Standard Stitches Ltd.
Woven Unit (Extended Building)

FF TOWER, BAIMAIL, KONABARI, GAZIPUR SADAR, BANGLADESH
(24.008554, 90.330263)
9th February 2021

RSC RMG SUSTAINABILITY COUNCIL

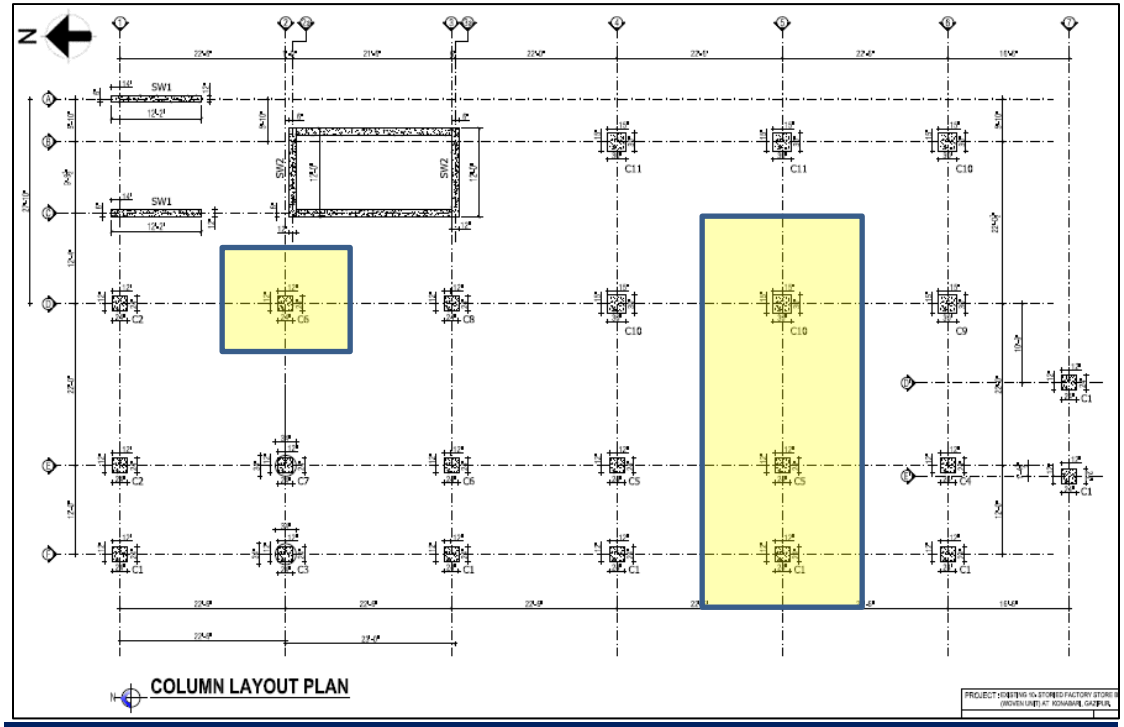
Building Information

1. Warehouse Building (G+9)

Observations

Column stress exceeds normal design limit

Observations: Warehouse Building



Column Layout Plan

Cursory calculation indicates that the marked columns are stressed above normal design limit considering live load (6 kPa) and minimum concrete strength based on aggregate type. Factory engineer is required to review design, load & column stress in the area identified above.

Typical floor loading

Observations: Warehouse Building

Factor of Safety of several pile foundations are below the allowable limit

Observations: Warehouse Building

PLANART DESIGN TECHNOLOGY ASSOCIATES

Architects and Engineers

04 Feb, 2021

an of existing piles and pile caps

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Piles:

SL No	Items	Data
A.	Live load considered	104 psf
B.	Length and diameter of pile as per investigation	60 ft depth from EGL and 16"x16" = 256 in2

SL No	Items	Working load on foundation	Ultimate resisting capacity of pile group	Factor of safety	Remarks
1.	Capacity of six piles group at grid B-4	1411 kips (max)	540×6=3240 kips	2.29	>1.5 Adequate
2.	Capacity of six piles group at grid D-4	1347 kips(max)	540 ×6=3240 kips	2.41	>1.5 Adequate
3.	Capacity of seven piles group at group B-C-3	1524 kips (max)	540×7=3780 kips	2.48	>1.5 Adequate
4.	Capacity of five piles group at group C-1	1020 kips (max)	540×5=2700 kips	2.64	>1.5 Adequate
5.	Capacity of five piles group at group E-3	997 kips (max)	540×5=2700 kips	2.71	>1.5 Adequate
6.	Capacity of four piles group at group D-2	895 kips (max)	540×4=2160 kips	2.41	>1.5 Adequate
7.	Capacity of four piles group at group F-2	933 kips (max)	540×4=2160 kips	2.31	>1.5 Adequate
8.	Capacity of three piles group at group D-1	757 kips (max)	540×3=1620 kips	2.14	>1.5 Adequate
9.	Capacity of two piles group at group D'-7	550 kips (max)	540×2=1080 kips	1.85	>1.5 Adequate
10	Reinforcement in Piles	Required 0.40% and 8mm @10"c/c as stirup (Minimum as per BNBC 3.11.1.13)	Provided 1.24 % or 4 -20 & 4 -16mm as long bar and 10mm @ 6"/10"c/c as stirup (provided as per drawings)		

Nos of piles under each (pile cap) foundation are found adequate

Design Technology Associates

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DEA of 10-Storied store building for (F.F tower) Standard

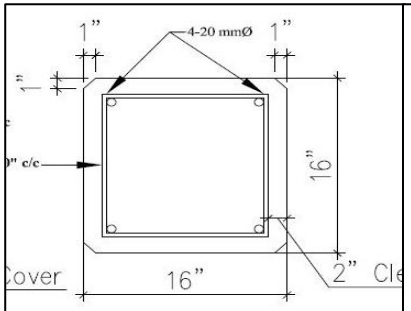
FoS check of pile foundations in report

As per the provided Detail Engineering Assessment report, factor of safety (FoS) of some piles are below the BNBC allowable limit for foundation.
Factory engineer is required to revise the floor load plan and propose remedial measure if requires for piles to reach the Factor of Safety above 2.50 in compliance with section 3.11.1.11 as per BNBC 2006.

PRE-CAST DRIVING:

R.C.C. Pre-cast pre- stressed driving pile may be provided preferably from the depth of 5ft and downwards, pile should be 12 inch x 12 inch size and the embedment length upto 20ft. from the base level of footing considering carrying capacity of 15.0 tons per pile safely.

In Soil test report 300X300mm pre-cast pile was suggested with capacity of 15 ton.



DETAIL OF HYDRAULIC DRIVEN PRE CAST PILE

NOTE:
fc'= 4000 psi
fy= 72500 psi
Design Capacity of Pile 135Ton
Which Should be Confirmed By Load Test (FS=2).

400X400 mm pre-cast pile has been shown in as-built drawing with load bearing capacity of 135 ton. But no calculation has been provided regarding the 400X400mm precast pile of capacity 135 ton.

Observations: Warehouse Building

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Lack of information in as-built drawing

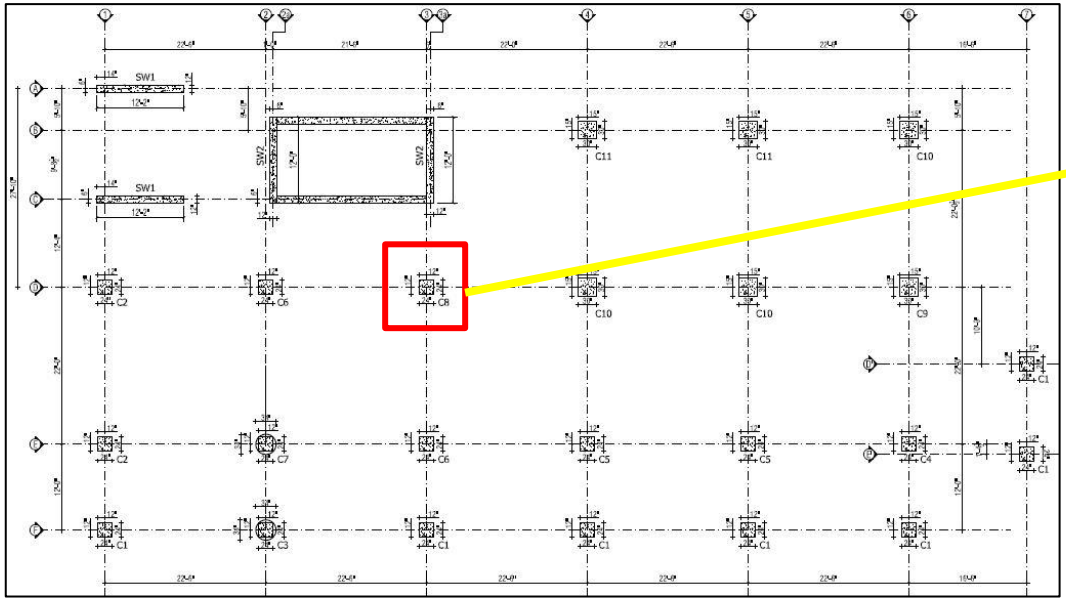
Observations: Warehouse Building

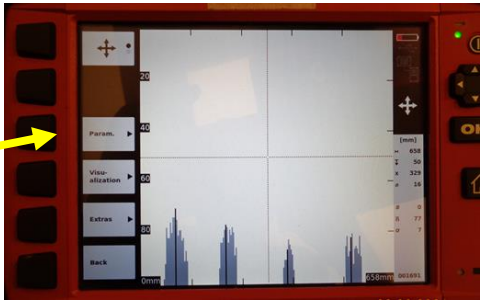
Column Number		BELOW OF GROUND FLOOR	GROUND & 1ST FLOOR	2ND & 3RD FLOOR	4TH FLOOR	5TH FLOOR
C-7		6" 24" 6" / 6" 24" 36" / 6" — 4-16mmØ	5" 24" 5" / 5" 24" 34" / 5" — 4-16mmØ	24" 24"	24" 24" — 8-20mmØ	24" 24"
	Column Size	36" Ø	34" Ø	24" X 24"	24" X 24"	24" X 24"
	Number of Bars	20-28+4-16mmØ	20-28+4-16mmØ	16-28mmØ	8-28+8-20mmØ	16-20mmØ
C-8		26" 26"	24" 24"	24" 24"	24" 24" — 8-20mmØ	24" 24"
	Column Size	26" X 26"	24" X 24"	24" X 24"	24" X 24"	24" X 24"
	Number of Bars	24-28mmØ	24-28mmØ	16-28mmØ	8-28+8-20mmØ	16-20mmØ

Column Schedule

Column schedule in provided drawing demonstrating the columns only up to 5th floor but in reality, this building is ten storied.

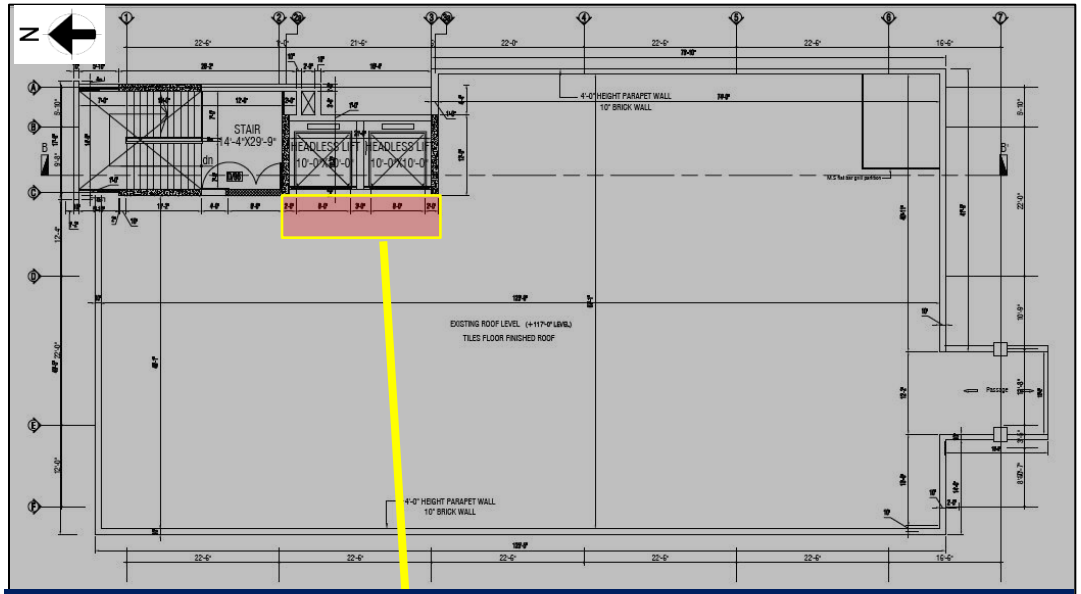
In column schedule, 5 number of re-bar shown at each side for Column C8 (5th floor)





At 9th floor (Grid-D/3) the number of re-bar for column C8 was found 4 at one side by ferro-scanning. Therefore, variation in rebar inside the columns has been confirmed among the stories.

Observations: Warehouse Building



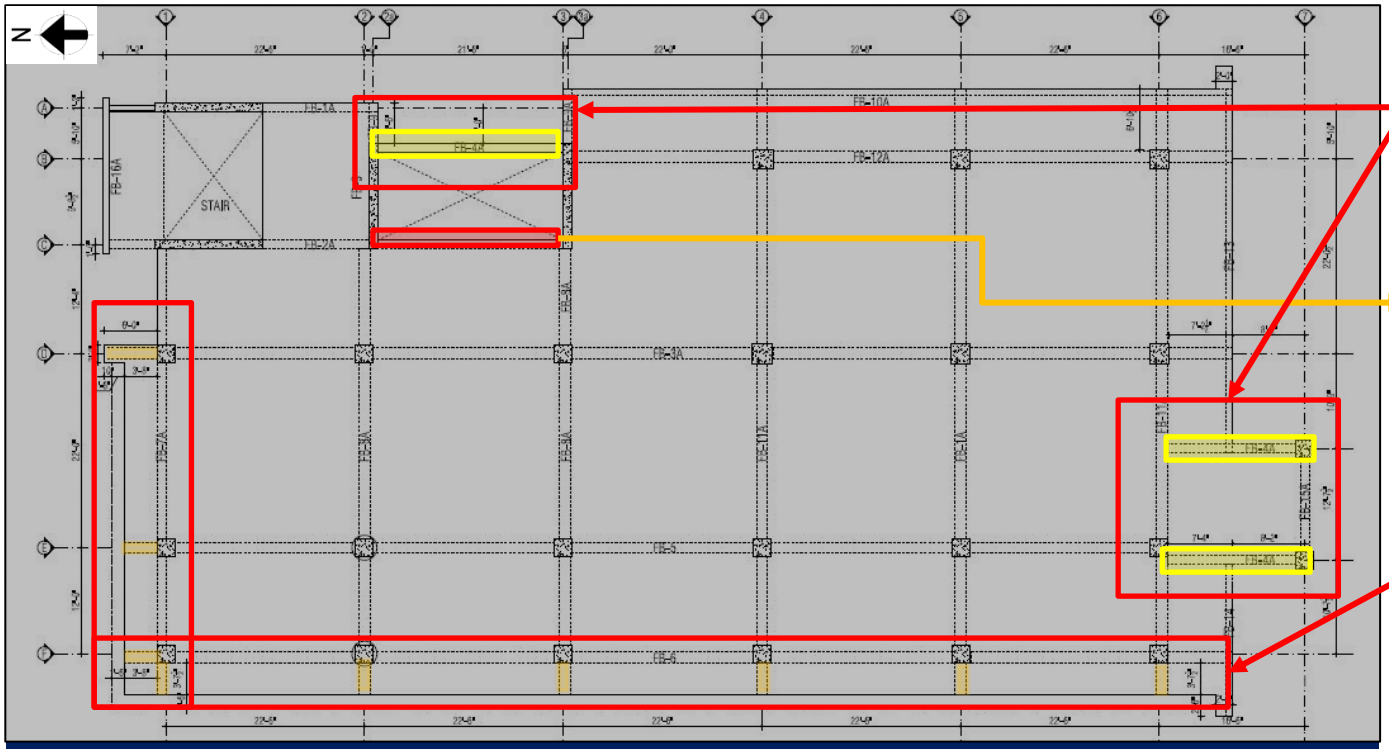
Roof Layout plan

Interior of the lift machine room. Marked location is Cantilever.

Factory engineer is required to survey the structures and prepare as-built drawings.

Undocumented cantilever was found extended from the floor slab of lift machine room. No details was shown in drawing. Also, the details of the roof top beam & slab of lift machine room were not shown in as-built drawing.

Observations: Warehouse Building



Beam Layout plan

The details of the Beam (FB-4A) has not been provided in as-built drawing.

The Beam ID has not been written at the marked location.

These Cantilever Beam were not found at site but shown in as-built drawing.

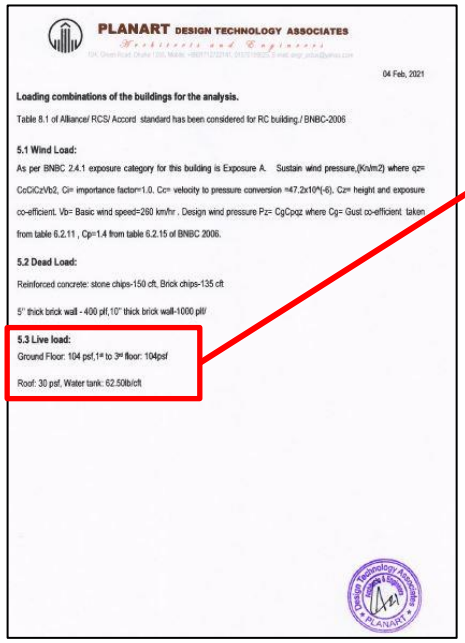
Cantilever Beam not found at site

Factory engineer is required to survey the whole structure and prepare accurate as-built drawings that are compliance with section 1.9.1.2 as per BNBC (Part-06).

Observations: Warehouse Building

Prepared DEA documents need to be revised.

Observations: Warehouse Building



PLANART DESIGN TECHNOLOGY ASSOCIATES

04 Feb, 2021

Loading combinations of the buildings for the analysis.

Table 8.1 of Alliance/ RCS/ Accord standard has been considered for RC building./ BNBC-2006

5.1 Wind Load:

As per BNBC 2.4.1 exposure category for this building is Exposure A. Sustain wind pressure,(Kn/m2) where qz= CcCiCzVb2, Ci= importance factor=1.0, Cc= velocity to pressure conversion =47.2x10^(-6), Cz= height and exposure co-efficient, Vb= Basic wind speed=260 km/hr . Design wind pressure Pz= CgCpqz where Cg= Gust co-efficient taken from table 6.2.11 , Cp=1.4 from table 6.2.15 of BNBC 2006.

5.2 Dead Load:

Reinforced concrete: stone chips-150 cft, Brick chips-135 cft

5" thick brick wall - 400 plf,10" thick brick wall-1000 plf/

5.3 Live load:

Ground Floor: 104 psf,1st to 3rd floor: 104psf

Roof: 30 psf, Water tank: 62.50lb/cft

5.3 Live load:

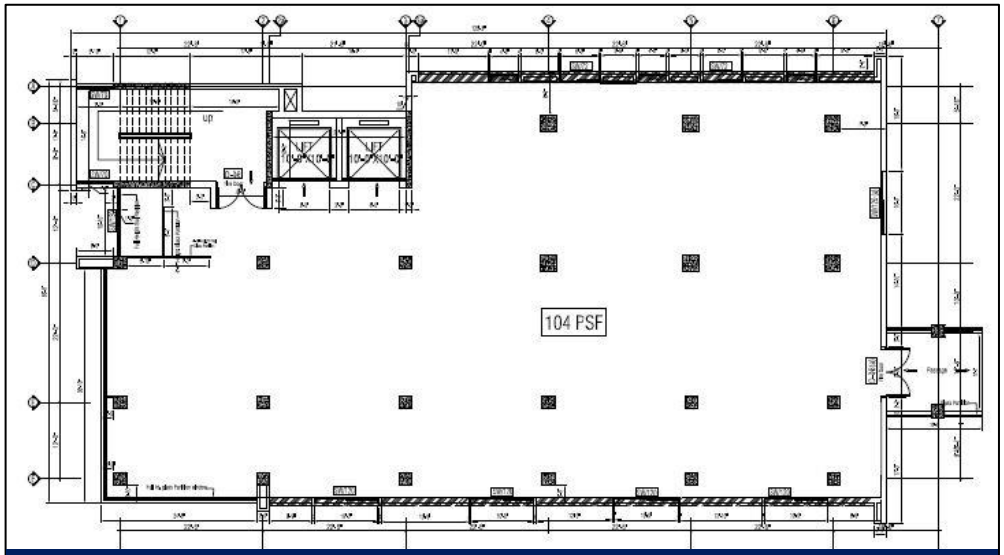
Ground Floor: 104 psf,1st to 3rd floor: 104psf

Roof: 30 psf, Water tank: 62.50lb/cft

In DEA report, the floor live load has been shown only up-to 3rd floor but the structure is a ten storied building. Factory engineer is required to revise the DEA report.

INDUSTRIAL, STORAGE & HAZARDOUS (Occupancy - G, H & J)	Workshop, factory, warehouse	1 Light workroom without storage	3.0 / 2.7
		2 Machinery hall & circulation area	4.0 / 4.5
		3 Factory, workshop etc.	5.0 / 4.5
		4 Manufacturing : light	6.0 / 4.5
		heavy	12.0 / 9.0 (5)
		ice	15.0 / 9.0 (5)
		5 Printing plant :	(5)
		Press room	7.0 / 11.0
		Composing and linotype room	5.0 / 9.0 (5)
		Paper storage room	12.0 / 9.0 (5)
		6 Motor room, fan room etc. including the weight of machinery	7.5 / 4.5
		7 Cold storage, grain storage	15.0 / 9.0 (5)
		8 Storage warehouses : light	6.0 / 4.5 (5)
		heavy	12.0 / 9.0
		9 Foundries	20.0 / 12.0

As per Live load Table-6.2.3; BNBC 2006, 6 kPa live load is required to be considered for Storage Warehouse (Light).



Load Plan – 104 psf (5 kPa) live load has been considered from 1st to 9th Floor.

In prepared live load plan, 5 kPa floor loading has been considered. But as per BNBC 2006, for the Storage warehouse (light) factory engineer was required to consider 6 kPa floor loading. Now factory engineer is required to revise the floor load plan in compliance with Table 6.2.3 (part-6, BNBC 2006).

Observations: Warehouse Building

3. CONCRETE :

a) MINIMUM 28 DAYS CYLINDER STRENGTH
(I) FOR COLUMN =4500 psi
(2) FOR FOOTING=4000 psi
(3) FOR GB=3500 psi
(4) FOR SLAB & BEAM=3500 psi

In general Note of structural drawing, concrete strength has been considered 4500 psi for Column, 4000 psi for footing and 3500 psi for Grade Beam, Beam & Slab.

4. Computation of concrete strength from the cylinder test results

ACI CODE - 562-13 - FOR STONE CHIPS, F.F TOWER. KONABARI, GAZIPUR.

Concrete strength from core cutting test		
Sample1 strength	7348	psi
Sample2 strength	6845	psi
Sample 3 strength	6975	psi
Sample 4 strength	6930	psi
Sample 5 strength	7390	psi
Sample 6 strength	7320	psi

Average=	7134.67	Psi
Standard Deviation=	243.4516	
V=	0.03	

The average core strength=	7134.67	psi
Coefficient of variation (V)=	0.03	
Co-efficient of variation modification factor Kc=	1.15	
Nos of core samples (N)=	6	

Now fceq=0.9xfcx(1-1.28xsq root((kcxv)^2/n+0.0015))

= 6076.72 psi

Cylinder test Report

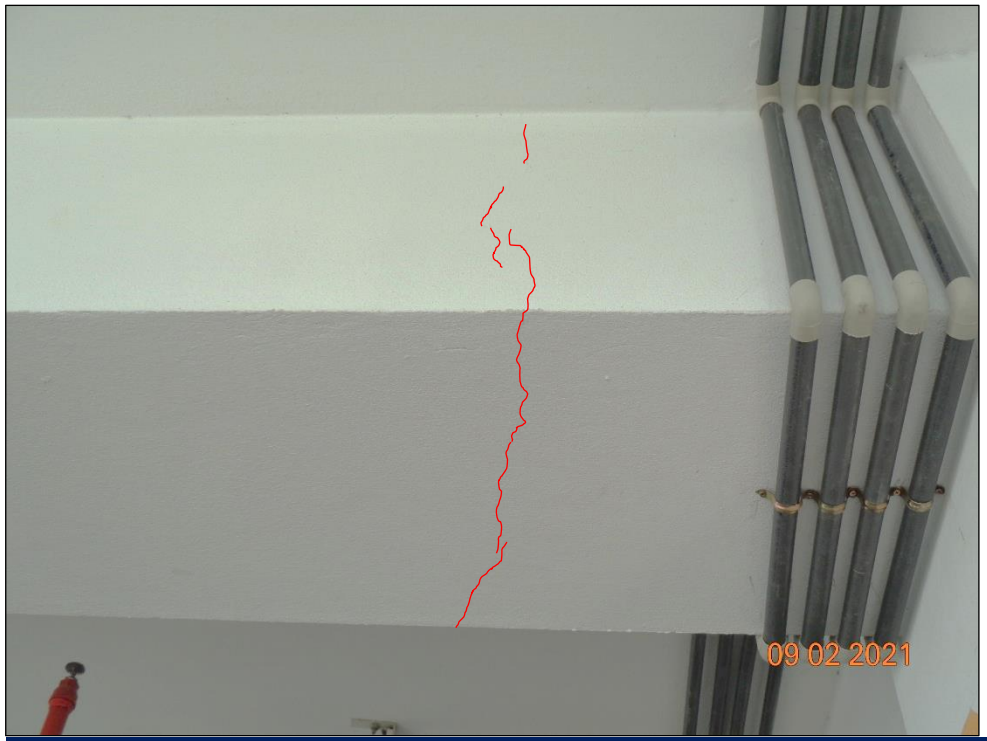
In prepared Detail Engineering Assessment (DEA) of the building, the concrete strength has been considered 6076.72 psi. This resultant strength has been obtained from cylinder test report considering ACI 562-13 Code. But this code is applicable for the concrete core that extracted from the structural members of existing building.
Moreover only two set of the cylinder test report found for the columns which do not meet the requirement for frequency of cylinder test as per BNBC.

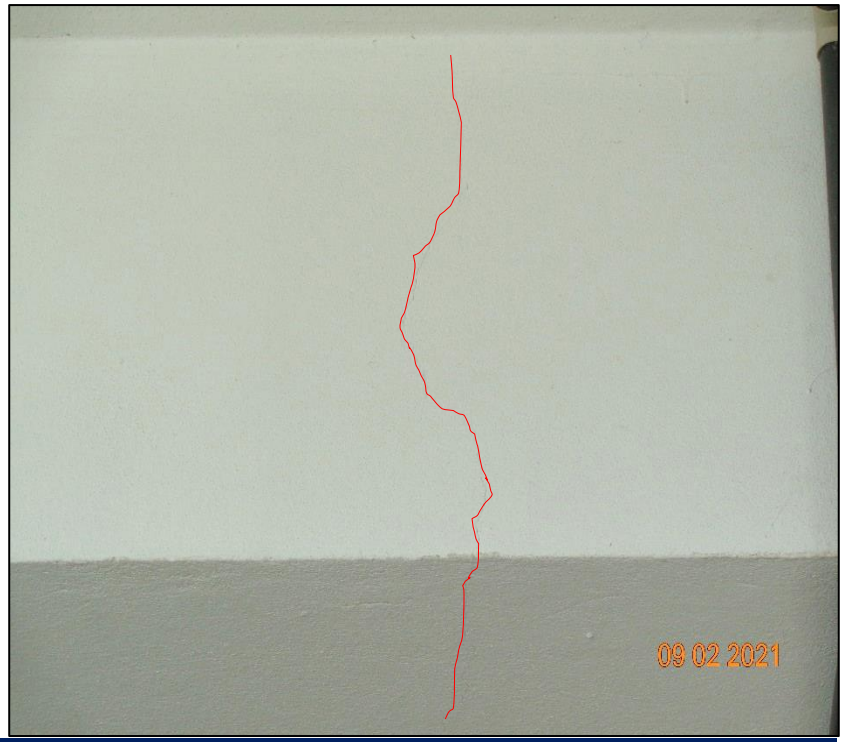
As per BNBC every building or structure shall have its design documents prepared in accordance with the provision of Section 1.9.1. The design document shall include a design report, and a set of structural drawings, which shall be prepared in compliance with section 1.9.1.1 and section 1.9.1.2 as per BNBC. Now factory engineer is required to revise the DEA which is in compliance with section 1.9.1 (part-6, BNBC).

Observations: Warehouse Building

Hairline crack in beams

Observations: Warehouse Building





Hairline cracks in beam

Hairline crack was found in the several beams throughout the building. Factory engineer is required to investigate the cause of crack and repair the cracks as per investigation report.

Observations: Warehouse Building

Column susceptible to vehicle impact

Observation: Warehouse Building

Columns having no barrier/protection at ground floor

Columns at loading unloading area are susceptible to vehicle impact. The factory is required to take necessary measures to prevent the vehicle impact by providing the barrier around the columns.

Observation: Warehouse Building

Crack in brick wall

Observations: Warehouse Building

Crack in brick wall

Cracks were found at several locations in brick wall at 9th floor. Factory engineer is required to investigate the cause of crack and repair the crack as per recommendation from investigation report.

Observations: Warehouse Building

Problems Observed

Warehouse Building:

Item 1: Column to be stressed exceeds normal design limit.
Item 2: Factor of Safety of several pile foundations are below the allowable limit.
Item 3: Lack of information in as-built drawing.
Item 4: Prepared DEA documents need to be revised.
Item 5: Hairline crack in beams.
Item 6: Column susceptible to vehicle impact.
Item 7: Crack in brick wall.

Priority Actions

Item No.	Observation	Recommended Action Plan	Recommended Timeline
01	Column to be stressed exceeds normal design limit	Factory Engineer to review design, loads and columns stresses.	6-weeks
02	Column to be stressed exceeds normal design limit	Verify in-situ concrete stresses by 100mm diameter cores.	6-weeks
03	Column to be stressed exceeds normal design limit	Carry out remedial works if required.	6-weeks
04	Column to be stressed exceeds normal design limit	Produce and actively manage a loading plan for all floor plates within the factory giving consideration to floor capacity and column capacity.	6-months
05	Factor of Safety of several pile foundations are below the allowable limit.	Factory engineer is required to check the adequacy of pile foundations in compliance with section 3.11.1.11 as per BNBC 2006.	6-weeks

Item No.	Observation	Recommended Action Plan	Recommended Timeline
06	Factor of Safety of several pile foundations are below the allowable limit.	Carry out remedial works if arise from the Detail Engineering Assessment.	6-months
07	Lack of information in as-built drawing.	Building Engineer to survey the structure and prepare accurate as-built (architectural and structural) drawings in compliance with section 1.9.1.2 as per BNBC.	6-weeks
08	Prepared DEA documents need to be revised.	Building engineer to update the DEA document including a report, and a set of structural drawings in compliance with section 1.9.1.1 and section 1.9.1.2 as per BNBC.	6-weeks
09	Prepared DEA documents need to be revised.	Implement the recommendations of DEA.	6-months

Item No.	Observation	Recommended Action Plan	Recommended Timeline
10	Hairline cracks in beams.	Factory engineer is required to investigate the cause of crack and repair the crack as per recommendation from investigation report.	6-weeks
11	Column susceptible to vehicle impact.	The factory is required to take necessary measures to prevent the vehicle impact by providing barrier around the columns.	6-weeks
12	Cracks in brick wall.	Factory engineer is required to investigate the cause of crack and repair the crack as per recommendation from investigation report.	6-weeks