistek
62	Occupation Add Room Pantry Room 4Fl	17,965,000	10-Mar-17	Design Revision	Principal Consultant	Asistek
Sub Total		4,315,794,000				

Sources : Gedung Prima Sejahtera Project

9.3 Analysis of Variation order Structure and Finishing Work

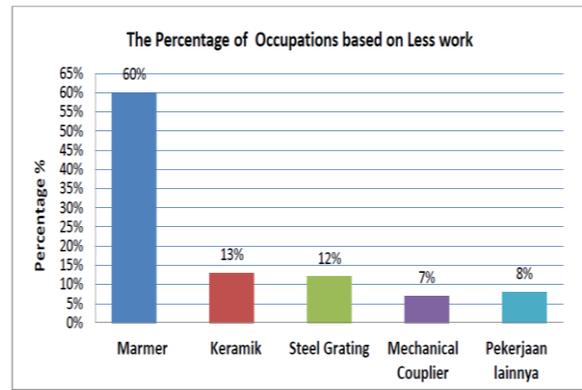
Value of Cost Variation order = IDR.4,315,794,000



amounted to 62 pieces. That is based on Site Intruccion from November 2015 to March 2017.

Chart 4.1. The relationship between the number of variation orders with the type of work and monthly.

Chart 4.2. The relationship between the porcentage variation order and the type of work



9.4 Analysis Variation order Less of Work

Value Variation order job less=IDR(6,838,330,000)

Less work consists of marble work, ceramics, steel gratings, mechanical couplers and other work.

Chart. 4.3. Relationship variation order Less work between the number of pententase with the type of work

Less work analysis is:

- Reduced Compact Marble (Marble) floor and wall coating (Variation order no.34).
 With less job value = IDR.(4,097,666,000) with pententase to total value of work less is 60%.
 Compact Marble or Marble material jobs are supplied by the owner. So it becomes less work, because the unit price BQ contract is material and wages.
- Work added and less floor tiles (Variation order no.9).
 With less job value = IDR. (900,854,000, -), with the percentage of total job value less than 13%.
 The existence of changes in the type of floor and ceramic walls, such as ceramic floor replaced carpet, marble, brick walls, natural stone walls or replacement of ceramic types. So that there is added and less work for ceramic floor and wall work.
- Work less Steel Grating lantait-4 to Floor-LMR (Variation order no.22).
 With less job value = IDR. (839,614,000), with pent percentage to total value of work less is 12%.
 The existence of Steel Grating speksifikasi change on Catwalk from 5x30 mm to 3x30 mm. So there is a change in the speksifikasi which resulted in less work.
- Mechanical Coupler for grafting beam into shear wall (Variation order no.8).
 With less job value = IDR. (472,183,000, -), with

Reduction, Working less door Alumunium (Variation order no.23,25,38,46,49).
 With less job value = IDR. (528,013,000, -) with pent percentage to total value of work less is 8%.

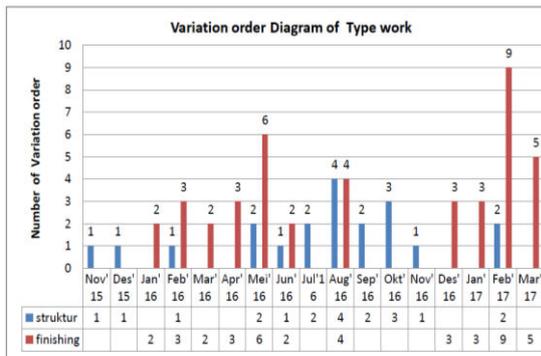
9.5 Analysis Variation order Addition of Work

Value Variation order added job = IDR. 11,154,124,000

Addition work consists of ACP, Steel, Plafond, Door&Window, Finsihing work and Structure work
 Chart. 4.4. Relationship variation order addition work between the number of pententage with the type of work

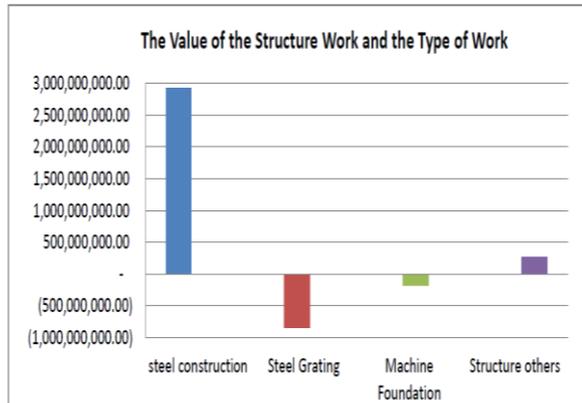
The addtion Work analysis is:

- Work added Aluminum Composite Panel (ACP) on the outer wall looks (Variation order no.5,7,12,17,21).
 With the added value of work = IDR.3,805,418,000, with porsentase to total added work value is 34%.
 Addition of Alumunium Composite Panel / ACP on 11th floor wall, LMR roof wall roof, roof parapet wall, ceiling floor.7, gutter area.11, Lisplank floor area.1.
- Work added Steel construction (Variation order no.26,27,28,36,37,39).
 With the added value of work = IDR.2.440.525.000, with porsentase to the total value of added work is 22%.
 There is a change in steel profile, so there is added work for steel work holder Antene Foundation, Canopy roof.
 Support Catwalk Steel, Steel Fins Building, steel structure elevator, LMR space steel, Steel spider pipe Lobby floor. The above work is a Provisional sum, so the volume calculation is done again and the unit price follows the BQ contract price. It turned out to be an added job because of the change in steel profile.
- Work added Ceiling (Variation order no.43).
 With the added value of work = IDR.572,733,000, with the percentage of total added work value is 5%.
 The existence of work added ceiling due to the calculation of the image of the tender with a picture for contruction the changes. The change resulted in added work of the ceiling work.
- Work added Doors and windows wood, iron, aluminum (Variation order no.42,44,45).

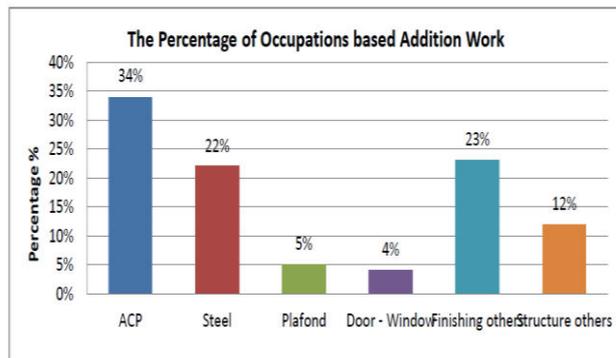


- pent percentage to total value of work less is 7%.
 Mechanical Coupler for grafting the beam into the shear wall is not done in the field, due to accelerate the implementation and facilitate the implementation and approval with the Supervisor of the Constitutional Court in the field. So that the volume and price of units in the BQ contract, all done less work.
- Less work foundation machine, Steel Sunshading Façade, Cat painting, Planter Box fence

With the added value of work = IDR.420,738,000, with the percentage of total added work value is 4%. The existence of work



added doors and windows to the calculation of the image of the tender with a picture for contruc



tion the changes. Such changes result in added work of doors and windows.

- Work added finishing.

With the added value of work = IDR.2,532,017,000, with the pententase to the total value of added work is 23%. For the Finis

hing work many changes in design and the design that occurred in the implementation of construction. So it can be submitted into added work

- Work added structure.

With the added value of work = IDR.1,382,693,000 with the persentase to the total value of Added work is 12 %

For structural work many changes Design and design additions in the implementation of construction. So it can be submitted into added work.

9.6 Analysis of Variation order Structural Work

The claim data of Variation order of structural work on Prosperous Building Prosperous Nature Alam project amounted to 20 pieces with value IDR.2,179,137,000, (incl Ppn). While the claim data Variation order entirely for the work of Structure and Finishing amounted to 62 pieces with the value IDR.4,315,794,000 (incl Ppn).

Porsentation analysis of the value of job variation order Structure against the total variation order value is 50.50%.

Value of contract work contract Structure = IDR. 85,941,276,590

Analysis of adding Porsentase work Structure of contract cost plus cost Variation order is to be = 2.54 %.

Chart.4.5 Relationship between the value of structural work and the type of work

Chart 4.6. Relationship between the value of structural work and Cost per month

Analysis Variation order job Structure:

- Addition of Bore Pile structure.

The addition of Bore Pile point (Subkon Bore Pile direct directly to the owner). So the contractor worked on the added work for cutting and pile bobok as well as added work for the work of pile cap and tie beam.

- Changes beam Lt.1 - Lt.3.

There is a change between the contract image and the image for construction. So the contractors do the added work for concrete beams, iron beams, and formwork beams.

- Mechanical Coupler for grafting beam into shear wall.

Mechanical Couplier for grafting the beam into the shear wall is not done in the field, due to accelerate the implementation and facilitate the implementation and approval with the Supervisor of the Constitutional Court in the field. So that the volume and price of units in the BQ contract, all done less work.

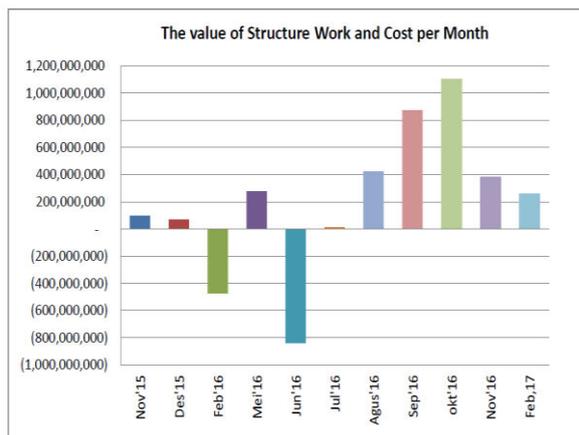
- Work of concrete plate placement Lift Service Floor.1 to Floor.8.

The addition and alteration of the concrete plate design of the Floor Service Lift area. 1 - Floor 8. So that the contractor to work added to the work of concrete, iron, formwork, iron chemicals and steel work.

- Changes of the floor.11 - floor.LMR.

The change from the 11th floor-floor.LMR block, due to changes from the structural planning consultant. So that the contractor to work added to the work of concrete beams, iron beams and formwork beams.

- Less work Steel Grating 4Fl to Floor-LMR
The existence of Steel Grating spesifikasi change on Catwalk from 5x30 mm to 3x30 mm. So there is a change in the spesifikasi which resulted in less work.
- Provisional sum work: Added work and less other structures Engine foundation, Steel lift area, LMR room Steel Staircase, Spider Column 1Fl
The change in volume or volume is recalculated, but the price follows the price of the existing BQ contract. Due to the time BQ calculate the contract of crossing using picture ratio or forecast picture.
- Work Add Less Koi Pond Structure 4Fl.
The design changes from the shape of the 4th floor Koi fish pond. So that there is a change of the volume of concrete, formwork and iron from the Koi pond structure work.
- Strengthening Structure Works 3Fl.
The design changes from the shape of the 4th



floor Koi fish pond. So that the reinforcement of 3-storey beams under the Koi pond, using Sika Wrap and Sika Carbodur methods. So there is added work for structural work.

- Steel Work added less Canopy Roof
A change in steel profile for roof canopy. So there is added work for steel roof canopy work.
- Steel Work added and less base of Antenna foundation.
There is a change in steel profile for Antena Foundation holder. So there is added work for steel work.
- Provisional sum jobs: Catwalk Steel Support.
Support armshaft sunshading façade, Steel Fins Building. The change in volume or volume is recalculated, but the price follows the price of the existing BQ contract. Due to the time BQ calculate the contract of crossing using picture ratio or forecast picture.
- Foundation Work of Exhaust Fan Ventilation.
Exhaust and fresh water changes. So there is added work for excavation of land, bobokan

concrete walls, iron chemistry, the addition of concrete, iron and formwork walls.

- Work added floor-roof ladder leader LMR.
The addition of steel construction ladder leader LMR floor-roof. So that the work added steel work.
- Work added Cat Walk roof floor LMR.
The addition of construction of Cat Walk LMR roof-floor steel. So that the work added steel work.

9.7 Analysis of Variation order Finishing Work

Data claims Variation order Finishing work on the project Building Prosperous Prosperous Nature Sutera amounted to 42 pieces with a value of IDR.2,136,657,000 (incl Ppn). While the claim data Variation order entirely for the work of Structure and Finishing amounted to 62 pieces with the value IDR.4,315,794,000 (incl Ppn).

The presentation analysis of the Variation order value of the Finishing work to the total variation o Value of contract work cost Finishing = IDR. 85,348,758,500

Analysis of adding Percentage Finishing work from contract cost plus cost Variation order is to be = 2.50 %

Chart.4.7 Relationship between the value of Finishing work and the type of work.

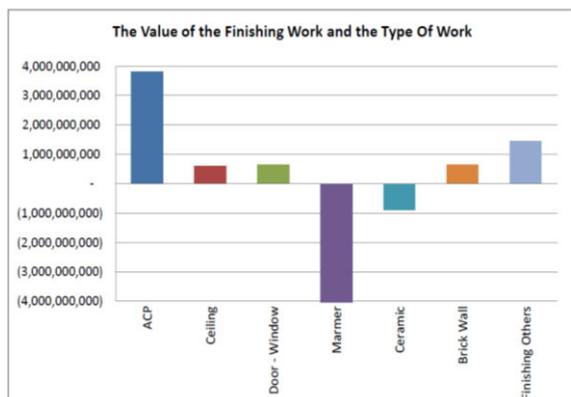
Chart 4.8. Relationship between the value of Finishing work and Cost per month

Analysis Variation order Finishing work:

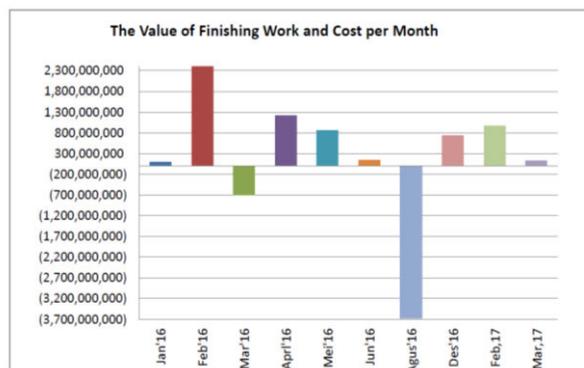
- Lightweight wall brick floor.Basement - Roof
The presence of a brick wall in the fire stair area from Basement floor to Roof floor. So there is the added work of lightweight bricks.
- Addition of warehouse space in fire stairs area-2 floors Basement.
The addition of warehouse space in the basement fire-2 basement area. So that the added work of brick walls, plaster, paint and wooden doors.
- Addition of Alumunium Composite Panel / ACP on 11th floor wall, LMR roof wall roof, roof parapet wall, ceiling 7, gutter area.11, paint reduction due to ACP installation, addition of brick and ACP floor.11, Lisplank area floor.1.
The addition of Aluminum Composite Panel on the wall looks outside,. At the suggestion of consultant planners and contractors using Alumunium Composite panel. To cover the outer wall, to prevent seepage of rainwater and estitika from looking outside. Then the added work of Alumunium Composite Panel and the reduction of paint weathershield outside wall.
- Addition of warehouse space on floor 1Mezzanine-floor.3.

The addition of floor warehouse space.1 Mezanine - floor .. So that there is work added walls Brick, Plaster, paint and wooden doors.

- Work added and less floor tiles.
The existence of changes in the type of floor and ceramic walls, such as ceramic floor replaced carpet, marble, brick walls, natural stone walls or replacement of ceramic types. So that there is added and less work for ceramic floor and wall work.
- Work added and less floor-1.
The existence of room changes on the 1st floor, resulting in added work and less brick walls, plaster, paint, doors and windows, ceiling and wall partition gypsum.
- Change of floor layout-4.
The change of room on the 4th floor, resulting in added work and less brick walls, plaster, doors, ceramics.
- U57M urinal changes to U447HJNM.
The existence of urinal changes that use the manual button replaced with urinal using manual button and sensor.
- Stainless steel coating work on the column.
The addition of Stainless steel coatings and less paint work on the columns in the ground floor Lobby area.



- Addition Kitchen zink Toilet area floor Basement.



The addition of Kitchen zinc basement toilet floor area.

- Addition of Sliding Wall and Sliding Glass floor-1 and floor-4.
The addition of 4th floor Sliding Wall and Sliding Glass floor-1, and the lack of work Frameless window and aluminum glass window doors.
- Addition of metal roof room Basement floor transformer.
The addition of metal roof to the transformer room using steel profiles, metal roofing and flashing metal.
- Work added and less finishing koi pond 4th floor.
The existence of added and less floor work of Wood Plastic composite, Andesite stone coating, ceramic coating, koi pond wall paint coating.
- Reduced Compact Marble floor and wall coating.
Compact Marble or Marble material jobs are supplied by the owner. So it becomes less work, because the unit price BQ contract is material and wages.
- Work added window out-floor 11.
To look the floor-11, the requesting party is given a window Fixed Window. So the window becomes added work.
- Jobs added and less work Ceiling.
For the Ceiling work the owner asks for the count and data changes between the tender image and the image for construction. So that can be added work and less for the work of ceiling.
- Work added and less wooden doors, iron and aluminum.
For wood door, iron, and aluminum work the owner asks for the count and change data between the tender image and the picture for construction. So that the work can be added and less for the work of wooden doors, iron and aluminum
- Work added and less fence building.
Less work for the fence around the building is the grc planter box and added work is the addition of the front fence of the office.
- LMR floor-roof Grill work.
The owner and consultant planner asked for a new grill to cover the machine foundation in the LMR area. So the added work is steel frame and aluminum grille frame.
- Garbage Work.
The owner asked for a larger trash bin for the need. Because in the contract BQ there is no garbage.
- Jobs Add and change finishing For the above items are added jobs and changes to the finishing work that the average requested by the owner at the end of the project. Which is translated and design by the consultant planner architect.

9.8 Influence of Variation Order to Time of Implementation

The timing of the project of Gedung Prima Sejahtera Alam Sutera under the contract is 15 months, from August 15, 2015 to November 15, 2016. But in the implementation there is a delay, due to:

1. The number of work items that have not been decided as soon as possible by the owner and consultant planner.
 2. For three weeks the project was terminated by the owner, due to technical problems with the local PEMDA.
 3. The number of work items designed by consultant planners is still immature and many changes.
- For the settlement period it is finally agreed between the owner, the planner consultant and the contractor that the main work plus the added work to be completed by 30 March 2017 (add time to 4 months). Contractors represented by Project manager, Site Manager and Engineering team calculate that the completion of the Prosperous Building of Alam Sutera Prime Project can be completed on 30 March 2017.

Considering several things:

- a. Number of Changes and Additions of Aluminum Composit Panel work requiring the arrival of material for 2-3 months. As well as his work is very complicated and requires a very dangerous safety.
- b. Marble material (supply by owner) is late and much changed.
- c. Changes and additions to the profile of steel work to be decided by the planning consultant. And the work is complicated and very dangerous. Especially the installation of Antene foundation due to the owner's connection to the installation based on the coordinates of the data.
- d. Mechanical and Electrical Works (ME) shall be decided immediately to expedite other work and work supplied and contracted by the owner.

10. Conclusion

From the results of the analysis that has been implemented then the authors can conclude things as follows:

1. The value of the contract work contract structure and finishing is Rp. 171.290.035.090, -.
- The cost value of variation order structure and finishing is IDR. 4,315,794,000
- So the analysis of additional porsentase of structural and finishing work of contract cost plus the cost of variation order becomes = 2.5196%.
- Value of cost Variation order job Structure = IDR. 2,179,137,000
- Value of cost Variation order of work Finishing = IDR. 2,136,657,000

So the porsentase Variation order Structure work becomes = 50.50%

So the porsentase Variation order Finishing work becomes = 49.50%

2. The timing of the Prima Sejahtera Alam Sutera Building project is 15 months, from August 15, 2015 to November 15, 2016. Due to the added work, the implementation time will be 30 March 2017 (add time to 4 months).

11. Suggestion

From the author's practice during the work related to variation order, hereby the author gives advice:

1. To perform calculations for the cost budget plan at the beginning of the project, it is also necessary to record data to identify variation orders comparing data based on drawings, volumes, technical specifications and materials.

We recommend that the Quantity Surveyor team learn also the contract correctly and thoroughly. Because in the contract consists of chapters and chapters that contain many rules about the implementation of the project. So it can be used as a reference and consideration to conduct negotiations and data for the manufacture of variation orders.

It is advisable to achieve success in the variation order data, to be assisted by engineering teams and field teams. Which is coordinated and managed by Project Manager. To achieve optimal variation order results.

2. For Processes and stages in the submission, calculation, and rules in the agreement variation order. It should be discussed and agreed in writing at the beginning of the project with QS consultants, supervisory consultants and contractors. So minimize misunderstanding in the calculations and decisions in the results of variation orders.

We recommend that variation order submitted and approved first by the owner, just done the implementation in the field. Or variation order has been processed and recognized by the owner during the development process runs. At least when the project is finished, the work variation order has been approved and agreed by the owner at least 90% of keseluruhan number of variation orders.

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