# Apparel Gallery Ltd.

147-148, Norshinghpur, Asulia, Savar, Dhaka
(23.929985N,90.304914E)

23 March 2014


ACCORD on Fire and Building Safety in Bangladesh

ARUP

# Observations

# Building 1

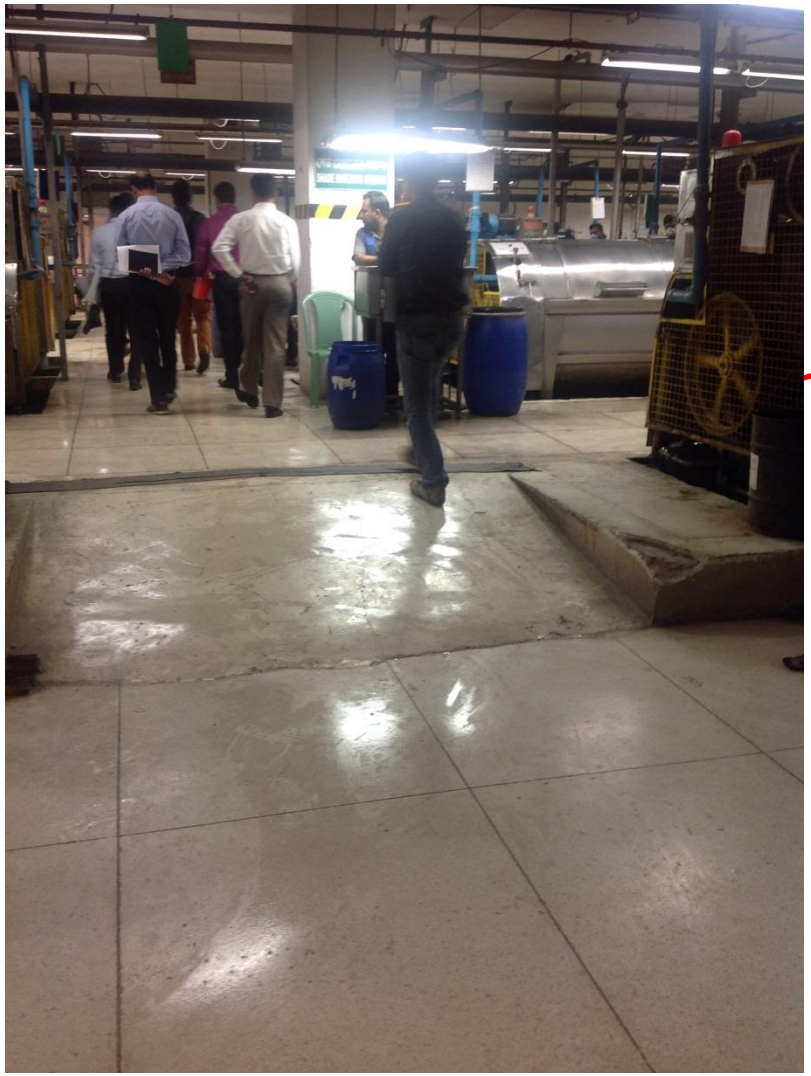
## Heavy loading due to raised floor area on Ground Floor

# Building 1

Raised floor area, build up unknown.

**Heavy loading due to raised floor area on Ground Floor**

# Building 1



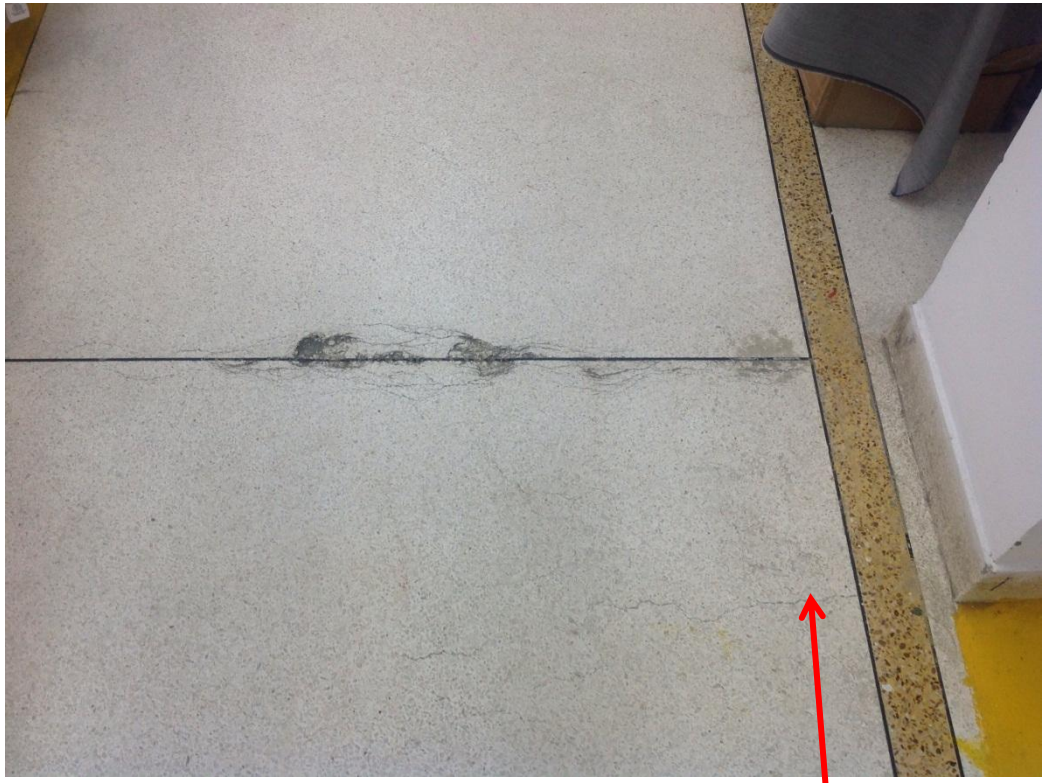
Raised floor area on top of raise area, not identified on drawings. Build up unknown.

**Heavy loading due to raised floor area on Ground Floor**

# Building 1

**Floor cracking.**

# Building 1



Multiple cracking in floor finish.

**Floor cracking**



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# Building 1

**Opening in floor with exposed reinforcement and water ingress.**

# Building 1

Water draining through opening affecting exposed reinforcement.

Opening in slab, exposed reinforcement.

**Opening in floor with exposed reinforcement and water ingress.**

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# Building 1

**Repaired cracking in soffit of ground floor slab.**

# Building 1

Recently repaired cracking in Soffit of ground floor slab adjacent to column with Basement slab cracking.

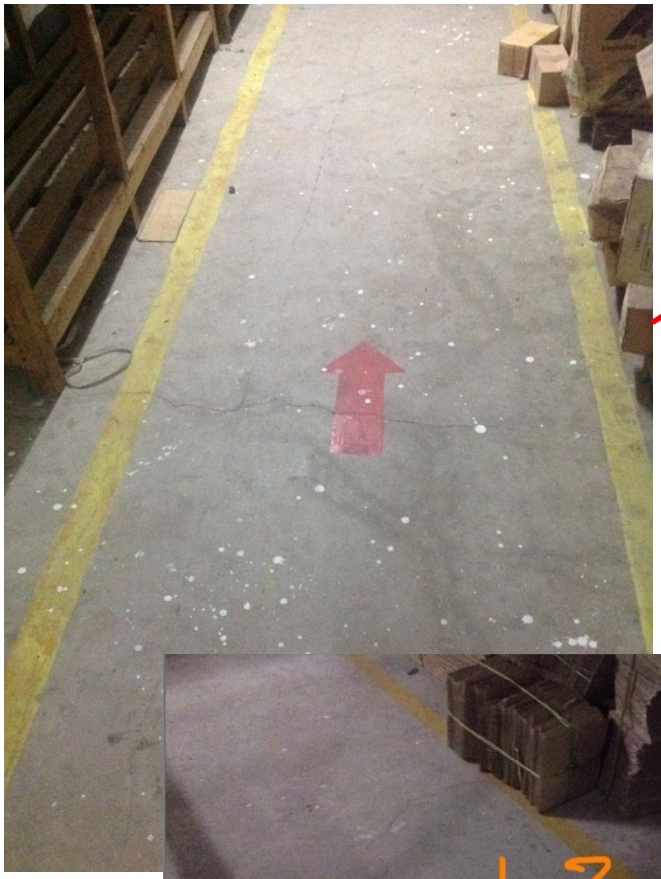
**Repaired cracking in soffit of ground floor slab.**

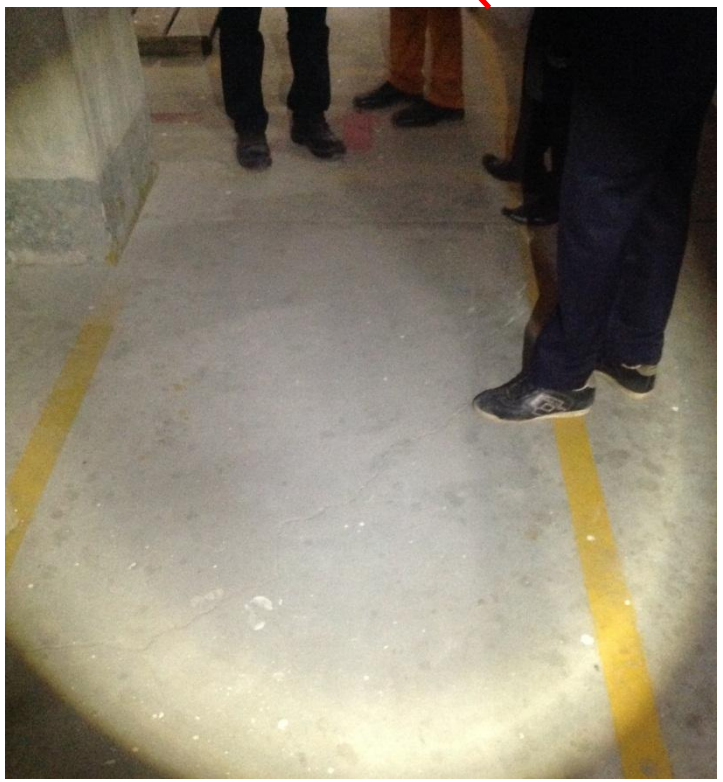
# Building 1

**Cracking in basement slab.**

# Building 1

Cracking in Basement slab around column perimeter.



**Cracking in basement slab**



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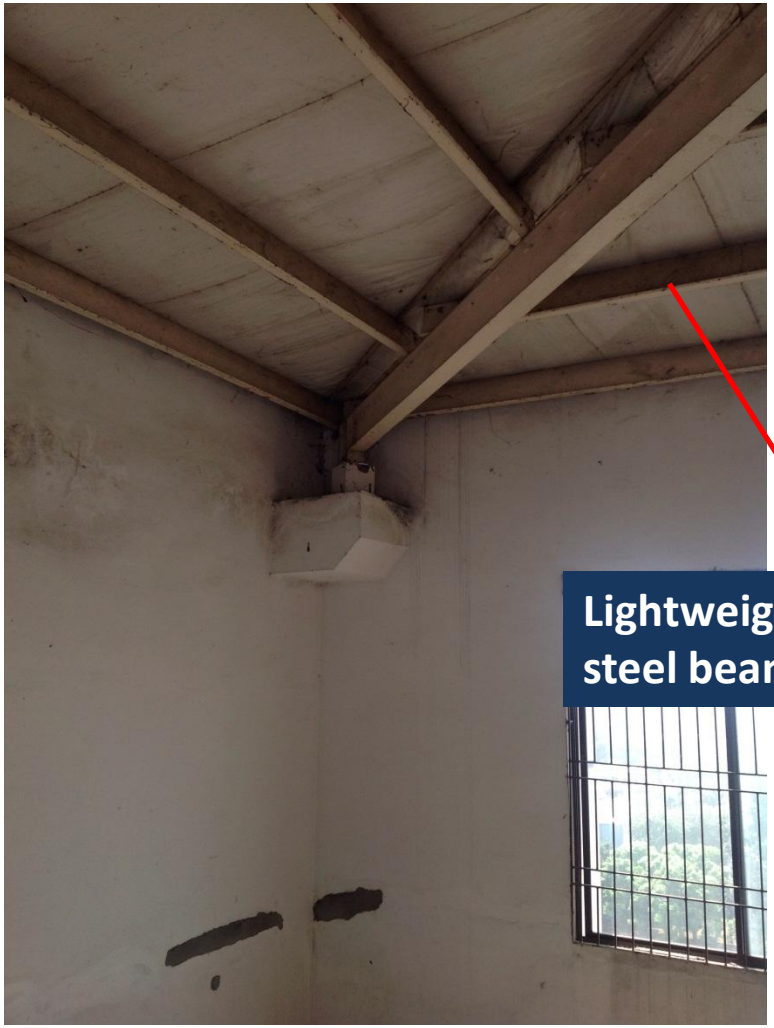
# Building 1

## Timber roof

# Building 1



Lightweight timber roof on steel beam cut at one end

Connection to be checked.

**Timber roof**



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# Building 1

## Façade cracking/spalling

# Building 1

Vertical Crack between cantilever and main structure.

**Check if crack is structural or cosmetic.**

# Building 1


**Check if cracks are structural or cosmetic.**



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# Building 1

**Spalling/Cracking, possibly due to corrosion of reinforcement.**

**Check for corrosion of reinforcement**

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# Building 1

**Water falling onto edges of all slabs, possible corrosion of reinforcement.**

**Check for corrosion of reinforcement**

# Building 1

Cracking in column face.
Remove render to check.

Diagonal Crack.
Remove render to check.

**Check if crack is structural or cosmetic.**

# Building 1

Drainage outlet falling onto cantilever edge below.

Cracking/Spalling. Confirm if reinforcement is corroded.

# Building 1

**Façade steps out at 6th floor level possibly due to construction tolerances.**

# Building 2

## Water ponding

# Building 2

Water ponding on unprotected concrete slab (roof structure removed)

# Building 2

## Water Storage

# Building 2





6 No. 2500L water tanks. (Currently not connected or filled)



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# Building 2

## Heavy Storage Loading

# Building 2


**High storage loads**



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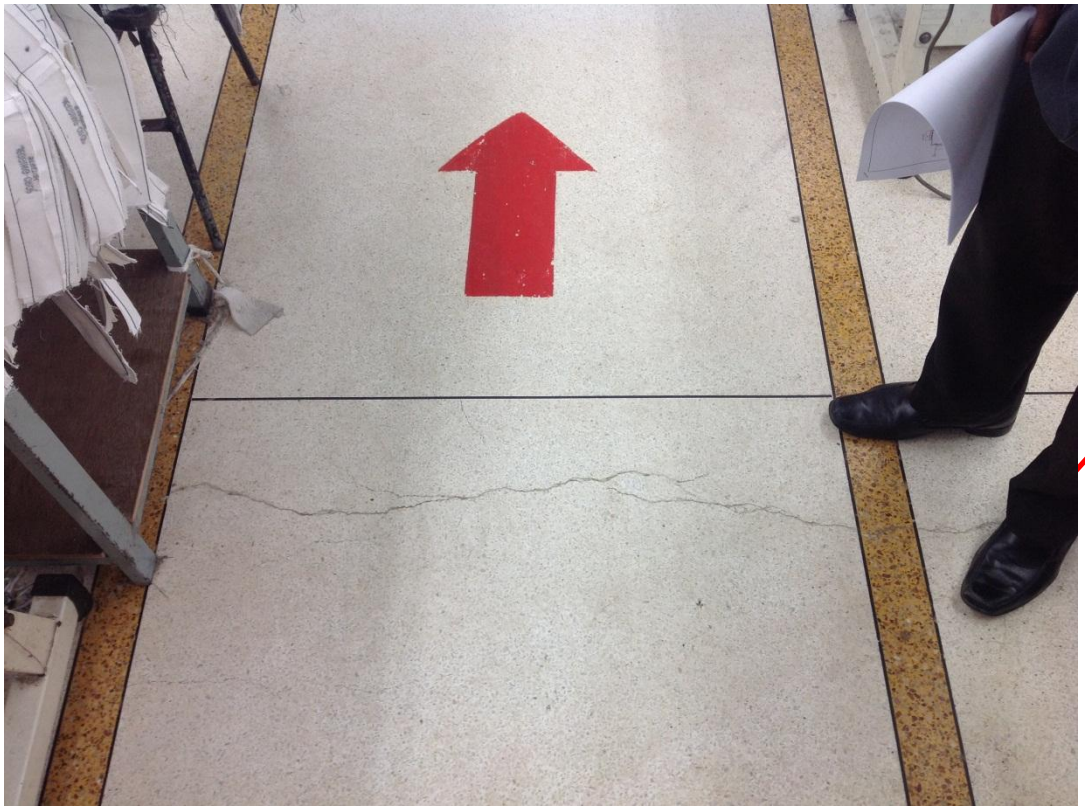
# Building 2

## Floor Cracking

# Building 2



Cracking on column line.

# Building 2

## Column without vehicle protection

# Building 2

**Column in loading bay vulnerable to vehicle impact.**

**Impact protection should be provided.**

# Priority Actions

# Problems Observed – Building 1

1. High Concrete Stresses in platform area as indicated in page 5 in Raised floor in 2 locations on Ground Floor, build up unknown but likely to be at least partially filled with sand, urgent opening up works required by building engineer to confirm build up.
2. Cracking in slabs, detailed design check required.
3. Evidence of repairs to cracks in soffit of ground floor under raised floor area's, repair should be removed by local engineer and reinforcement behind check for possible signs of corrosion.
4. Opening in floor with exposed reinforcement to be addressed by the Building Engineer and repaired.
5. Evidence of water draining down façade of building causing possible reinforcement corrosion, remove source of water/divert and check slab edges for spalling/corrosion
6. Check adequacy of timber roof (connections for uplift) following part removal of roof.

# Problems Observed – Building 2

7. **Building 2** - Check on column loads and design required in order to inform loading limits in warehouse.
8. **Building 2** - Column without vehicle protection

| Item No. | Observation | Recommended Action Plan | Recommended Timeline |
|---|---|---|---|
| 1 | Building 1<br>Heavy loading due to raised floor area on Ground Floor | A full Detailed Engineering Assessment is to be commenced for columns in the area of the raised platform at ground floor | **Immediate - Now** |
| 2 | Building 1<br>Heavy loading due to raised floor area on Ground Floor | Until DEA is complete reduce load at all levels to less than 1.5kN/m2 and especially from stacked garments from area highlighted on page 5 | **Immediate - Now** |
| 3 | Building 1<br>Heavy loading due to raised floor area on Ground Floor | At ground floor (grid B2-D4) remove the second lift of raised platform and investigate the construction of the lower platform. If found to be solid or filled with sand, remove material or evacuate areas above until structure and foundations proven. | **Immediate - Now** |
| 4 | Building 1<br>Heavy loading due to raised floor area on Ground Floor | Conduct concrete tests to prove concrete strength | **Immediate - Now** |
| 5 | Building 1<br>Heavy loading due to raised floor area on Ground Floor | DEA to prove adequacy of foundations in the area B2 to E7 noting the cracking to basement slab at column D3. DEA to confirm if movement is still live as it was noted that the soffit of the ground floor slab had been freshly painted | **Immediate - Now** |
| 6 | Building 1<br>Heavy loading due to raised floor area on Ground Floor | Detail Engineering Assessment and strengthening / remedial works as specified by the building engineer to be completed | **6-weeks** |
| 7 | Building 1<br>Heavy loading due to raised floor area on Ground Floor | Produce and actively manage a loading plan for all floor plates within the factory giving consideration to floor capacity and column capacity. | **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 |
|---|---|---|---|
| 8 | Building 1<br>A check on slab design is required due to consistent cracking observed across all floors | Create controlled loading plans for all floors, designating where storage can be placed and can not be placed | **6-months** |
| 9 | Building 1<br>A check on slab design is required due to consistent cracking observed across all floors | Provide calculations showing the structural adequacy of all slabs/beams, taking into account the loading plans and all built structure including additions beyond the original design. Provide concrete strength tests. | **6-months** |
| 10 | Evidence of repairs to cracks in soffit of ground floor under raised floor area's, repair should be removed by local engineer and reinforcement behind check for possible signs of corrosion | Evidence of repairs to cracks in soffit of ground floor under raised floor area's, repair should be removed by Building Engineer and reinforcement behind check for possible signs of corrosion. | **6-weeks** |
| 11 | Evidence of repairs to cracks in soffit of ground floor under raised floor area's, repair should be removed by local engineer and reinforcement behind check for possible signs of corrosion | Repairs as detailed by the Building Engineer to be completed should investigations above reveal corrosion of reinforcement | **6-months** |

| Item No. | Observation | Recommended Action Plan | Recommended Timeline |
|---|---|---|---|
| 12 | Opening in floor with exposed reinforcement to be addressed by engineer and repaired | Remove source of water to avoid further corrosion to reinforcement. Clean all affected reinforcement back to bare steel. Repair concrete using suitable structural mortar | **6-weeks** |
| 13 | Opening in floor with exposed reinforcement to be addressed by engineer and repaired | Provide calculations showing the structural adequacy of floor with opening | **6-months** |
| 14 | Evidence of water draining down façade of building causing possible reinforcement corrosion, remove source of water/divert and check slab edges for spalling/corrosion | Engineer to inspect water leakage and damaged structure including the exterior and propose a suitable repair. | **6-months** |
| 15 | Roof partially removed. Timber joists and connection of cut steel rafters to be checked for uplift | Building Engineer to inspect section of roof that remains and verify its adequacy against uplift giving consideration to open door on roof | **6-weeks** |

| Item No. | Observation | Recommended Action Plan | Recommended Timeline |
|---|---|---|---|
| 16 | Building 2<br>Verify concrete strengths in columns in locations supporting bonded warehouse areas due to high observed loads | Factory Engineer to review design, loads and columns stresses in area identified above. | **Immediate - Now** |
| 17 | Building 2<br>Verify concrete strengths in columns in locations supporting bonded warehouse areas due to high observed loads | Verify insitu concrete stresses either by cores or existing cylinder strength data for columns. We note that cylinders have been provided for slabs and foundations but also note that these elements were specified with a different concrete mix and target strength. | **Immediate - Now** |
| 18 | Building 2<br>Verify concrete strengths in columns in locations supporting bonded warehouse areas due to high observed loads | Produce and actively manage a loading plan for all floor plates within the factory giving consideration to floor capacity and column capacity | **6-weeks** |
| 19 | Building 2<br>Verify concrete strengths in columns in locations supporting bonded warehouse areas due to high observed loads | Continue to implement load plan | **6-months** |
| 20 | Column in loading bay vulnerable to vehicle impact | Impact protection should be provided | **6-weeks** |