



Job No.: 354 : Commercial Office Building for HE.Juma Ahmed Al-Bawardi

Commentary on Variation Order Requests

Foreword :

This internal Report is a commentary on Variation Order Requests, based on the progress on the site, correspondences and meetings between parties.

I am thankful to the cooperation extended to me by the Project Manager ,Construction Manager, Consultants Engineer and the Civil and MEP engineers.

It is to be noted that I was not allowed to review the correspondence folder saying that these are private and not official but was able to get it from the secretary.

All the supporting documents with each variation were studied and the Addition and Omission quantities and there pricing was verified with the help of BoQ and Tender documents and drawings.

The total original cost of the project without variation is 60.648 millions after 5.6% discount.

Status of Variation Orders

Variation Order Number	Description	Cost after Consultants approval (AED)	Remarks
VO1	Change in Secant Pile Diameter from 75cm to 90cm	147,975	Rejected by Consultant
VO2	Underground Services	166258 (Addition)	There were no Omissions and all the additions are substantiated
VO3	Change in Type of Foundation	3,755,396.00 (Addition)	Approved by Consultant & ADCP Rejected by the Owner
VO4	Fire Fighting System Variation as per changed Civil Defence Requirement	73344 (Addition)	All the additions and Omissions are substantiated
VO5	Wash Basin and Kitchen Sink Replacement	57236.00 (Addition)	All the additions and Omissions are substantiated
VO6	Changes in height of Wooden Door	-	included in VO8 Changes in Interior Finishing
VO7	ADDC New Regulation, New Substation Location and Revised Ground Floor Layout	314,834	Under Study by ADCP Approved by Ramahi

VO8	Main Entrance and Lift Lobby Interior Decoration Changes in height of Wooden Door,Basement lift lobby finishes (Does not include the 12floor Office space)	1060679.00 (Addition)	
VO9	Basement Lift Lobby Finishes	-	included in VO8 Changes in Interior Finishing
VO10	PC rate Variation (Office Pantry and Toilet Tiles)	-87627 (Omission)	in favor of client Approved by consultant and ADCP
VO11	Change of Partition Wall between Offices	23851 (Addition)	Approved by consultant
VO12	Additional Etisalat Requirement on Telephone Systems	158,474	Under Study by ADCP Approved by consultant
VO13	Change in Aluminium thickness from 6mm to 4mm	-43,725 (Omission)	Under Study by ADCP in favor of client
VO14	12th Floor Finishing works (Not including the lift lobby)	Yet to be Submitted by the contractor	As calculated by me the total Omission comes out to be 418946 AED
VO15	Provisional sum allowance for rerouting of Etisalat existing telephone cable	Yet to be Submitted by the contractor	200,000 AED is consultants approximation which is to be returned to Owner

Total approx. Variation Cost to the Owner excluding VO1 and VO3 = 1,104,378.00 AED

Calculation of the Contractors Penalty for delay in Project Handover :

VO 3 change in foundation design has been approved by Ramahi and ADCP and hence the contractor has updated its revised completion period to 22months + 80 days and has revised the completion date to 8th April 2010 in its monthly progress report since the month of Jan.2010.This is not approved by the owner officially.

Original Handover date is 18th Jan 2010

Projected Handover date is 8th April 2010

Total projected delay = 31+28+21 = 80 days

Sub Contract Clause 47.1 : Limit of penalty 10% of contract price , max. delay 40% of time for completion
in days

$$\begin{aligned}\text{Penalty per day after Jan.10}^{\text{th}} &= ((10\% \text{ of } 60,648,000) / (40\% \text{ of } 660 \text{ days})) \\ &= 60,648,00 / 264 = 22,972.72 \text{ per day}\end{aligned}$$

Total Projected Penalty = 22972.72 x 80 = 1,837,817.6 AED

Comments on Variation Order Requests :

VARIATION ORDER 1 : Change in Secant Pile Dia.

Date Requested : 8th May 08

Cost Impact : 147,975 AED

Time Impact : 15 days (Rejected by Consultant)

The reason provided by the Contractor verbally was that there was no Pile casing for 75cm dia. Piles, hence 90cm dia is provided.As there is no such limitation it is unacceptable and wrong.

It is noted that by increasing the secant pile dia. The contractor needs one size of 90cm Pile casing for both the secant piles and the foundation piles.

According to Dutch foundation letter DF/2008/30708, it revised the secant wall design and changed the earlier pile dia of 75cm which was adequate for the design loads, to 90cm.

This was earlier requested by GM Amana to MD Ramahi arguing that it is reqd. for maintaining safety and stability of excavation surface and to reduce water seepage.

It was later rejected by Ramahi although the increased dia piles were constructed without the approval.

VARIATION ORDER 2 : Underground Services

Date Requested : 26th July 08

Cost Impact : 166,258 AED (Approved)

It is found that all the additions were substantiated by invoices. There are no Omissions.

15% profit is charged over the total additional expenditure by the contractor

Breakdown : (after consultants correction)

Temporary Rerouting of 70mm underground electric cable+15% profit	44485 AED
Temporary Removal of existing storm water line ble+15% profit	36340 AED
Temporary Rerouting of street light cables, poles and its found. ble+15% profit	85433 AED
Total	166258 AED

VARIATION ORDER 3 : Change in Foundation Design

Date Requested : 26th Aug 08

Cost Impact : 3,755,396 AED
Owner)

Time Impact : 80days (Approved by Consultant/ADCP Rejected by

From the correspondences it is found that it was Ramahi which asked Amana, letter reference MR/GIC/254/2008 dated 5th May 2008, to request Baynunah that they review the raft foundation and Baynunah produced another revision of their report in which they recommended pile foundation, Knowing that raft will always be there.

(Because the foundation is below water table raft is always required to resist water upthrust. There cannot be isolated footings when the water table is above foundation.)

After this Amana started executing the variation and asking for time and cost impact for the changed foundation after they got the variation approved by the consultant (as clear from 14th August 08 correspondence) with 80 days extension instead of 120 as asked by Amana.

In the meeting on 11th Aug. 2009 at Baynunah lab, when it was asked what prompted Ramahi to request for a second revision, Ramahi has stated that Abu Dhabi Municipality instructed them to adopt a pile foundation.

No evidence of such an instruction is provided to any party.

It is not the job of municipality to instruct or recommend type of foundations for buildings.

Recommendation about the type of foundation is Baynunah's/Ramahi's responsibility as they are the official agencies for doing that.

By shifting its responsibility to Municipality, Ramahi has unwittingly accepted that the revised study done by Baynunah was intended to recommend Raft and Pile foundation.

- **Absence of Net Allowable Bearing Capacity and Settlement calculation from the Soil Report**

It is found from the correspondence that the Net Allowable Bearing Capacity calculation and settlement calculation and their verification by tests were never a part of soil investigation study or if it was done then it was deliberately not included in the Soil Investigation Report.

The revised soil inv report which is with me also does not have the above two items, neither their calculations nor the tests to verify it.

They gave this value of Net Allowable Bearing Capacity of 207kPa at 13.3m depth, in a fax as response to Amana query and that is only one page of fax for Raft foundation at 13.3m as per the first soil investigation report. And Settlement Value was never given except to Mouchel.

Although Mouchel study was not provided to me and neither the base reactions at the loading points on raft to check the designed capacities of foundation with the loads, the following inconsistencies and irregularities are found in the final Geotechnical Report as submitted by Baynunah :

Comments against Shear Failure and Settlement Calculations and Baynunah's reply

- **Factor of safety of 9 against Bearing Capacity at Raft depth of 13.3m**

Mouchel comments cast doubts over why a safety factor of 9 is applied for Bearing Capacity failure. Rock Quality Designation (RQD) one parameter upon which the safety factor depends as given for all boreholes does not appear to be genuine because no method statements or tests were given in the Soil Report of its verification .

Baynunah comment clarification states that the factor of safety of 9 is as recommended by Foundation design by Boweles for the assumed RockQualityDesignation value of 48% which is the average RQD value for Bore hole no 1 out of 5 bore holes.

In the soil inv. report the Unconfined Compressive Strength Test result and RQD value for boreholes was given but no Tests and calculations for Bearing Capacity and Settlement values of soil. They have given Bearing capacity of piles but no bearing capacity of soil.

A safety factor of 9 against Bearing capacity of soil means for a Net Allowable Bearing Pressure of 207 kPa the Net Ultimate Bearing Pressure will be $207 \times 9 = 1863\text{kPa}$

- **Settlement comments and its reply :**

The value of E modulus, upon which the calculated settlement value depends, is not substantiated in the geotech report and Baynunah's clarification is that it is based on their previous experience with the type of rocks and the UCS values (and not on tests).

The E modulus should have been calculated with the help of insitu tests instead of assuming it.

Although Mouchel has doubts over settlement calculation and have raised questions, they say that even if the settlement calculation is assumed to be correct the resulting settlement figure -- (does not justify this safety factor because it) -- is good for most applications

They counter this by saying that the acceptable settlement to be considered for design is decided by the designer and it can be higher than the calculated value. And for a higher settlement value the bearing pressure can be increased linearly.

Please open the below hyperlink to refer to the Mouchel comments and Baynunah's reply and Mouchel's final letter

[Report on Variation Orders\mouchel comments and final letter](#)

Conclusion :

Both the Bearing Capacity and Settlement calculation and tests are a standard part of any geotechnical report and should have been done at the time of soil investigation and included in the report.

Low Net allowable Bearing Capacity of Soil and excessive settlement are the main reason for the change in foundation design.

Baynunah withheld these two information on purpose, and when this was required by Mouchel, they fabricated it to suit their revised recommendation.

It is clear from the Mouchel letter to Mr Patrick Azar Senior VP ADCP, dated 20th Aug09 ref.900010.001/585, that

the geological and geotechnical information of the site and the loading/building model does not warrant a pile foundation unless the safety considerations are unreasonably high.

To conclude, Baynunah generated a very safe set of geotechnical parameters, and Factor of Safety against Shear Failure and Settlement, to feed into the design so that the Amana's/Ramahi's overdesigned expensive Pile foundation can be justified instead of the originally specified Raft Foundation.

Shortcomings of the Foundation Design irrespective of the validity of Pile foundation

1. There are 6 pile groups of various sizes bearing different loads but for all of them one size of pile is chosen. Further the grouping effect of pile is not considered in the calculation of the pile capacities/sizes.
2. Raft and Pile are both analyzed separately for design and structural analysis of their monolithic load bearing capacity is not taken into account in design.
3. The soil is considered as perfectly cohesionless and unconfined for design.
4. Factor of safety of 2.5 taken by Dutch foundation for the Pile design is slightly too conservative. A rational factor of safety of 1.8 would have been sufficient.

Please open the below hyperlink for detailed breakdown and comments on the approved VO request.

[Report on Variation Orders\variation order 3Change in Foundation type](#)

VARIATION ORDER 4 Rev.2: Fire Fighting System Variation as per Civil Defence Requirement

Date Requested : 3rd Aug 08

Cost Impact : 73,344 AED (As Approved by consultant)

Breakdown : (after consultants correction)

Civil Works	25098 AED
Fire Fighting works	48246 AED
Total	73344 AED

All the additions/omissions were substantiated by invoices.

No profit is charged over the total additional expenditure by the contractor.

Comment : This project started on 28th May 2008 and was supposed to be finished on 18th Jan 2010, but Civil defence requirements of 2007 were used for Tender purposes.

VARIATION ORDER 5 : Wash Basin and Kitchen Sink Replacement

Date Requested : 1st Nov. 09

Cost Impact : 57,236AED (As Approved by consultant)

Omissions which only include the material costs before variation as given in the Omissions calculation when subtracted from the (material costs + supply and fixing charges) as given in the BoQ give the Supply and fixing charges

Comment : Supply and Material Fixing Charges = 182733-29470 = 153263

All the additions are omissions were substantiated.

Please open the below hyperlink for breakdown

[Report on Variation Orders\VO5washbasinkitchensinkreplacement](#)

VARIATION ORDER 6 : Changes in height of Wooden door

Date Requested : N/A

Cost Impact : 120,205AED (As Approved by consultant)

Superceded and included in VO.8

Total amount charged in BoQ for Wooden doors = 482,550 AED

Please open the below hyperlink for the breakdown

[Report on Variation Orders\doorsrevision.XLS](#)

VARIATION ORDER 7 : ADDC new Regulation,New Substation Location and Revised Ground Floor Layout

Date Requested : 20/Jun/09

Cost Impact : 314,834AED (Approved by the consultant,Under study by ADCP)

No comments.This variation is not available to me.

VARIATION ORDER 8 : Changes in Interior Design

Date Requested : 8/Dec/09

Cost Impact : 1,060,679 AED (As Approved by consultant)

Breakdown : (after consultants correction)

1-Ground Floor Main Entrance and Lift Lobby Typical lift lobbies from Mezzanine to 11th floor (ie Wellfix Variation excluding service lift area)

Addition 1,905,998 AED
Omission 1,132,113 AED as per consultant

It is noted that Total Omissions according to the BoQ as calculated by me for Wellfix job from Mezz., 1st floor to 11th floor excluding service lift area is 1,279,284 AED.

Please open the below hyperlink for breakdown

[Report on Variation Orders\VO8Main entrance and lift lobby intfinish\Omissions for lift lobby Mez,1 to 11floor](#)

2-Basement lift lobbies

Addition 158,925 AED (As Approved by consultant)
Omission 176,430 AED (As Approved by consultant) includes only material cost

Total Omissions according to the BoQ ,as calculated by me which include material cost with supply and fixing charges is 331965 AED.

Omissions which only include the material costs before variation as given in the Omissions calculation when subtracted from the (material costs + supply and fixing charges) as given in the BoQ give the Supply and fixing charges

Therefore Supply and Fixing charges = 331965 – 176430 = 155,535 AED

Comment : This was earlier supposed to be done by Wellfix.

Please open the below hyperlink for breakdown

[Report on Variation Orders\VO8Main entrance and lift lobby intfinish\OMISSIONS for basement lift lobby](#)

3-Lobbies of Service Lift Area

The total Omissions according to the BoQ as calculated by me for service lift area is 41939AED

Please open the below hyperlink for breakdown

[Report on Variation Orders\VO8Main entrance and lift lobby intfinish\omissions for service lift area Mezz,1-11floor](#)

4-Change of Wooden door height and Frame Width

As Approved by consultant

Omission : 8560 AED

Addition : 120,205 AED

Please open the below hyperlink for breakdown

[Report on Variation Orders\doorsrevision.XLS](#)

Comments : As far as VO8 is concerned there is no reason why material fixing and supply charges should not be included in the Omissions together with the material charges because Amana is not doing anything.

All the material supply and fixing is done by Wellfix and they have already charged for it

Initially Wellfix was supposed to do lift lobbies from basement to 11th floor and main entrance and I have the quotation for that.

Wellfix has charged a lumpsum of 1,820,020 AED for all lift lobbies from 3rd Basement to 11th floor + GF main entrance.

But Amana has taken the basement and GF lift lobbies and the main entrance internal finishing from Wellfix and executed it.

By doing this and including all the Interior Finishing variations in VO8 the contractor has made the calculation of this variation very complicated.

Total Omissions for Basement

Lift lobby Internal finishes

with lightning fixture

331964.53 AED

Total Omissions for GF Main Entrance

Interior finish

75226 AED

Total Omissions for Mez.,and floors 1-11 Lift Lobby

Interior finish with lightning fixtures

1279284.12 AED

Total Omissions for Internal

finishes Service Lift Room

with lightning fixture

41939.26 AED

Total lift lobby Omission as per BoQ including all charges = 1,728,414 AED

According to the consultants approved VO there is a extra cost of 1,060,679 AED for VO8.

VARIATION ORDER 9 : Basement lift lobby finishes

Date Requested : N/A

(Approved by consultant)
Superceded and included in VO.8

VARIATION ORDER 10 Rev.2 : Office,Pantry,Toilet, Watchman Room and Roof Lift Lobby tiles (PC rate variation Bill No.10 pg 10.1 notes)

Date Requested : 1/Nov/09

Cost Impact : 87,627 AED in favor of the owner (As Approved by consultant)

Comment : Material Supply and fixing charges by Amana = 1,315428-451223 = 864,205 AED

Please open the below hyperlink for breakdown

[Report on Variation Orders\VO10 OfficePantry toilet watchmenroom and roof liftlobby tiles](#)

VARIATION ORDER 11 Rev.2 : Change of Partition Wall between two Offices

Date Requested : 15/Nov/09

Cost Impact : 23,851AED (As Approved by consultant)

Total net Addition as calculated as calculated by me is 15451 AED

Please open the below hyperlink for breakdown

[Report on Variation Orders\VO11Change in partition wall between offices](#)

VARIATION ORDER 12 : Additional Etisalaat Requirement for Telephone System

Date Requested : 5/Nov./09

Cost Impact : 158,474 AED (Approved by Ramahi Under study by ADCP)

This variation is not available to me and hence no information on this additional Etisalaat requirement.

VARIATION ORDER 13 : Change in Aluminium Thickness from 6mm to 4mm

Date Requested : 25/Nov/09

Cost Impact : -43,725 AED in favor of client (Approved by Ramahi Under study by ADCP)

This variation is not available to me.

Comments : In the BoQ and specification the thickness specified is 4mm.

VARIATION ORDER 14 : 12th Floor Finishing Works

Date Requested : August/09

Cost Impact as calculated by me : 418946 AED

(Not yet Approved by Consultant.Yet to be submitted by the Contractor)

Please refer to the below hyperlink for the breakdown.

[Report on Variation Orders\12th floor omissions final copy](#)

VARIATION ORDER 15 : Provisional sum for rerouting of Etisalaat existing cables

In Bill No.2 Site Works, additional items Amana has charged 300,000 AED as provisional sum for rerouting of Etisalaat existing telephone cable which includes 15% main contractor overhead and profit. It is estimated by consultant that at least 200,000 AED out of the above amount should be returned to the owner.It is yet to be submitted by the contractor with substantiation.

General Comments on the Variation Orders :

- The material costs and supply and fixing charges are not separated and are lumped together in the BoQ.
So from the BoQ material costs cannot be determined.
In the calculation of variations only material costs are added / omitted.
Hence supply and fixing charges remain the same as charged in the BoQ. before and after the variation.
- The Reinforcement and the concrete are not separately charged in the BoQ. Instead a fixed rate of 1400 AED / cub.m is applied for RCC.
In VO1 and VO3 the contractor has charged for extra steel separately with the BoQ charges of concrete volume
- According to the original BoQ in which there is no breakdown , everything is in lumpsum, the total price for electrical works they have charged is 6300 AED!
And in the revised BoQ in which the breakdown is given ,after 5.6% discount the total price for electrical works they have charged is 7,538,265.15 AED.
In the original the quantities of individual items is given but rates are not given and in the revised after discount rates are given but the quantities are not given.
So calculation for lightning fixtures was done by taking the quantities from one and rates from another.
- In the original BoQ for Plumbing drainage and Fire Fighting works Bill no 13 in which only items are given and no prices against them the lumpsum charged is 49,820 AED !
and in the revised BoQ after 5.6% discount the total price is 2,340,218 AED
- In the original BoQ for Water supply works the lumpsum charged is 18,421,758 AED and in the revised BoQ after 5.6% discount it is charged as 1,795,860 AED
- The above comments show lot of irregularities in the original BoQ.
- By studying the VOs it is seen that the Contractors requested amount has been reduced by 40-50% after correction by the Consultant in almost each variation except fire fighting.
- The Owner's Representative's suggestions to improve the construction schedule made on the basis of regular monitoring of all the construction activities and there progress at the site on a daily , weekly and monthly basis since the month of August were never taken seriously or acted upon.
- Wellfix job initially was for all basement floors,mezz.,and ground to 11th floor and the main entrance.
Throughout, the Contractor has hampered and delayed payment due to it ,making false promises , although it may be assumed that Wellfix was at least 30% responsible for it. And in the end it has taken basement ground and main entrance from wellfix .
By doing this and including all the Interior Finishing variations in VO8 the contractor has made the calculation of this variation very complicated.
All this has also caused delay to the overall progress of the project.