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Identified Priority 1 Concerns

- Capacity check of steel structures

From the inspections and drawings obtained, calculation check of interior columns of Building 1, Building 3 and Building 4 indicate that the FoS of Building 1 is 1.49 the FoS of Building 3 is 2.68 and the FoS of Building 4 is 1.27.

1.3 Material Specifications

The following is the list of the material standards and specifications for which the building components have been designed:

Material Specifications		
Below are BBS standard material specifications that will be used in the project. BBS reserves the right to make material substitutions and changes in specifications as and when deemed necessary.		
No.	Components	Specifications
1	Built-up	ASTM A572M/SS 400/Q345B Grade 345 Type 1 ASTM A370
2	Hot Rolled Tubes/Pipes	JIS - G 3466 - STKR 490
3	Cold Formed Channels	EN - 10025 S355JR
4	Wall, Roof & Liner Panel	ASTM A607/SS 400 Grade 40 JIS - G 3131 SPHC JIS - G 3132 SPHC
5	Mezzanine Deck Panel	ASTM A792M Grade 345B: Coating AZ150/ ASTM A792M CS-B AZM150G/M2/ ASTM A792M Grade 50, PREPAINTED Al-Zn/ ALLOY-COATED
6	X-Bracing	ASTM A615M Grade 420 JIS - G 3101 - SS 400
7	Anchor Bolts	ASTM A370 JIS G3101 - SS 400
8	High Strength Bolts	A325 M Type 1 Hot Dip Galvanized DIN 933 Class 8.8Zinc coated
9	Sag Rods	ASTM A 36 M or DIN 933 Grade 4.6
F _y = Yield Strength ; F _t = Allowable Tensile Stress ; F _u = Ultimate Tensile Strength ; P _u = Minimum Breaking Load.		

NB: BBS reserves the right to substitute partly or entirely some of the materials in case of material non-availability or supply shortage

No.	Components	Specifications	Strength
1	Built-up	ASTM A572M/SS 400/Q345B Grade 345 Type 1 ASTM A370	F _y = 34.5 kN/cm ²

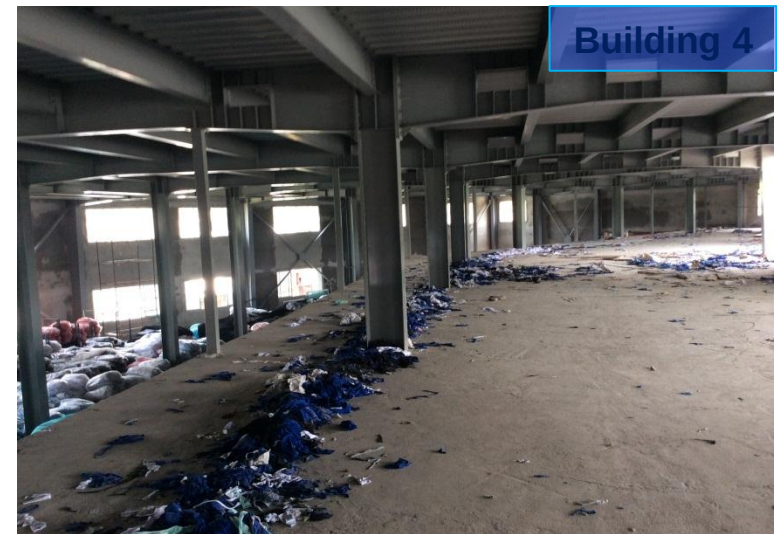
However according to material property, the yield strength of steel (F_y) is 34.5 kN/sq.cm. But, for the purposes of this report, we have continued to use the yield strength of steel (F_y) of 25.2 kN/sq.cm. The decision whether to adopt the values from the materials specifications is left to the Detailed Engineering Assessment.

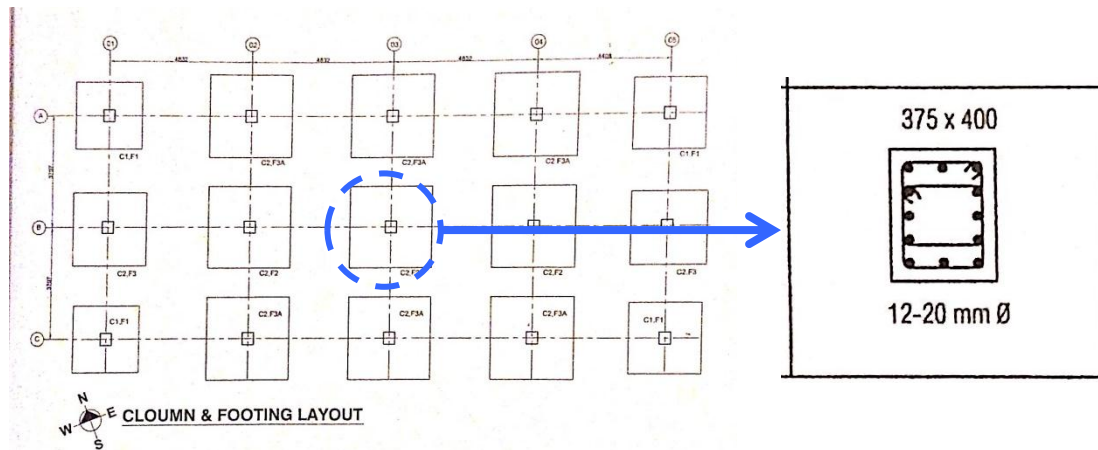
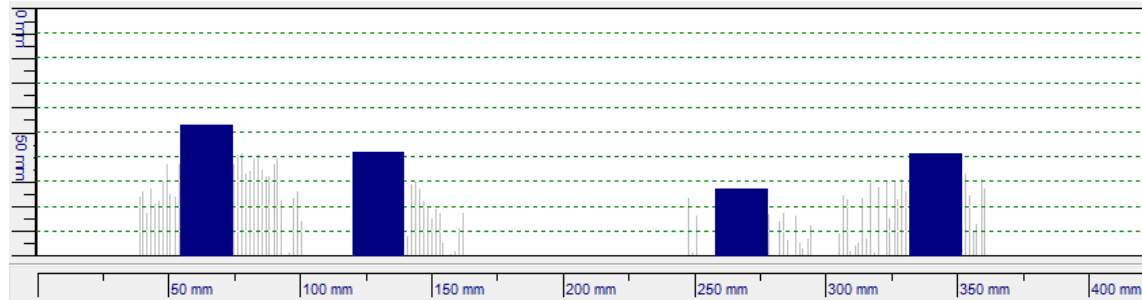
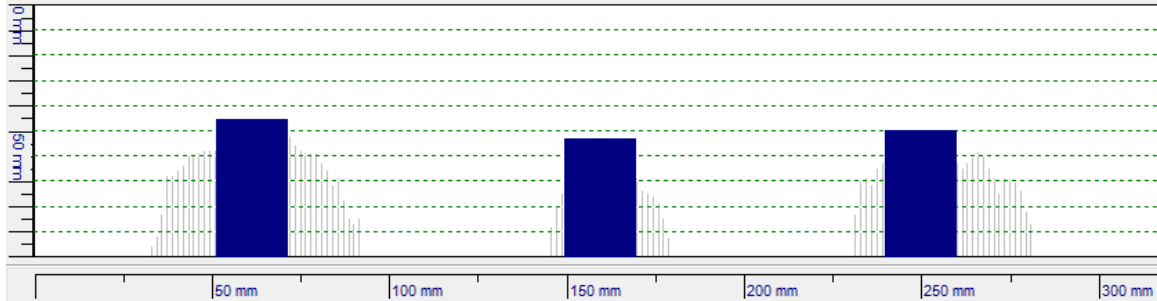


Identified Priority 2 Concerns

- No fireproofing for steel structure elements,
- Inconsistencies between the drawings of Building 2 and the actual as-built conditions

It is unclear whether fire proofing material is applied on structural steel elements.





The size of column C2, as measured at the ground floor (300 x 350 mm) is smaller than what is specified in the drawings (375 x 400 mm). The no. vertical rebar measured on-site (10-Ø20 mm) is less than what is specified in the drawings (12-Ø20 mm).

From calculation check, it indicates that the FoS of interior column is 4.79.

Identified Priority 3 Concerns

- Reinforcement left exposed at roof level of Building 2

Reinforcement is left exposed. It is unclear whether rust proof paint is applied.



Overall Stability System

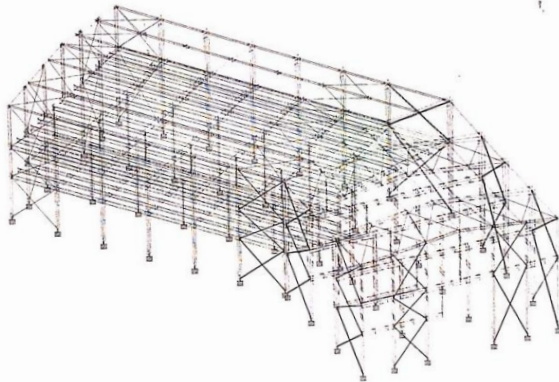


We were informed that lateral load was included in the design of Building 4 as shown in the graphic output below, submitted by .

However there are concerns on the stability system for lateral loading and seismic loading of Building 1, Building 2 and Building 3.

We require that these items be investigated in a Detail Engineering Assessment.

1.5 DESIGN SUMMARY



Design Loads:

1	Design Live Load (kN/m ²) on roof	0.57
2	Design Dead Load (kN/m ²) on roof	0.1
3	Design Live Load (kN/m ²) on Mezzanine	3.0(1 st Floor) & 5.0 (2nd Floor)
4	Design Dead Load (kN/m ²) on Mezzanine	3.5
5	Wind Speed (KPH)	215
6	Wind Exposure	A
7	Enclosure	Enclosed
8	Rain Water Intensity (mm/hr)	150
9	Earthquake zone coefficient (Zone= 2)	0.15

1.2.4 Load Combination

- DL
- DL+LL
- DL+WF
- DL+EQ
- 0.75(DL+LL+WF)
- 0.75(DL+LL+EQ)

Water Ingress at Roof Level

There is no water ingress found at roof level of Building 2. However water ponding has been found on the roof slab. It is also unclear whether waterproofing material is applied.



Priority Actions

Problems Observed Summary

ITEM 1:	(Priority 1)	Capacity check of steel structures.
ITEM 2:	(Priority 2)	No fireproofing for steel structure elements.
ITEM 3:	(Priority 2)	Inconsistencies between the drawings of Building 2 and the actual as-built conditions.
ITEM 4:	(Priority 2)	Overall stability system.
ITEM 5:	(Priority 3)	Reinforcement left exposed at roof level of Building 2.
ITEM 6:	(Priority 3)	No waterproofing material at roof level.

Item No.	Observation	Recommended Action Plan	Recommended Timeline
1	Capacity check of steel structures.	Verify in-situ yield strength of steel by collecting samples for [the identified columns / samples from 4 columns]. Factory Engineer to review design, loads and columns stresses in area identified above. A Detail Engineering Assessment of Factory to be commenced immediately	immediate – now
2	Capacity check of steel structures.	Produce and actively manage a loading plan for all floor plates within the factory giving consideration to floor capacity and column capacity. A Detailed Engineering Assessment to be completed.	6-weeks
3	Capacity check of steel structures.	Continue to implement load plan.	6-months
4	No fireproofing for steel structure elements.	Fireproofing material for structural steel element is recommended as suggested in BNBC Codes.	6-weeks
5	No fireproofing for steel structure elements.	Maintain standard of quality control.	6-months

Item No.	Observation	Recommended Action Plan	Recommended Timeline
6	Inconsistencies between the drawings of Building 2 and the actual as-built conditions.	Factory Engineer to survey the actual conditions and revise the drawings. Factory Engineer to review design, loads and columns stresses to confirm suitability for loads applied. Produce and actively manage a loading plan for all floor plates within this area giving consideration to floor capacity and column capacity.	6-weeks
7	Inconsistencies between the drawings of Building 2 and the actual as-built conditions.	Continue to implement load plan	6-months
8	Overall stability system.	Request that the Detail Engineering Assessment of the overall building to be carried out and in particular, stability and foundation aspects should be investigated in detail.	6-weeks
9	Reinforcement left exposed at roof level of Building 2.	For both durability and serviceability, rust proof paint or any appropriate methods is recommended.	6-months
10	No waterproofing material at roof level.	Engineer to inspect water damaged structure including the exterior and propose a suitable repair. For both durability and serviceability, waterproofing on the roof slab is recommended. Moreover the roof slab drainage system should be investigated.	6-months