Mondol Fashion Ltd

Rashid Tower, Tongabari, Asulia, Savar
(23.90585, 90.32248)

8th April 2014

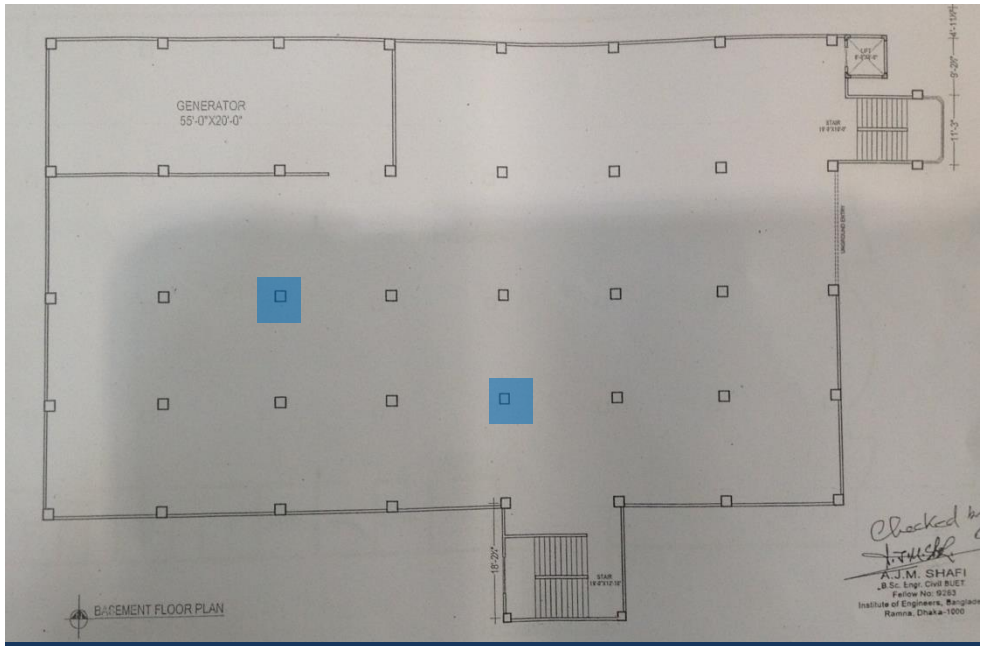
ACCORD on Fire and Building Safety in Bangladesh

ARUP

Observations

Stress Levels in Columns

Cursory calculations indicate that the working stress of the columns at Ground Floor and First Floor levels are at a high level. Refer to Action 1.



Ground Floor (Semi-Basement) Floor Plan

Tested Column C/3 (Stone)

Tested Column D/5 (Stone)

Tested Columns

Construction of the building began in 2006, with construction of Foundations up to 2nd Floor level completed in 2007. Levels 3, 4 and 5 were subsequently constructed between 2012 and 2013. Stone aggregate was noted in the Ground Floor (or semi-basement) columns, although brick aggregate was observed at the head of one of the exposed columns at the intersection with the 1st Floor Slab. It is understood that the columns up to 2nd Floor level have stone aggregate and all other structural concrete members contain brick aggregate. There is a discrepancy between the drawings and the constructed building in relation to the size of the columns at Basement level. The columns were observed to vary in size in a random manner, and are typically smaller than is indicated in the drawings. Steel reinforcement quantities were also observed to be smaller than is indicated in the drawings. Grade 72 High Strength steel, which is called up in the structural drawings, was observed in the columns at Roof level.

Column strength

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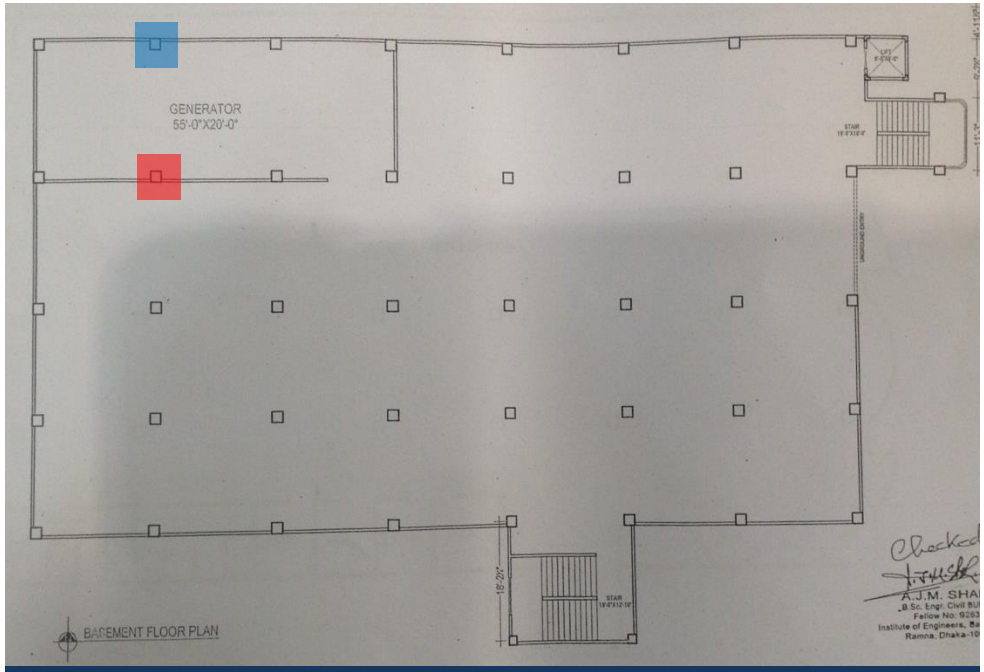

Ground Floor (Semi-Basement) Floor Plan

Exposed Aggregate

Exposed Rebar to Roof

High strength reinforcement steel bars were observed at Roof level. The number of bars observed at Roof level is comparable with observations at basement level using the ferroscanner, but is inconsistent with what is indicated in the Structural Drawings.

Exposed Column A/2
Hairline cracks were noted to column head. This prompted the removal of plaster, which revealed different aggregate types used in distinct concrete pours for the same column.

Column strength

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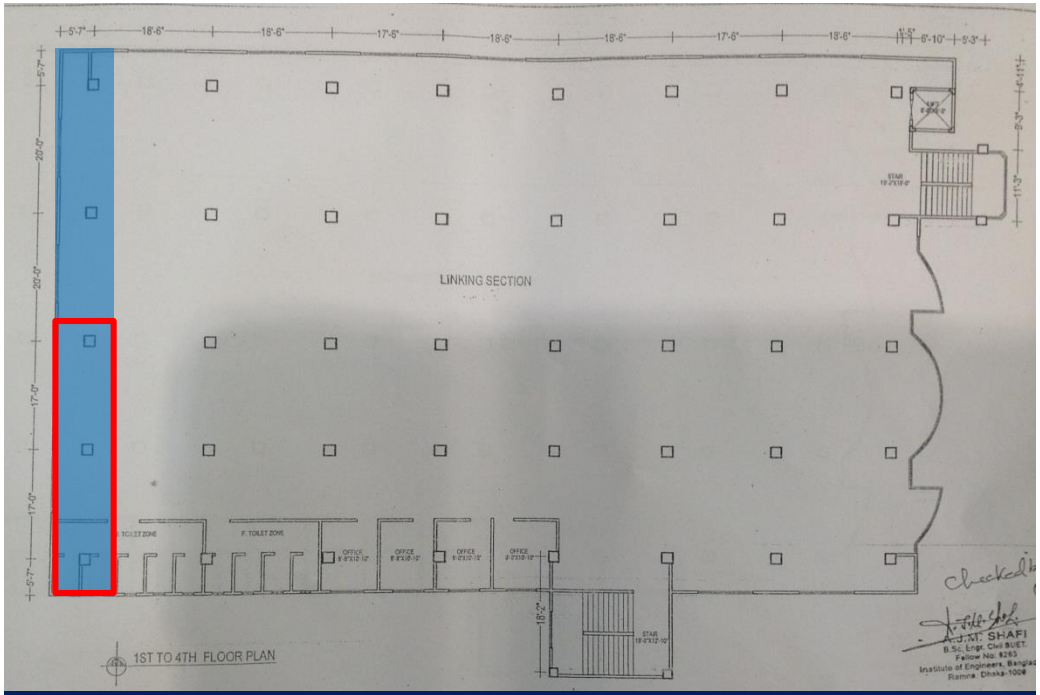
Heavy floor loading in toilet areas

Areas of high super dead loading were noted in the toilets along the West elevation of the building at the cantilever location, in the form of plinths, suspended slabs and walls. Building Engineer to check that the cantilevers have been adequately designed to accommodate this loading.



Typical Floor Plan

Extent of Toilets to 3rd and 4th Floors

Extent of Toilets to 1st, 2nd and 5th Floors

500mm Toilet Plinth to 3rd Floor

Heavy floor loading

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300mm Toilet plinth to 2nd Floor

150mm plinths, slabs and walls to 4th and 5th Floors

500mm Toilet plinth to 1st Floor

120mm Suspended slab to 1st Floor Toilet

Heavy floor loading

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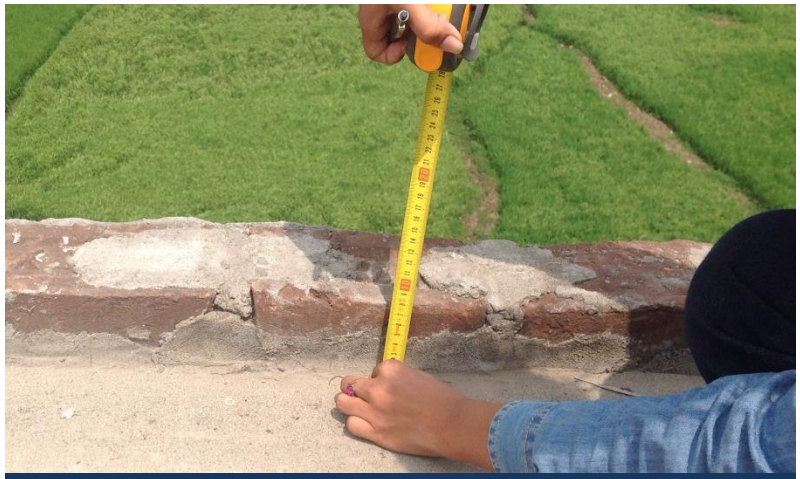
Lack of any guarding / edge protection at Roof Level and at some stairs levels

There is no edge protection at Roof level where works are ongoing. Handrails are also missing to stairs. Building Engineer to install adequate fall barrier / guarding with immediately effect.

Typical Floor Plan

Edge Protection

Roof Area



Height of Parapet to Roof

Lack of Fall Barrier to Roof

Edge Protection

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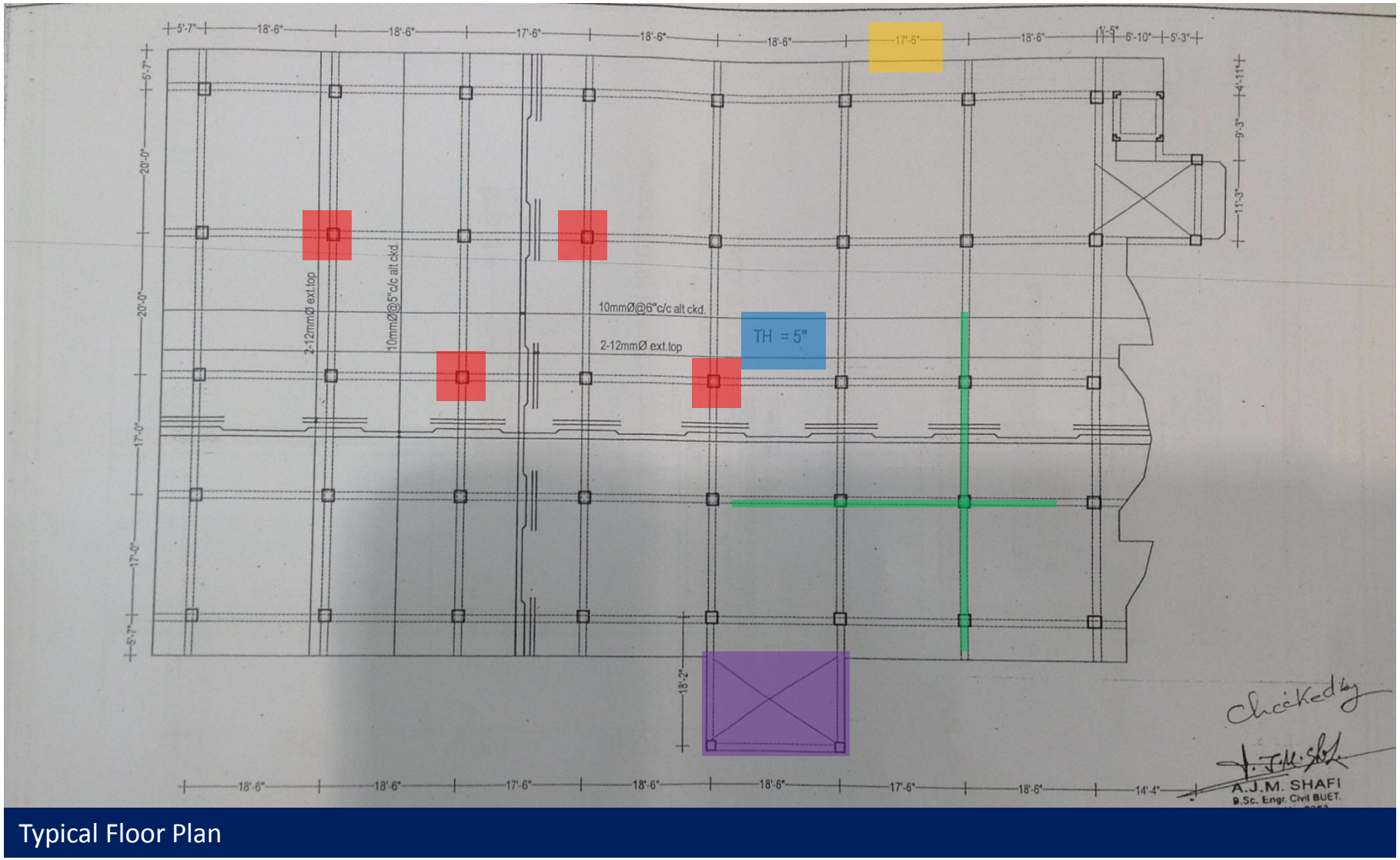
Differences between actual construction and information on design drawings

A set of Structural Drawings (undated), by EMO Consulting Engineers, which appeared to be original, was made available for review on the day of the survey. There are a number of inconsistencies between drawings and constructed building. A non-exhaustive list of issues include:

- Incorrect column sizes, particularly at Ground Floor level where the uniformity in internal column size indicated in the drawings is not apparent;
- Incorrect column reinforcement – the number of bars observed at Roof level, and again at Ground Floor level using the Ferroscanner, was not in accordance with the drawings;
- Inconsistent construction type – the drawings appear to indicate beam and slab construction, whereas flat slab with perimeter beam is observed at 1st Floor level, flat slab at 2nd and 3rd Floor levels, and beam and slab thereafter;
- Inconsistency with aggregate type – stone aggregate is referenced in the drawings , whereas it is understood that brick aggregate has been used in all structural elements other than columns to 2nd Floor level.
- Slab thickness is called up as 5” in the drawings, whereas a minimum of 6” is observed;
- The layout of the south facing staircore does not appear to be in the correct location.

Building Engineer to review and provide clarification.

Drawing Inconsistencies



Typical Floor Plan

Under-sized Columns

Incorrect Staircore position

Incorrect slab thickness

Inconsistent construction type

Incorrect Grid dimension

Drawing Inconsistencies

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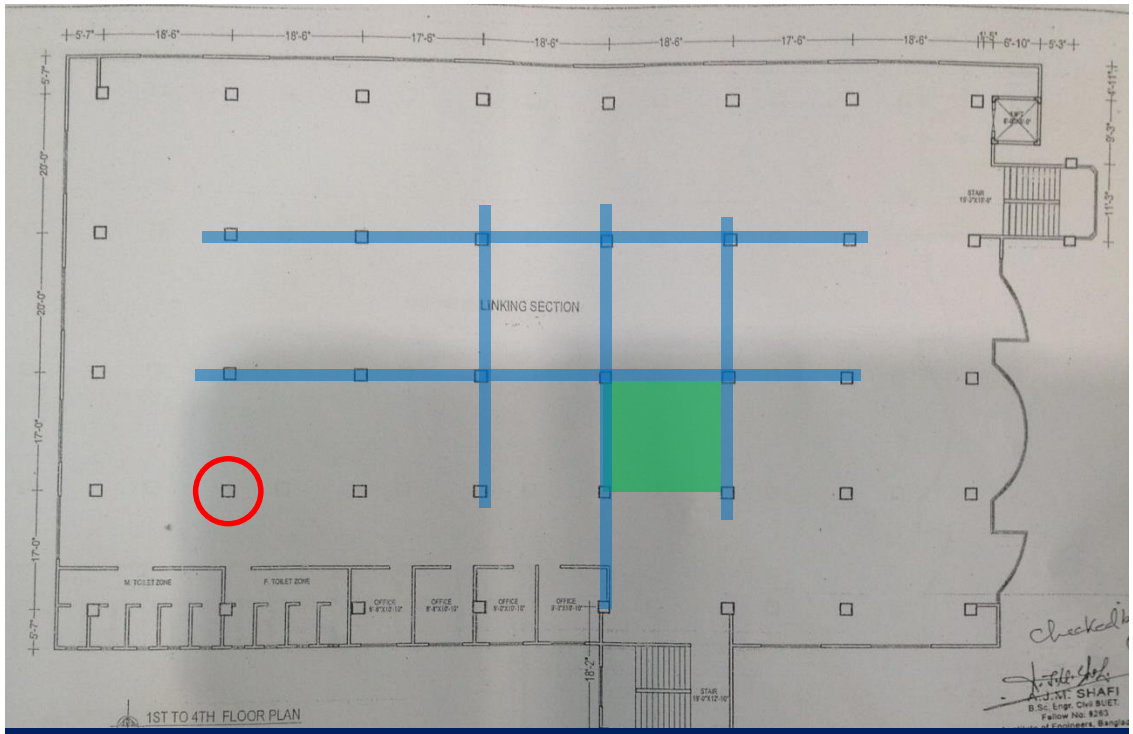
Hairline cracking on beams and some slab soffit areas

Hairline cracking was observed to the soffit of a number of beams and slabs at Ground, 2nd, 3rd, and 4th Floor levels. Building Engineer to investigate and carry out remedial works to the structure as required.

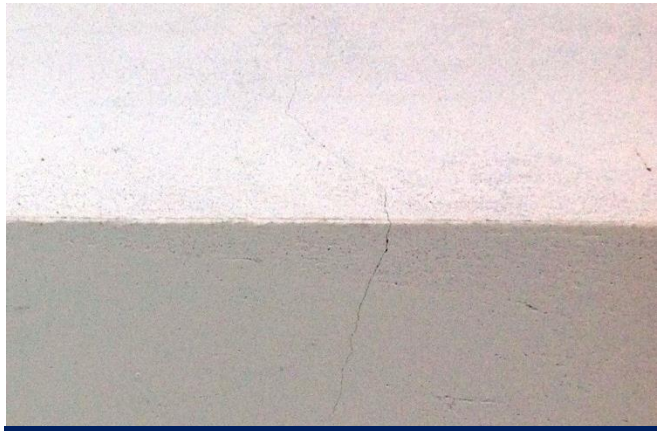


Typical Floor Plan

Non-exhaustive extent of cracking to beams to 2nd, 3rd & 4th Floors

Cracking to underside of slab adjacent to column X

Location of cracking to 4th Floor slab



Cracking to underside of beam

Cracking to underside of beam

Hairline Cracking

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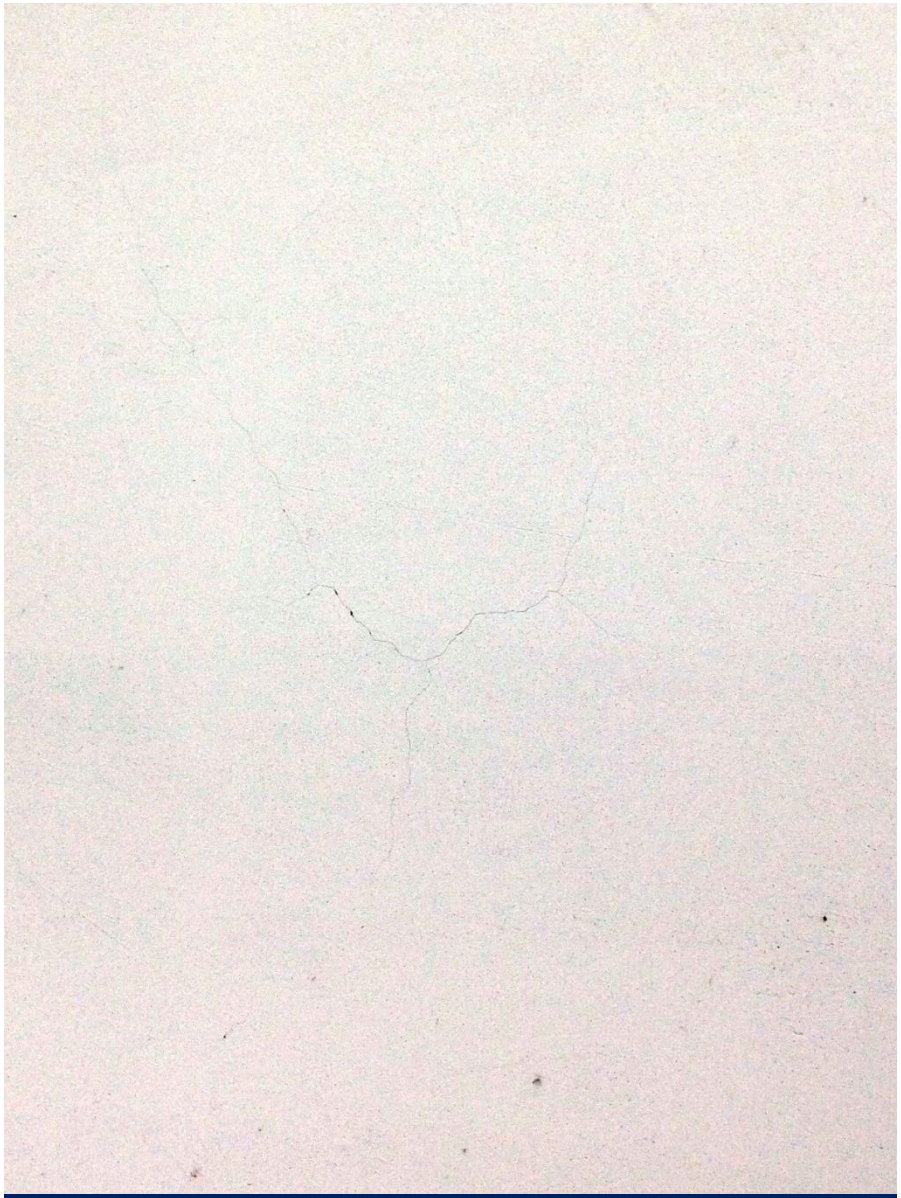
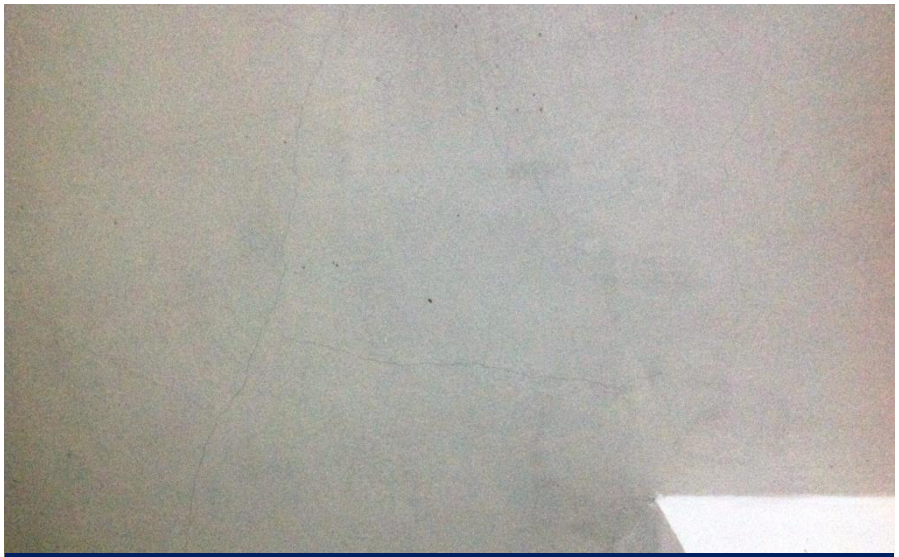


Cracking to underside of two-way spanning slab

Cracking to underside of flat slab adjacent to column



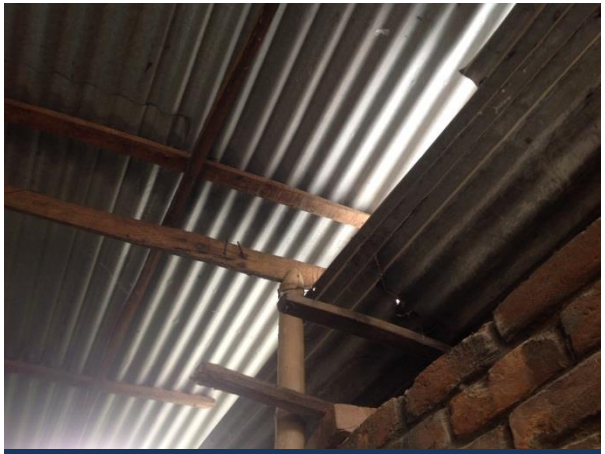
Cracking to underside of flat slab adjacent to column

Cracking

Apparently non-engineered roof structure to Generator Room

Building Engineer to review the design of the lightweight roof structure to the Ground Floor Generator Room to the East of the building. Metal steel sheeting was also observed at Roof level adjacent to the south-facing staircore, which did not appear to be adequately held in place. Building Engineer to implement any upgrade works to the Generator Room structure, as deemed necessary following the above review, and to remove / secure the loose metal sheeting, as required.

Lightweight Steel Roof to Ground Floor Generator Room



Lightweight Steel Roof to Ground Floor Generator Room

Apparently loose metal sheeting at Roof level

Lightweight Steel Roofs

Priority Actions

Problems Observed

ITEM 1: Stress levels in Columns
ITEM 2: Heavy floor loading in toilet areas .
ITEM 3: Lack of any guarding/edge protection at Roof Level and at some stairs levels.
ITEM 4: Differences between actual construction and information on design drawings.
ITEM 5: Hairline cracking on beams and some slab soffit areas.
ITEM 6: Apparently non engineered roof structure to Generator Room

Item No.	Observation	Recommended Action Plan	Recommended Timeline
1	Stress levels in Columns	Factory Engineer to investigate aggregate type used in each individual column at Ground and First Floor levels particularly at column top level.	**6-weeks**
2	Stress levels in Columns	Factory Engineer to review design, loads and columns stresses in all columns using a model based design check to loading set out in BNBC-2006	**6-weeks**
3	Stress levels in Columns	Factory Engineer to verify insitu concrete strength by taking 100mm diameter cores from 4 columns . Verify grade of steel reinforcement used	**6-weeks**
4	Stress levels in Columns	Make structural alterations as advised by Engineer	**6-months**
5	Heavy floor loading in and toilet areas	Engage an Engineer to investigate the floor loading, and advise on any necessary alterations taking account of floor capacity and column capacity	**6-weeks**
6	Heavy floor loading in and toilet areas	Make any structural alterations as advised by Factory Engineer	**6-months**
7	Lack of any guarding/edge protection at Roof Level and at some stairs levels	Provide adequate edge protection at Roof Level and at stairs	**6-weeks**
8	Differences between actual construction and information on design drawings	Engage an Engineer to survey the structure and prepare a full set of “as-constructed” drawings	**6-weeks**

Item No.	Observation	Recommended Action Plan	Recommended Timeline
9	Hairline cracking in beams and slab soffits	Monitor cracks on beams. Engage an engineer to investigate if cracks are only in the plastering	**6-months**
10	Hairline cracking in beams and slab soffits	Engage an engineer to advise on load reduction and repair and strengthening of the beams if required	**6-months**
11	Apparently non engineered roof structure to Generator Room	Building Engineer to check the capacity of the lightweight roof and make any necessary alterations	**6-months**