Ripon Knitwear Ltd.
Ripon Packaging Ltd.

Jarun, Konabari, Gazipur
(23.994231, 90.323039)
23rd April 2014

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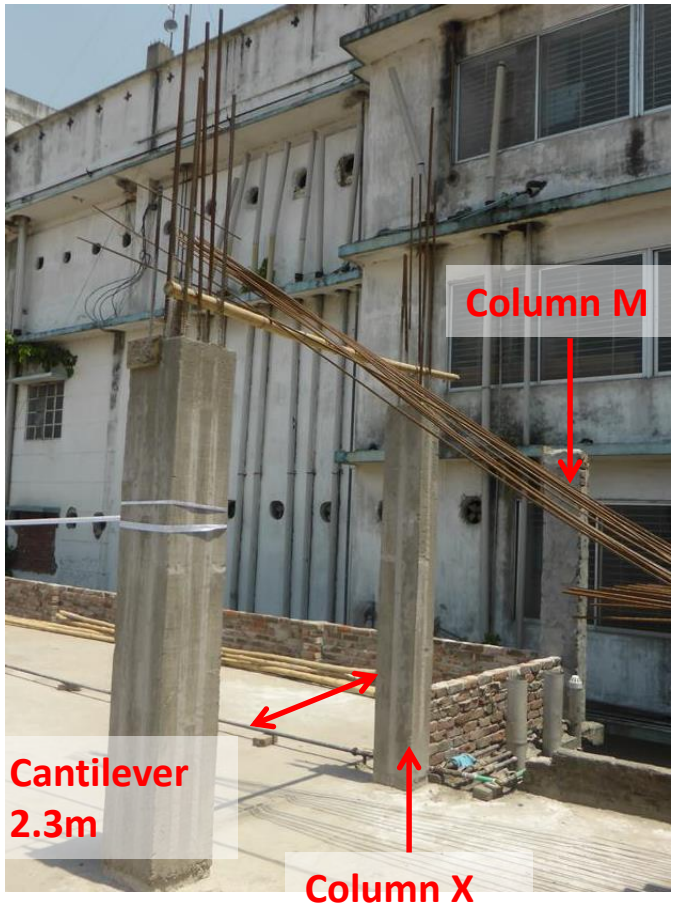
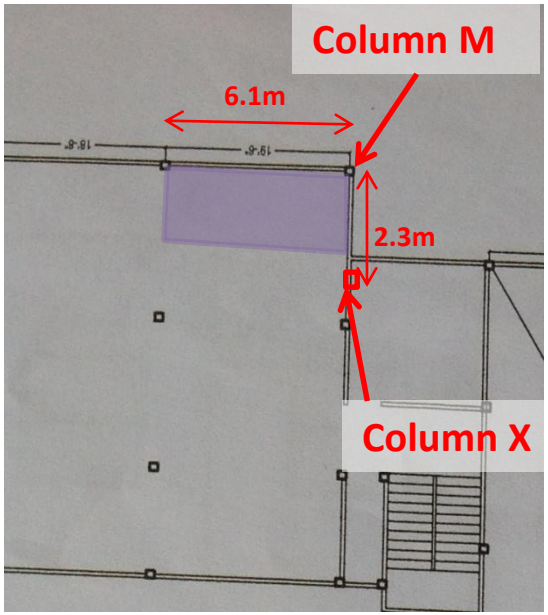
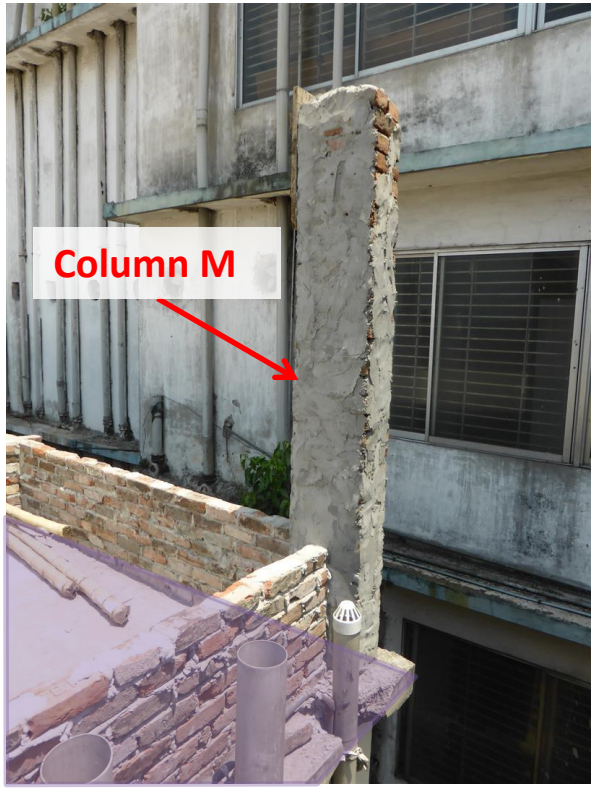
ARUP

Observations

Highly stressed column for irregular structural arrangement







Rooftop vertical extension ongoing without any available design.

Structural arrangement observed on site does not match Permit Drawings.
'Column M' is constructed as a masonry column. No design information or details for approx 1.3m cantilever slab.

Highly stressed column for irregular structural arrangement

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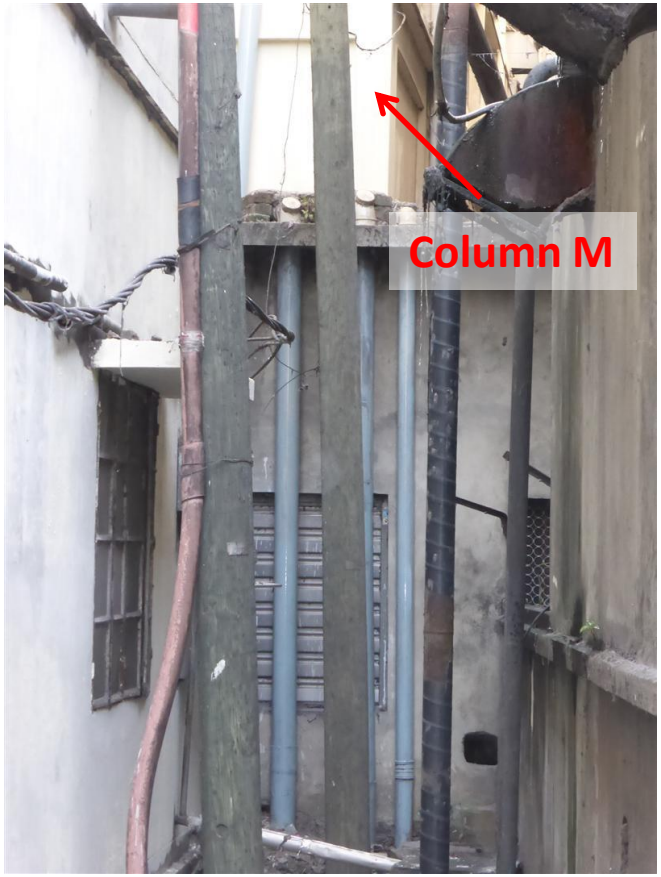
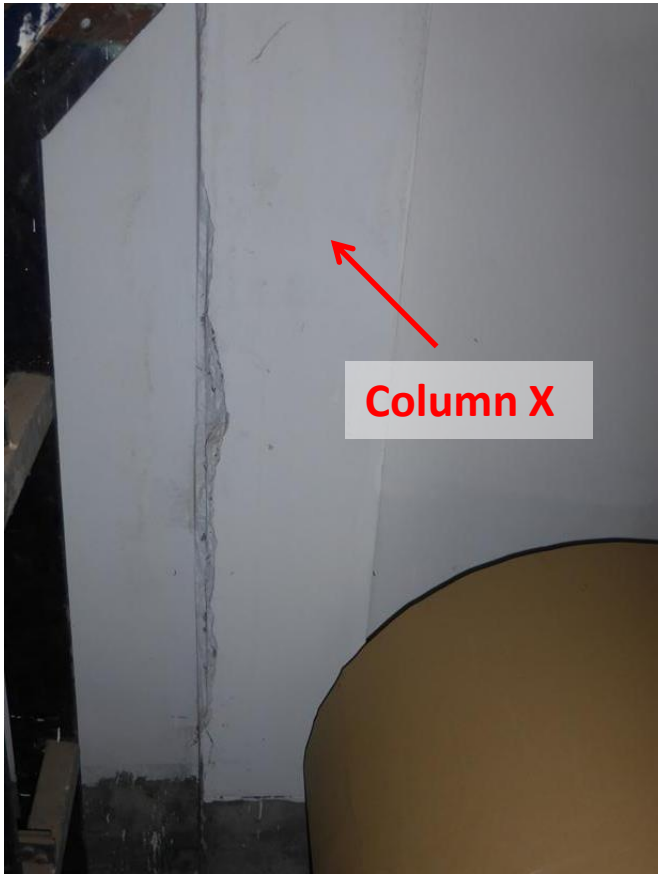


Outline calculations indicate high working stress in concrete columns adjacent to masonry column. Deterioration to column cover zone.

Continued construction at roof level will increase working stress in columns.



Masonry Column cannot be accessed at ground floor level as it is within an adjacent factory building.

Red brick aggregate observed in column. No structural design information to indicate design concrete mix assumptions.

Highly stressed column for irregular structural arrangement

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Unclear structural systems and lack of relevant structural information

Masonry column provided at end of cantilever which appears to continue to ground floor level. Unclear whether it is intended that this column provides support to gravity loads.

'Beam & slab' and 'flat slab' used at the same level. No structural engineering design information for flat slab system.

No structural design information available for survey team review.
Permit drawings do not match as built conditions.

Unclear structural systems and lack of relevant structural information

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Flat slab construction at roof level ongoing. No structural design information available.

Unclear structural arrangements for vertical and lateral loading.

Soft storey in moment frame at double-height ground floor. No structural design information or details available.

Unclear structural systems and lack of relevant structural information

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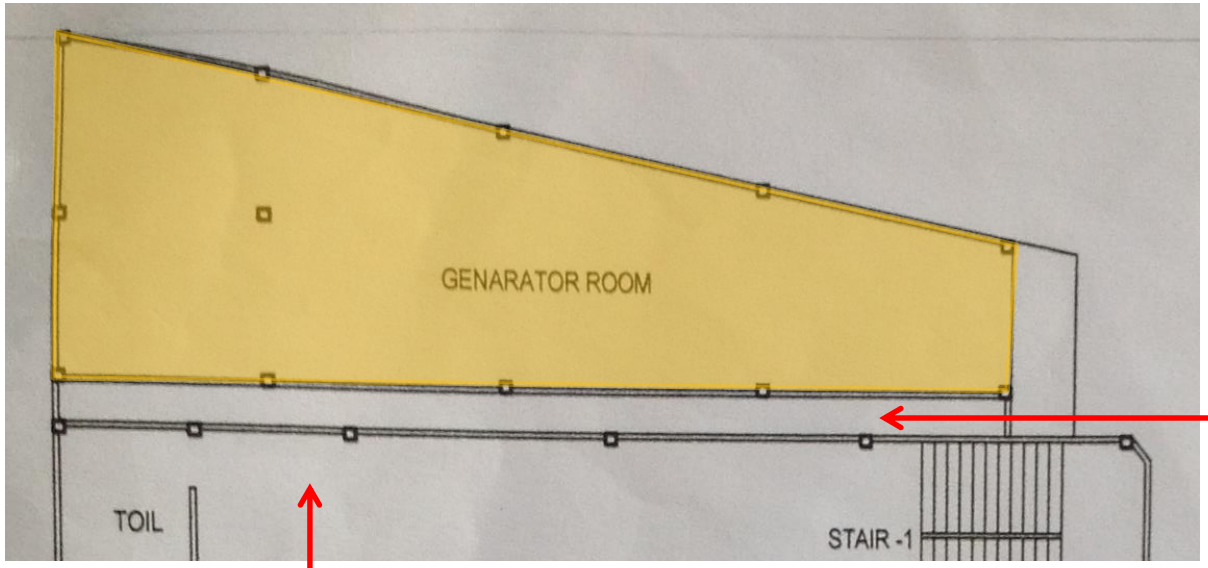
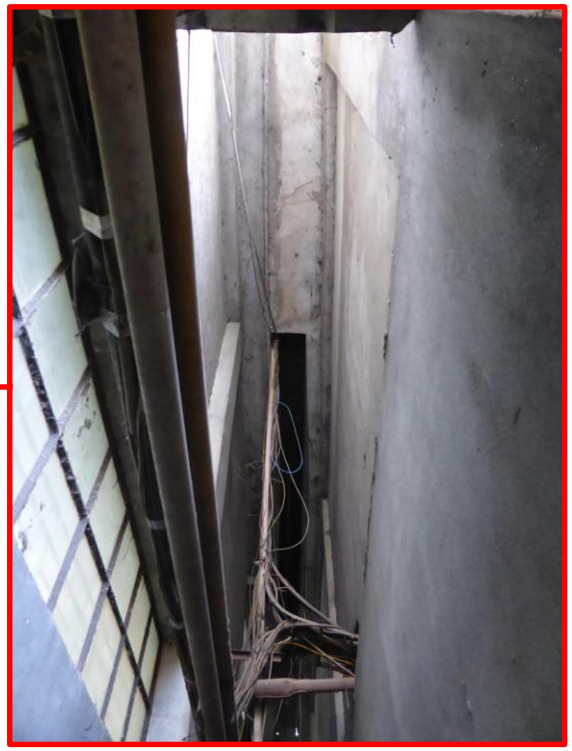
Structural stability of Generator Building



Windows and grilles provided to main factory floors looking into void space. Factory management advise two structures constructed at same time; not consistent with observations on site.



Generator House constructed adjacent to main factory building. No connectivity at first, second or third floor.

Generator House structure

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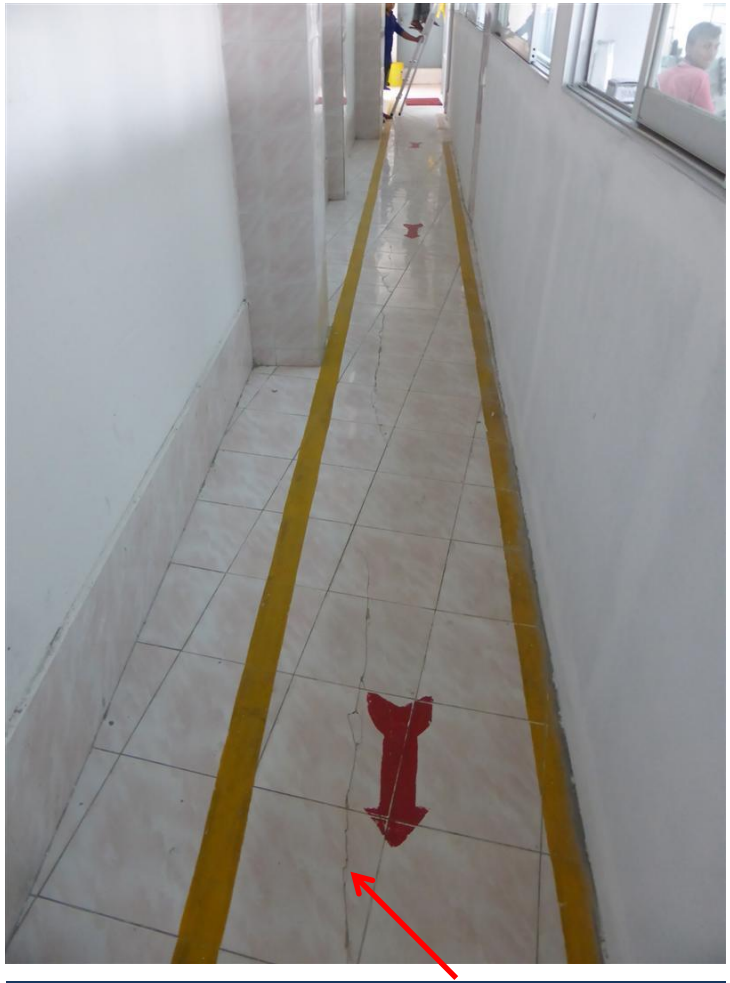


Generator House connected to main factory principally at fourth floor slab. Cracking observed in link slab.

Double height space at ground floor. Stability provided by double height column and beam frame. Robustness of 4-storey moment frame (typically single bay with flat slab) unclear.

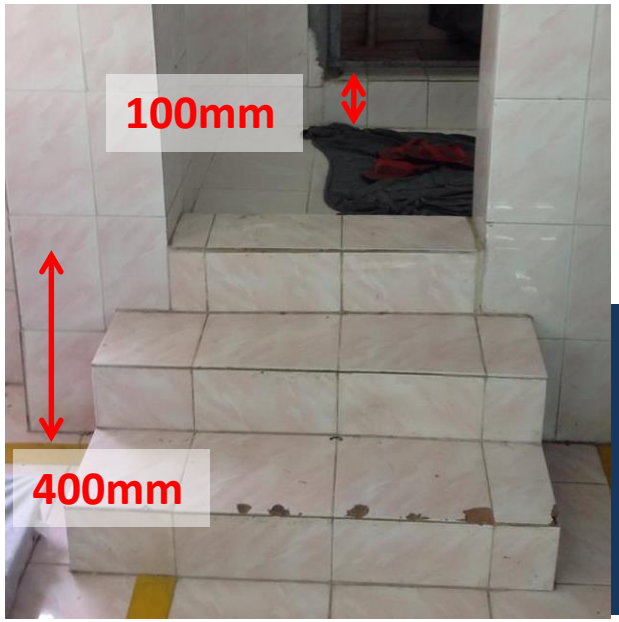
Generator House structure

Localised areas of high loading

Construction storage on slab associated with ongoing construction at roof level.

Unreinforced masonry walls supported on flat slab structure.

Areas of high load throughout building due to storage.
Numerous water tanks supported on roof slab.



Typically 400-500mm solid build up in general washroom area. Solid masonry walls around toilet cubicles.

Localised areas of high loading

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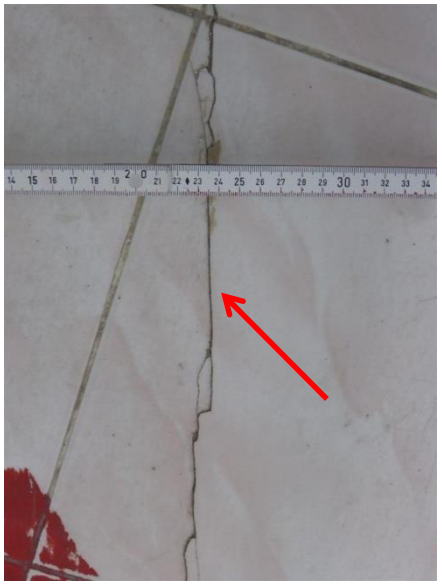
Damage to structural elements

Damage to RC beams in a number of location due to installation of travelling cranes.

Some cracking observed in finishes, concrete slab soffits and damage to concrete cover zones.



Damage to structural elements

Unclear lateral stability of canteen portal frame at roof level

Unclear lateral stability system for portal frame roof structure, orthogonal to portal frame span. Lightweight tin roof susceptible to wind uplift.
Unreinforced masonry walls supported on roof slab structure.

No structural design or drawings of steel portal frame available for survey team review.

Incomplete braced bay in portal frame roof. Missing cross bracing ties.

Slotted holes in rafters allow movement and do not restrain lateral movement of portal frames.

Canteen portal frame at roof level

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Non-engineered structures within the complex

A number of non-engineered sheds and outbuildings observed within complex. Lightweight roof sheeting and holding down systems susceptible to wind uplift.

Non-engineered structures within the complex

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Problems Observed

1. Highly stressed column for irregular structural arrangement
2. Unclear structural systems and lack of relevant structural information
3. Structural stability of Generator Building
4. Localised areas of high loading
5. Damage to structural elements
6. Unclear lateral stability of canteen portal frame at roof level
7. Non-engineered structures within the complex

Item No.	Observation	Recommended Action Plan	Recommended Timeline
1	Highly stressed column for irregular structural arrangement	No further construction at roof level to be carried out until a full Detail Engineering Assessment (DEA, see attached scope) of the building is completed.	**Immediate - Now**
2	Highly stressed column for irregular structural arrangement	Factory Engineer to review design, loads and columns stresses for all columns.	**Immediate - Now**
3	Highly stressed column for irregular structural arrangement	Verify insitu concrete stresses either by cores or existing cylinder strength data for all the columns or 100mm dia. cores from minimum 4 non-critical columns.	**Immediate - Now**
4	Highly stressed column for irregular structural arrangement	A Detail Engineering Assessment (DEA) of Factory to be commenced - see attached Scope	**Immediate - Now**
5	Highly stressed column for irregular structural arrangement	Produce and actively manage a loading plan for all floor plates within the factory giving consideration to floor capacity and column capacity.	**6-weeks**
6	Highly stressed column for irregular structural arrangement	A Detail Engineering Assessment (DEA) of Factory to be completed.	**6-weeks**
7	Highly stressed column for irregular structural arrangement	Remove fixed loading as required by DEA.	**6-months**
8	Highly stressed column for irregular structural arrangement	Complete any strengthening works arising from DEA.	**6-months**
9	Highly stressed column for irregular structural arrangement	Continue to implement the load plan.	**6-months**

Detail Engineering Assessment

This Schedule develops a minimum level of information, Analysis and testing expected as part of a Detail Engineering Assessment.
The Building(s) have been visually assessed and it is deemed necessary that a detailed engineering assessment be carried out by a competent Engineering Team employed by the factory Owner.
This Request should be read in conjunction with the BUET developed Tripartite Guideline document for Assessment of Structural Integrity of Existing RMG Factory Buildings in Bangladesh (Tripartite Document), the latest version of this document should be referenced. T his document also gives guidance on required competency of Engineering Team.

We expect that the following will be carried out:

1. Development of Full Engineering As-Built Drawings showing Structure, loading, elements, dimensions , levels, foundations and framing on Plan, Section and Elevational drawings .
2. The Engineering team are to carry out supporting calculations with a model based design check to assess the safety and serviceability of the building against loading as set out in BNBC-2006, Lower rate provisions can be applied in accordance with the Tripartite Guidelines following international engineering practice, justification for these lower rate provisions must be made.
3. A geotechnical Report describing ground conditions and commenting on foundation systems used/proposed.
4. A report on Engineering tests carried out to justify material strengths and reinforcement content in all key elements studied.
5. Detailed load plans shall be prepared for each level showing current and potential future loading with all key equipment items shown with associated loads.
6. The Engineering team will prepare an assessment report that covers the following:
    - As-Built drawings including
        - Plans at each level calling up and dimensioning all structural components
        - Cross sectional drawings showing structural beams, slabs, floor to floor heights, roof build-ups and Basic design information of the structure
    - Highlight any variation between As-built compared to the designed structure
    - Results of testing for strength and materials
    - Results of geotechnical assessment and testing/investigation
    - Details of loading, inputs and results of computer modelling
    - Commentary on adequacy/inadequacy of elements of the structure
    - Schedule of any required retrofitting required for safety or performance of Structure

Any proposals for Retrofitting to follow guidance developed in the Tripartite Document

Item No.	Observation	Recommended Action Plan	Recommended Timeline
10	Unclear structural systems and lack of relevant structural information	As part of DEA outlined in Item 1, as built structural information of existing structure to be generated and assessed.	**6-weeks**
11	Unclear structural systems and lack of relevant structural information	Building Engineer to determine capability of existing structure to resist gravity and lateral loading. Particular attention to structural adequacy of flat slab design and construction for column punching shear is required.	**6-weeks**
12	Unclear structural systems and lack of relevant structural information	Update as built drawings as strengthening works are completed.	**6-months**
13	Unclear structural systems and lack of relevant structural information	Update as built drawings if further modifications are made to structural elements within the building.	**6-months**
14	Structural stability of Generator Building	All cracking in slabs between main factory building and Generator House to be monitored.	**6-weeks**
15	Structural stability of Generator Building	As part of DEA outlined in Item 1, Building Engineer to determine capability of Generator House structure to resist gravity and lateral loading.	**6-weeks**
16	Structural stability of Generator Building	Complete strengthening works as required by DEA.	**6-months**
17	Structural stability of Generator Building	Repair cracks to Building Engineer's specification as necessary.	**6-months**
18	Structural stability of Generator Building	Continue to monitor cracks in slabs between main factory building and Generator House.	**6-months**

Item No.	Observation	Recommended Action Plan	Recommended Timeline
19	Localised areas of high loading	Create controlled loading plans for all floors, which account for solid partition loads and other fixed loads and designate where storage can be placed.	**6-weeks**
20	Localised areas of high loading	Plans to take findings of DEA, as per Item 1, into account.	**6-weeks**
21	Localised areas of high loading	Continue to implement load plans.	**6-months**
22	Localised areas of high loading	Complete modifications required from DEA	**6-months**
23	Damage to structural elements	As part of DEA outlined in Item 1, all damage (cracking, damage to concrete cover zone, damage to beams at location of movable cranes etc.) to slabs, beams and columns to be identified.	**6-weeks**
24	Damage to structural elements	Remedial/strengthening details to be implemented as required by DEA.	**6-weeks**
25	Damage to structural elements	Complete strengthening/remedial works as required by DEA.	**6-months**
26	Damage to structural elements	Continue to monitor structure for further cracking	**6-months**

Item No.	Observation	Recommended Action Plan	Recommended Timeline
27	Canteen portal frame at roof level	As part of DEA outlined in Item 1, Building Engineer to review structural steelwork design, with particular attention to lateral stability of portal frame in both orthogonal directions.	**6-weeks**
28	Canteen portal frame at roof level	Supporting RC slabs, beams and columns to be checked for loads applied due to unreinforced masonry walls.	**6-weeks**
29	Canteen portal frame at roof level	Carry out remedial works to portal frame as required.	**6-months**
30	Canteen portal frame at roof level	Carry out strengthening of supporting RC structure as required.	**6-months**
31	Non-engineered structures within the complex	Building Engineer to commence structural assessment of all sheds and outbuildings within complex.	**6-weeks**
32	Non-engineered structures within the complex	Loading on primary structure to be accounted for in DEA.	**6-weeks**
33	Non-engineered structures within the complex	Carry out and complete strengthening works to sheds and outbuildings to Building Engineer's specifications.	**6-months**