Crystal Vestiti Ltd.

74/1 Vogra, National University, Joydebpur, Gazipur
Geographic Coordinates: 23.971447, 90.378687
31 July 2023

RSC RMG SUSTAINABILITY COUNCIL

Building Information

Building-1 (Production Building): Three (G+2) storied building.

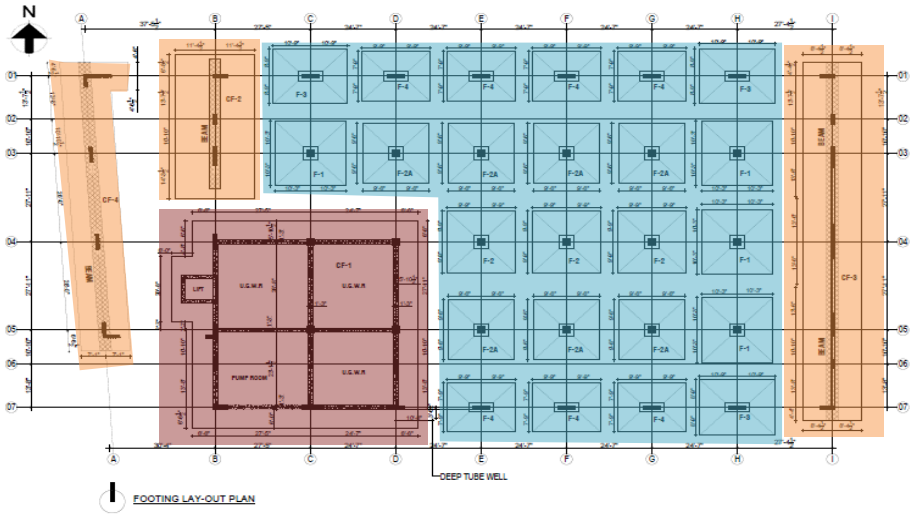
Building-2 (Utility Building): Single-storey building.

Building-3 (Admin Building): Partially two (G+1) storied building.

Observations

Foundation on expansive soil & ground bearing capacity consideration in the design report

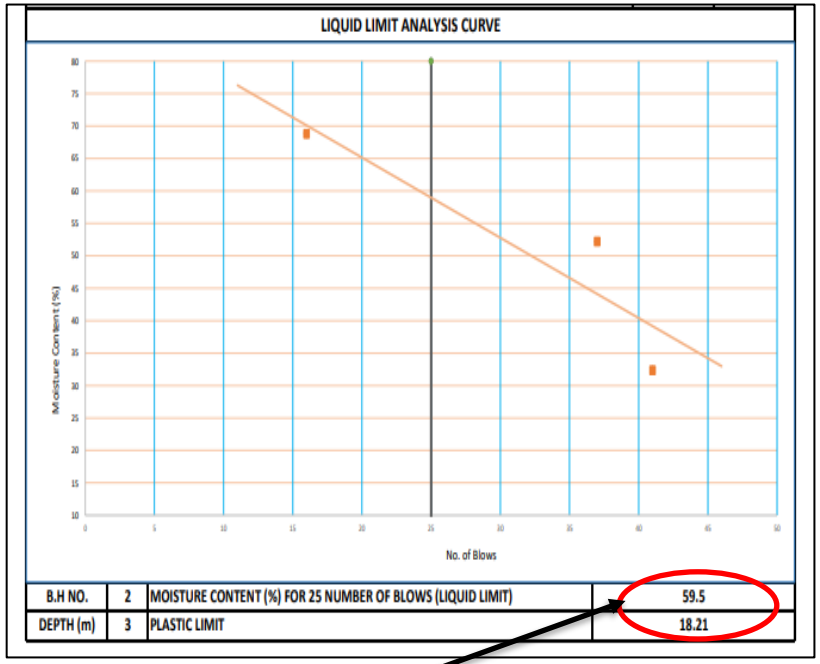
Observation: Building-1 (Production Building)



The building is standing on three different types of shallow foundations.

Foundation rest on fat clay (CH) and Liquid Limit is greater than 50 which indicates possibility of expansive behavior of the soil. There are some low land water bodies nearby the building.

The building engineer is required to carry out further investigation for the expansive soil and incorporate the result in the design report. Suggest remedial measure accordingly.



DEPTH (m)	SAMPLE NO.	SAMPLE INDEX	LAYER THICKNESS	LITHOLOGICAL DESCRIPTION			
				STRATA COMPOSITION	USCS	PLASTICITY	CONSISTENCY OR COMPACTNESS
1	D-01		1 m	Mostly **Clay** with Some Silt	**CH**, Fat Clay	Plastic	Medium Stiff
2	D-02		1 m	Mostly **Clay** with Some Silt	**CH**, Fat Clay	Plastic	Soft
3	U-01 D-03		1 m	Mostly **Clay** with Some Silt	**CH**, Fat Clay	Plastic	Stiff

Soil Test Report

Observation: Building-1 (Production Building)

When, D/B<2.5,

Nc = 5(1+0.2B/L)*(1+0.2D/B) ≤ 9 (Sec. 6.5.1, Foundation Engineering-P.C. Varghese)

As per RSC guideline, we have checked adequacy of footing area and thickness for **105 psf** live load. Considering concrete strength **(00 psi)** and allowable bearing capacity from above calculation, we found that all the footings are adequate in bearing capacity. All the footing thickness are also adequate for punching shear capacity.

As per **Skempton method** for clay soil, (For footing CF3)

N_c= 5*(1+0.2*B/L)*(1+0.2* D_f/B) ≤ 9 (P.C. Varghese-Page no. 116)
= 5*(1+0.2*17/113.5)*(1+0.2*10/17) = 5.75

Q_{ult}= CN_C

Q_{ult}= 1000*5.75= 5750 psf = 5.75 ksf

Qall = 9.28/ 2.5 =3.71, required area =3834/3.71=1033.4 sft <1901 ok.

Factored load (from Etabs-dcon2) =6050 kip, Developed factored stress =6050/1901=3.18 ksf

Developed Shear at d distance from support = (53.38x17.83-8.33x53.38)/2 =253.5 kip kip.

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Engineering design report

Miscalculation for soil bearing capacity.

The building engineer is required to revise the soil bearing capacity calculation in the design report and re-calculate the foundation capacity accordingly.

Observation: Building-1 (Production Building)

Crack on floor beams in several locations

Observation: Building-1 (Production Building)

Cracks on beam in several location of all floors

The building engineer is required to check the intensity of crack , investigate the reason of crack considering both structural and geotechnical concern and prepare an investigation report with proper remedial actions .

Observation: Building-1 (Production Building)

Load plan not prepared for ground floor suspended slab

Observation: Building-1 (Production Building)

Underground fire pump room

Heavy storage on suspended ground floor

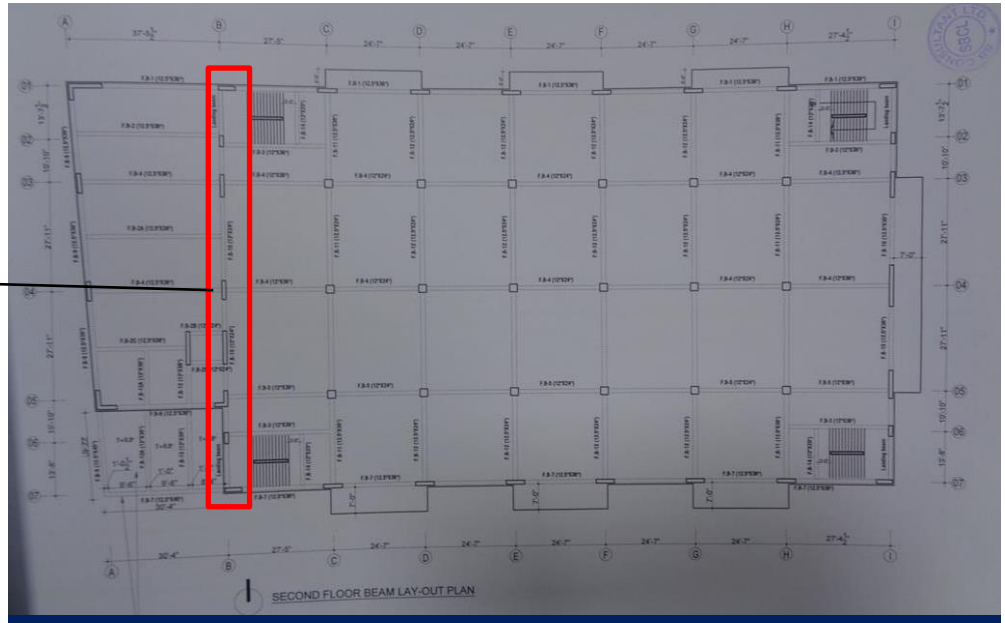
There was no floor live load plan for the suspended ground floor. The building engineer is required to prepare floor load plan for the suspended ground floor.

Observation: Building-1 (Production Building)

Mismatch and lack of as-built drawing

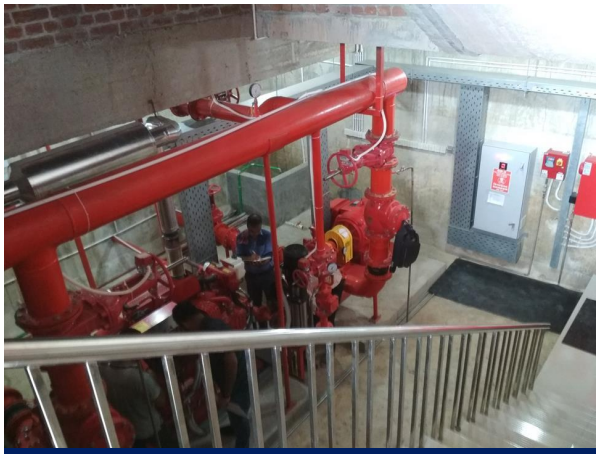
Observation: Building-1 (Production Building)

Beam on site: 900 mm depth



As built drawing: beam depth 600 mm

The building engineer is required to update as-built structural drawing as per site condition.



Underground fire pump room

Underground fire pump room not shown in as-built architectural drawing and mismatch found in 1st & 2nd floor beam. The building engineer is required to survey the structure and prepare accurate as-built architectural and structural drawing.

Observation: Building-1 (Production Building)

Lack of anchorage for stair top metal roof

Observation: Building-1 (Production Building)

Lack of anchorage between rafter and wall connection of staircase roof.

The building engineer is required to provide adequate anchorage to resist uplift forces.

Observation: Building-1 (Production Building)

Lack of anchorage for storage rack

Observation: Building-1 (Production Building)

Lack of anchorage for storage rack

The factory is required to anchor/brace all the non-structural element including storage racks.

Observation: Building-1 (Production Building)

Lack of fall protection

Observation: Building-1 (Production Building)

Falling hazard at loading-unloading area

The factory is required to provide suitable fall protection system to avoid falling hazard.

Observation: Building-1 (Production Building)

Column stress exceeds normal design limit considering possible vertical extension

Observation: Building-1 (Production Building)

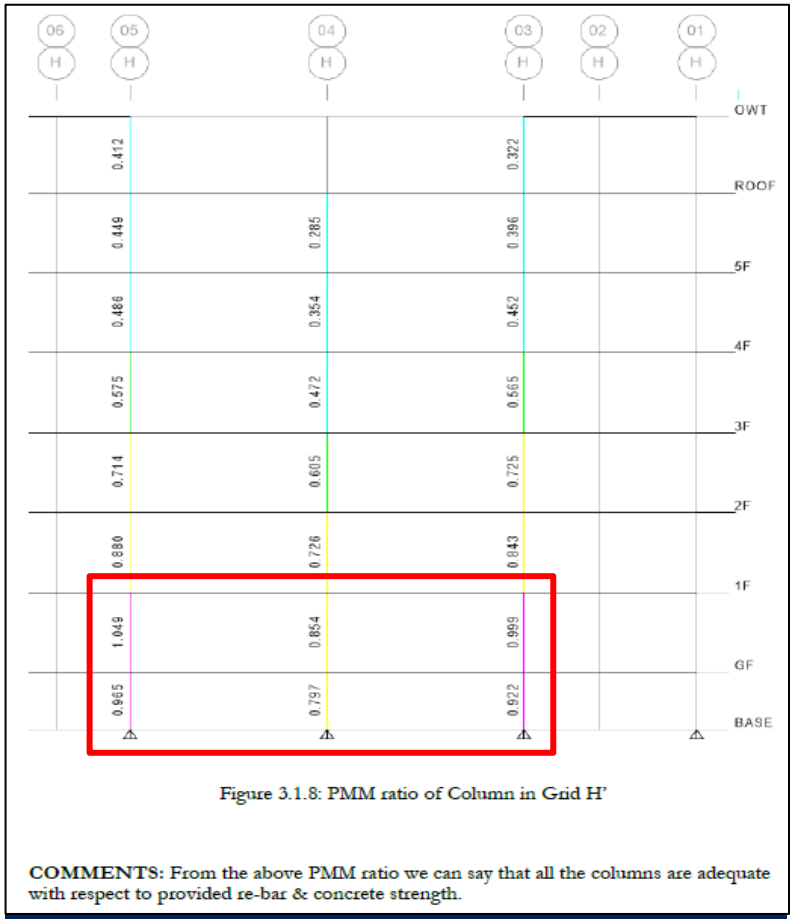
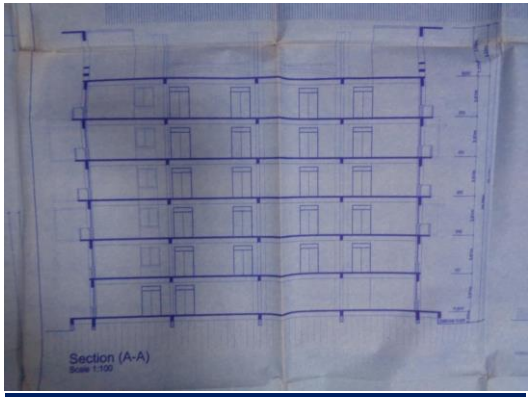


Figure 3.1.8: PMM ratio of Column in Grid H'

COMMENTS: From the above PMM ratio we can say that all the columns are adequate with respect to provided re-bar & concrete strength.

Over stress column in design report: PMM>1.0



Building-1 was permitted for proposed 6 storey

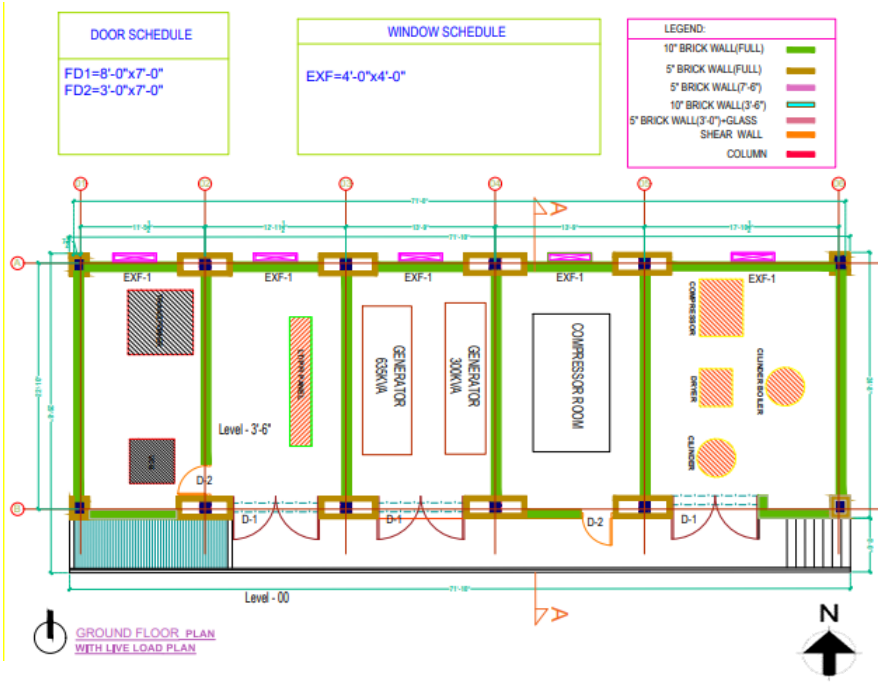
Extended column on roof indicates future vertical extension of the building.

For proposed 6 storied building, considering design strength of concrete, some of the columns were found over-stressed. Prior to vertical extension, the building engineer is required to revise Detail Engineering Assessment (DEA) for the proposed building.

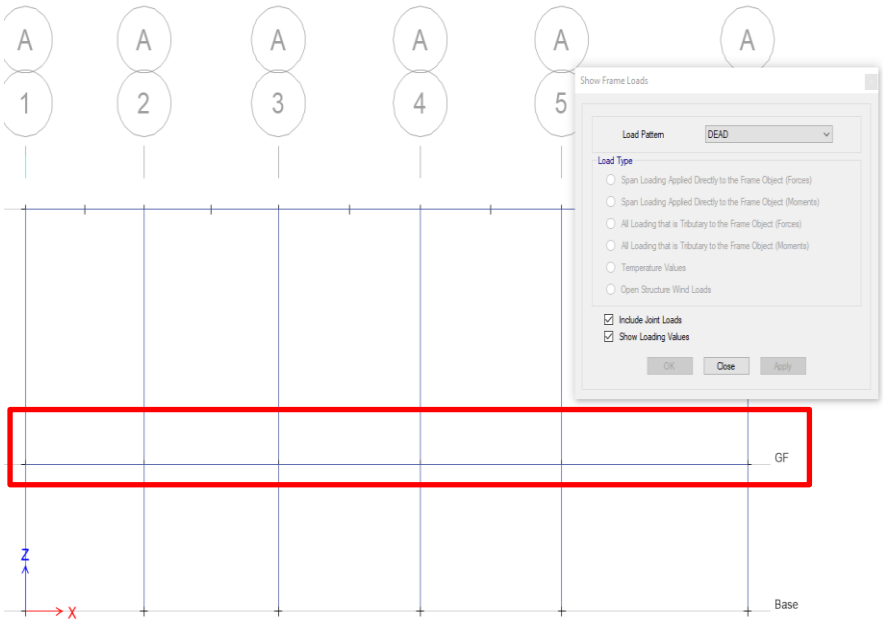
Observation: Building-1 (Production Building)

Brick wall load missing in the analysis

Observation: Building-2 (Utility Building)



Brick wall layout: 250 mm brick walls



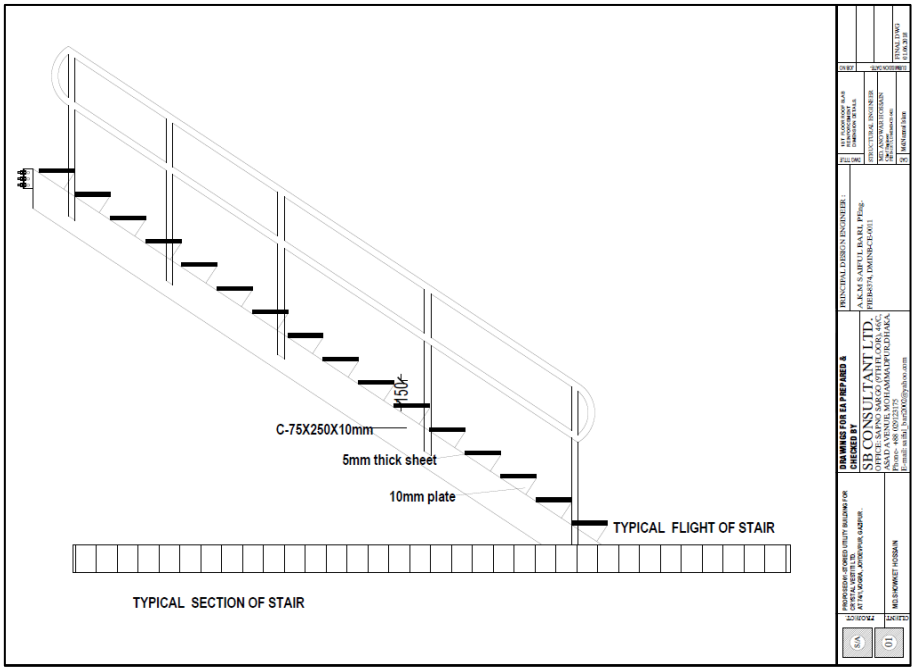
FEA Model: Wall load missing on frame

There were 6m high 250mm brick walls on the beams which was not considered in the finite element analysis (FEA) model. The column height was 6m and size was 300mm x 375mm. The building engineer is required to consider wall loads & slenderness effect of column in the analysis and update the FEA model & design report accordingly.

Observation: Building-2 (Utility Building)

Mismatch in as-built drawing

Observation: Building-3 (Admin Building)



As-built drawing shows steel stair

Concrete stair adjacent to Building-3

The building engineer is required to survey the structure and prepare accurate as-built drawing.

Observation: Building-3 (Admin Building)

Dampness on slab & wall

Observation: Building-3 (Admin Building)

Dampness on roof slab

The factory is required to identify the reason of dampness and take necessary remedial measures.

Dampness on brick wall

Observation: Building-3 (Admin Building)

Problems Observed

Building-1 (Production Building):

Item 01: Foundation on expansive soil and ground bearing capacity consideration in design report.
Item 02: Crack of floor beams in several locations.
Item 03: Load plan missing for ground floor suspended slab.
Item 04: Mismatch and lack of as-built drawing.
Item 05: Lack of anchorage for stair top metal roof.
Item 06: Lack of anchorage for storage rack.
Item 07: Lack of fall protection.
Item 08: Column stress exceeds normal design limit considering possib le vertical extension.

Building-2 (Utility Building):

Item 09: Brick wall load missing in the analysis.

Building-3 (Admin Building):

Item 10: Mismatch in as-built drawing.
Item 11: Dampness on slab & wall.

Priority Actions

Item No.	Observation	Recommended Action Plan	Recommended Timeline
01	Foundation on expansive soil and ground bearing capacity consideration in design report. (Building-1)	The building engineer is required to carry out further investigation for the expansive soil and incorporate the result in the design report.	6-weeks
02	Foundation on expansive soil and ground bearing capacity consideration in design report. (Building-1)	Revise the soil bearing capacity calculation in the design report and re-calculate the foundation capacity accordingly. Suggest remedial measure accordingly.	6-weeks
03	Foundation on expansive soil and ground bearing capacity consideration in design report. (Building-1)	Carry out suggested remedial work if required.	6-months
04	Crack on floor beams in several locations. (Building-1)	The building engineer is required to check the intensity of crack , investigate the reason of crack considering both structural and geotechnical concern and prepare an investigation report with proper remedial actions .	6-weeks

Item No.	Observation	Recommended Action Plan	Recommended Timeline
05	Crack on floor beams in several locations. (Building-1)	Carry out suggested remedial work.	6-months
06	Load plan missing for ground floor suspended slab. (Building-1)	The building engineer is required to prepare floor load plan for the suspended ground floor following BNBC requirement. Submit the load plan and supporting documents to the RSC for review.	6-weeks
07	Load plan missing for ground floor suspended slab. (Building-1)	Implement accepted floor load plan.	6-months
08	Mismatch and lack of as-built drawing. (Building-1)	The building engineer is required to survey the structure and prepare accurate as-built architectural and structural drawing.	6-weeks
09	Lack of anchorage for stair top metal roof. (Building-1)	The building engineer is required to provide adequate anchorage to resist uplift forces	6-weeks

Item No.	Observation	Recommended Action Plan	Recommended Timeline
10	Lack of anchorage for storage rack. (Building-1)	The factory is required to anchor/brace all the non-structural element including storage racks.	6-weeks
11	Lack of fall protection. (Building-1)	The factory is required to provide suitable fall protection system to avoid falling hazard.	6-weeks
12	Column stress exceeds n ormal design limit consid ering possible vertical ex tension. (Building-1)	Prior to vertical extension, the building engineer is required to revise Detail Engineering Assessment (DEA) for the proposed building.	6-months
13	Column stress exceeds n ormal design limit consid ering possible vertical ex tension. (Building-1)	Carry out suggested remedial work if required.	6-months
14	Brick wall load missing in the analysis. (Building-2)	The building engineer is required to consider wall loads & slenderness effect of column in the analysis and update the FEA model & design report accordingly.	6-weeks

Item No.	Observation	Recommended Action Plan	Recommended Timeline
15	Brick wall load missing in the analysis. (Building-2)	• Carry out suggested remedial work if required.	6-month
16	Mismatch in as-built drawing. (Building-3)	The building engineer is required to survey the structure and prepare accurate as-built drawing.	6-weeks
17	Dampness on slab & wall. (Building-3	The factory is required to identify the reason of dampness and take necessary remedial measures.	6-month