

Euro Jeans Ltd

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Observations

Defects and poor workmanship to the steelwork connections in Sheds 1 and 2

Defects and poor workmanship was observed to a large number of steel connections in Sheds 1 and 2, including distortion and buckling of the connection plates, inadequate bearing / opening up of end plates, inadequate welds, bolt omissions and inadequate replacements, severe rusting and pitting. The issues are likely a cause of overstressing, excessive movement due to instabilities or substandard quality of fabrication / erection. Detailed Engineering Assessment required.



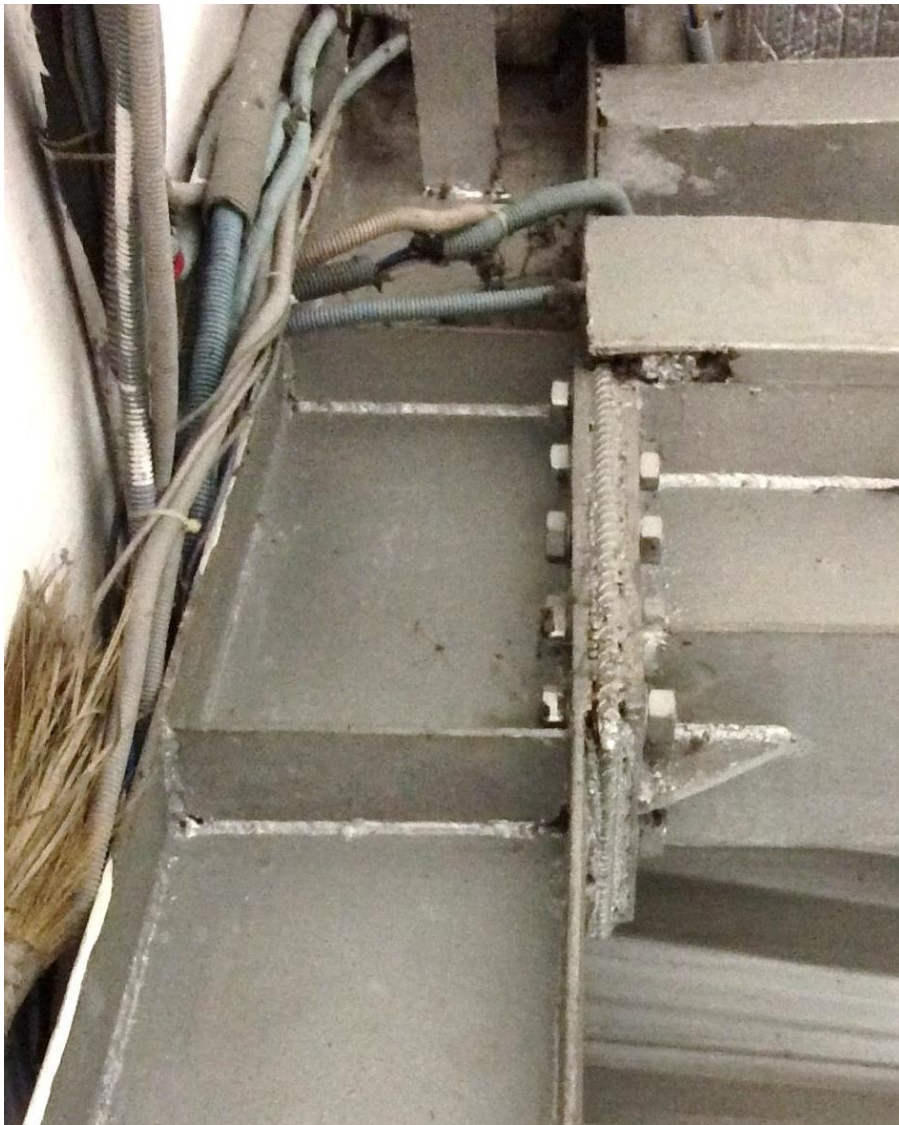
Shed 1 – Welded connection instead of bolted connection



Shed 1 – Distorted end plates / inadequate bearing of end plates



Shed 1 – Distorted end plates / inadequate bearing of end plates



Shed 1 – A large number of connections were observed to have been altered – Rebar appears to have been welded to end plates where there is inadequate bearing.



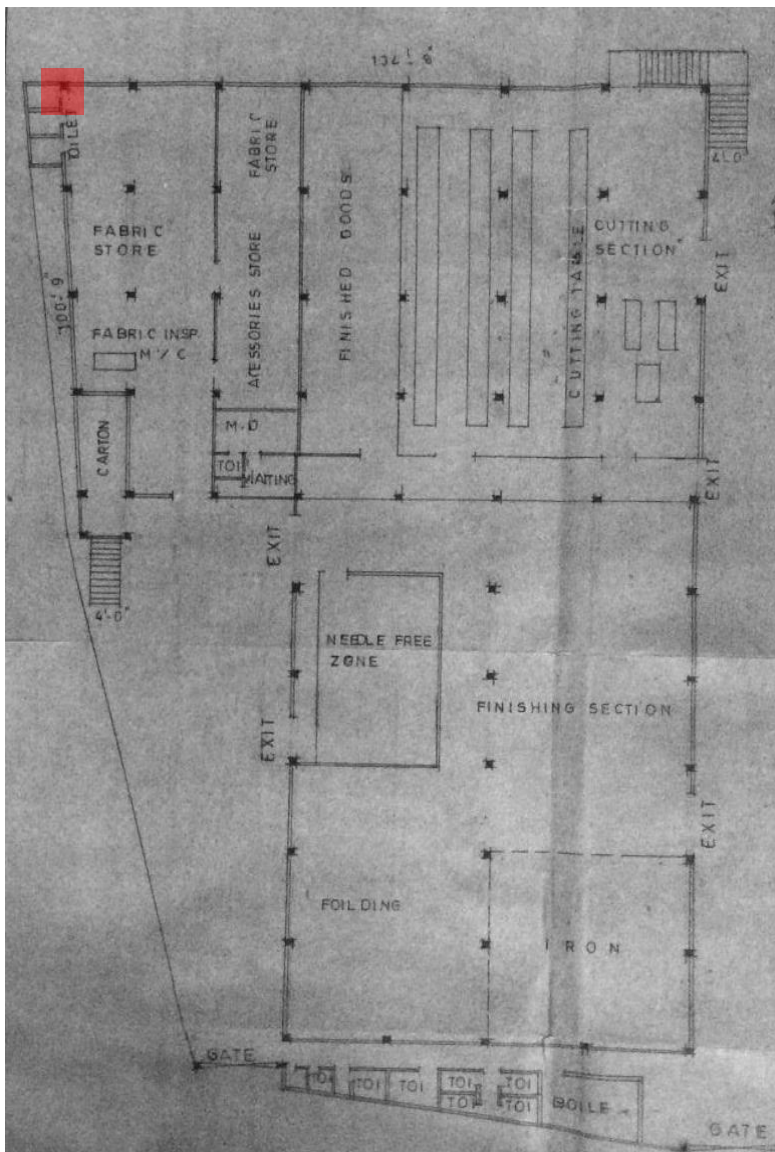
Shed 1 – In many cases where rebar appears to have been welded to end plates as a remedial solution to inadequate bearing, the detail is poorly executed.



Shed 1 – Missing bolts

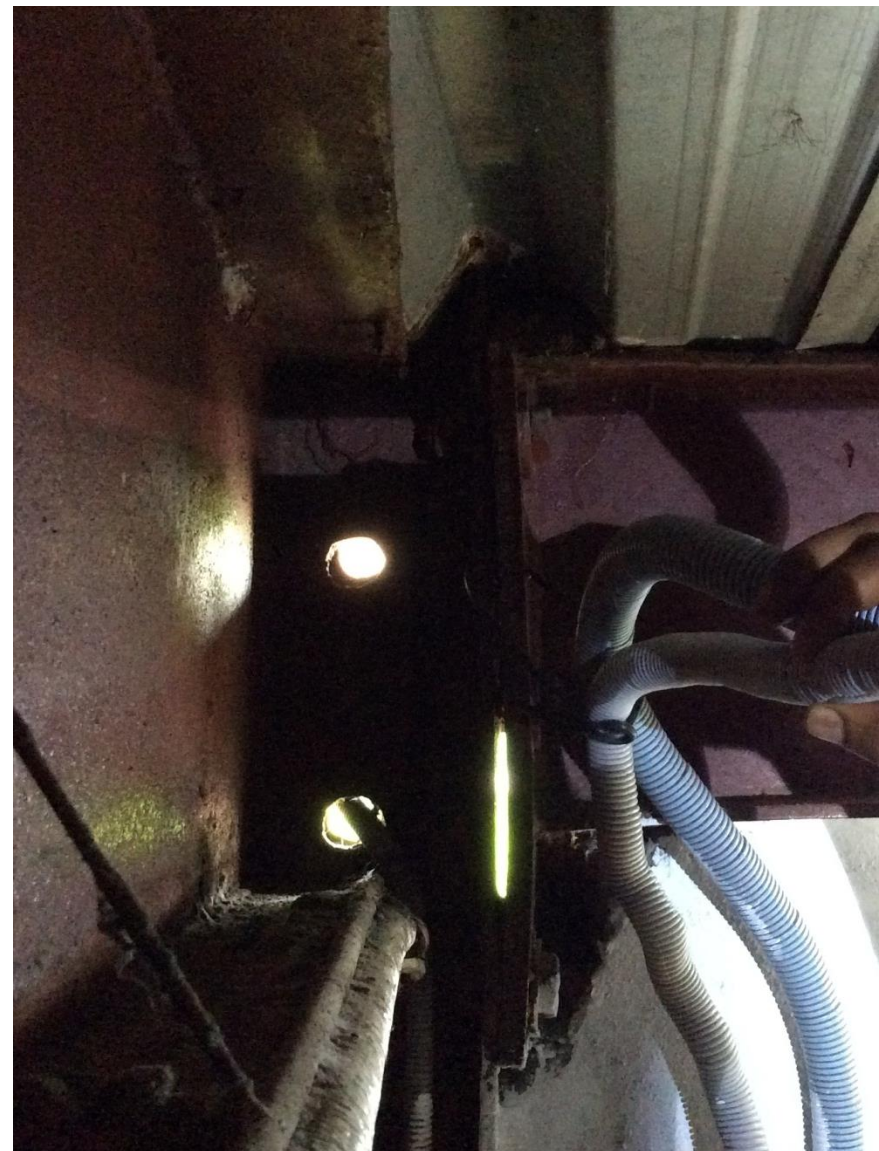


Shed 1 – Inadequate bolt replacements – it appears as though a smaller diameter bolt has been used

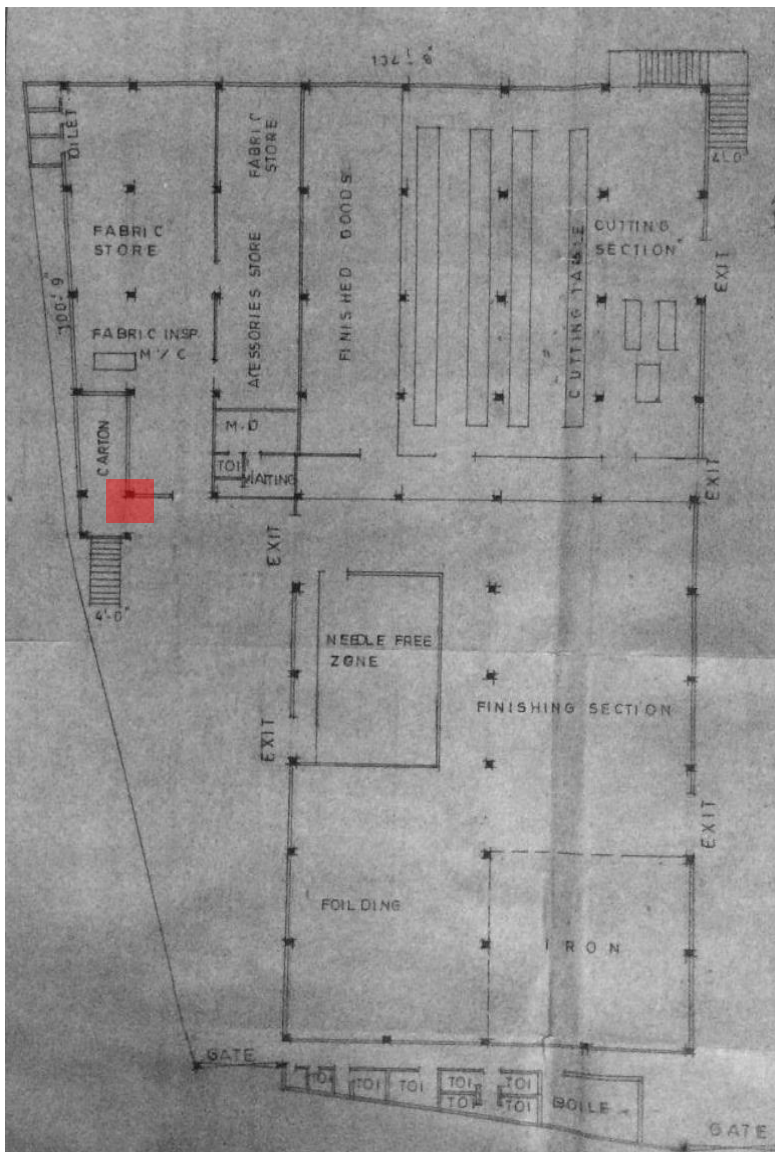


Shed 2 – Ground Floor Plan

Location of buckled end plate



Shed 2 – Buckled end-plate to First Floor edge beam. The plate appears to have buckled either from overstressing and / or inadequate connection



Shed 2 – Ground Floor Plan

Corroded / pitted steel column



Shed 2 – Column appears to have been painted without adequate remedial work to treat corrosion.



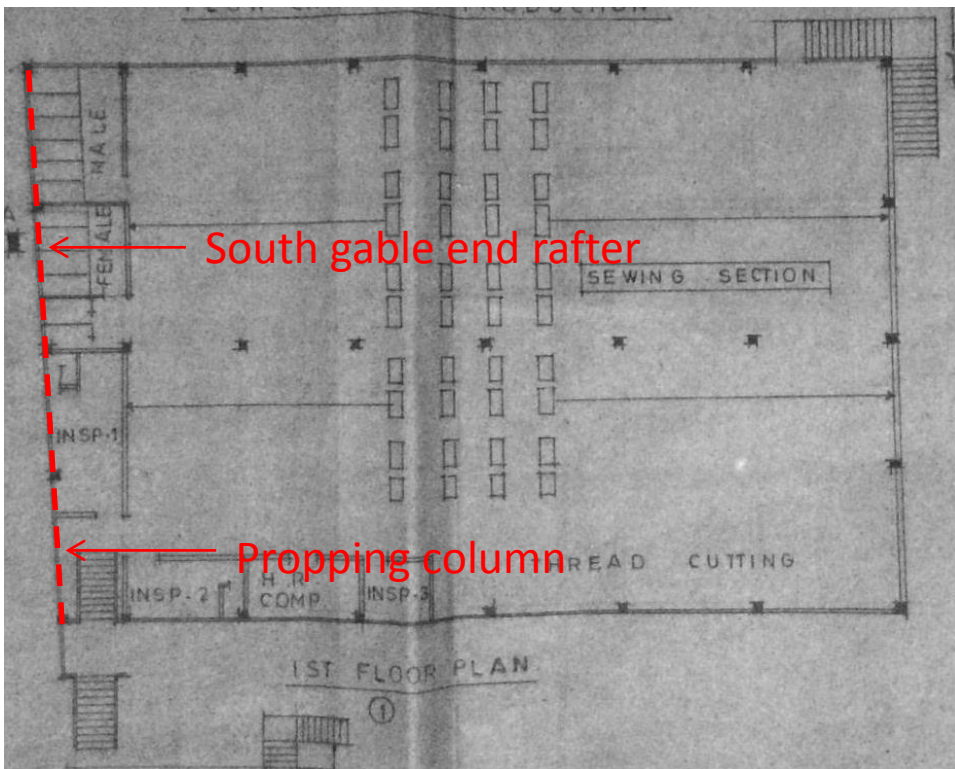
Shed 2 – Missing bolts to portal frame rafter



Shed 2 – Distorted end plates / inadequate bearing of end plates to central rafter support

Concerns over support detail to gable-end rafter at 1st floor level of Shed 2

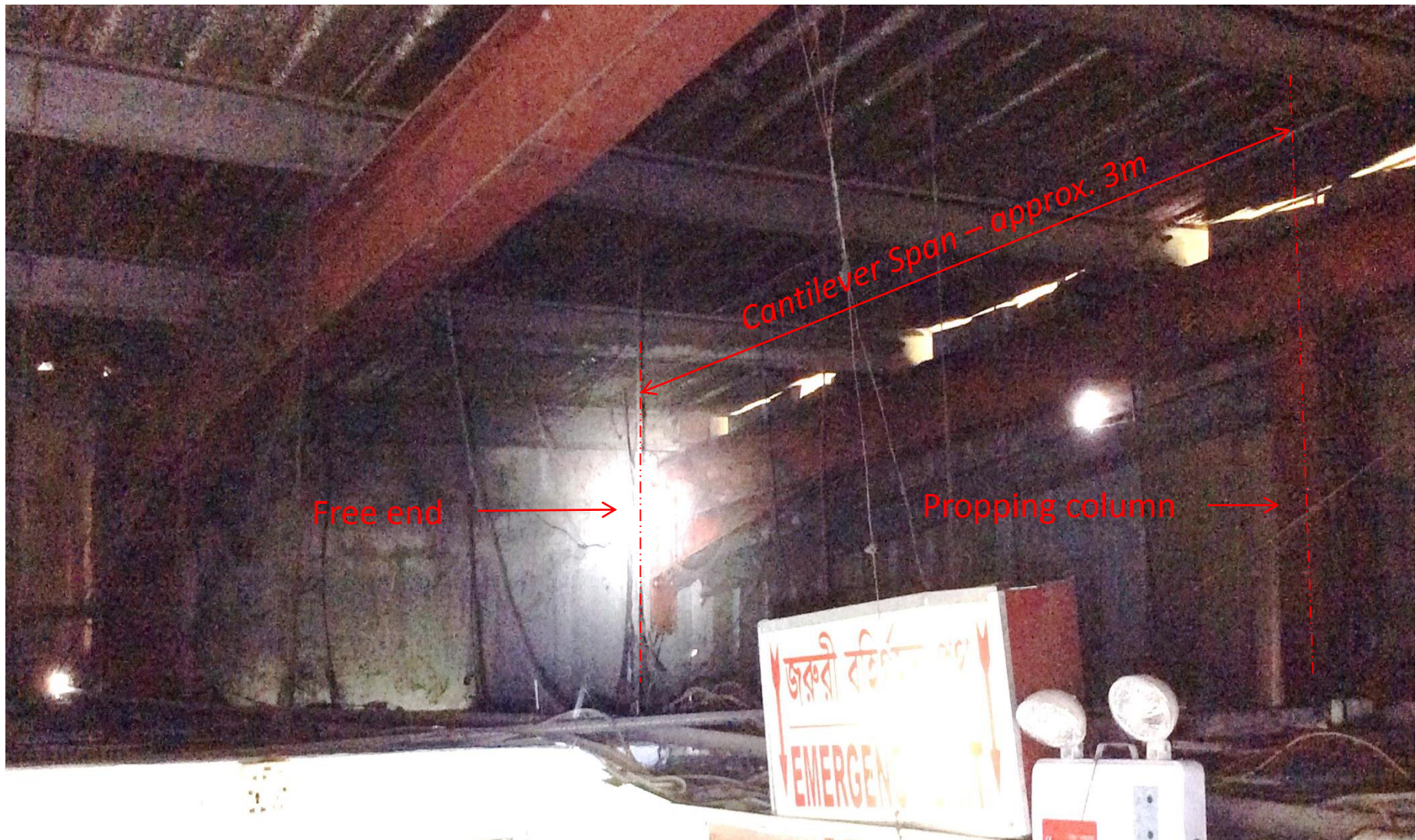
There are concerns over the structural adequacy of the rafter to the south gable end of Shed 2. The detail of the portal frame to the South-East corner is atypical: the rafter butts up against the water tank wall instead of a column, and there is no connection to the water tank wall. The rafter is instead propped up by a cantilevering steel column and cantilevers approximately 3m beyond the prop to where it meets the water tank wall. The connection detail between the rafter and the prop is unclear, although the moment capacity of the portal frame appears to have been lost. Detailed Engineering Assessment required.



Shed 2 – 1st Floor Plan



Propping column



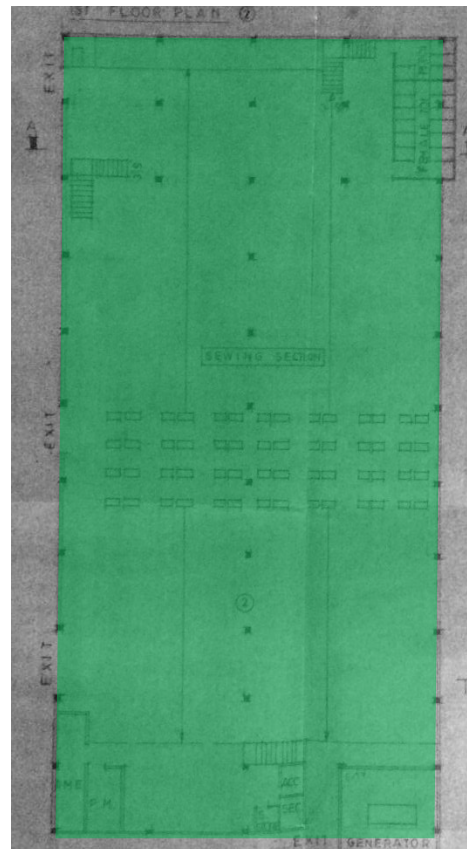
Unconnected end of rafter to South-East corner; rafter propped by a cantilevering steel column

Lack of / inadequate stability members in Sheds 1 and 2

Horizontal and vertical diagonal cable bracing is missing from the two-storey structure of Shed 2, vertical bracing is missing from the single-storey structure of Shed 2, and while bracing is provided to Shed 1, it is loose and therefore ineffective. There appears to be a misunderstanding as to the requirements for bracing in providing support for wind load. Building Engineer to review requirements for bracing to Sheds 1 and 2, and supervise installation and tightening of bracing as necessary.



Shed 2 – Ground Floor Plan



Shed 1 – Ground Floor Plan



Shed 1 – Horizontal and vertical cable bracing provided, but loose and ineffective.

Shed 2 – Two-storey structure – Horizontal and vertical cable bracing missing.

Shed 2 – Single -storey structure – Vertical cable bracing missing. Horizontal bracing appears loose.



Shed 2 – Two-storey structure – Horizontal and vertical bracing missing



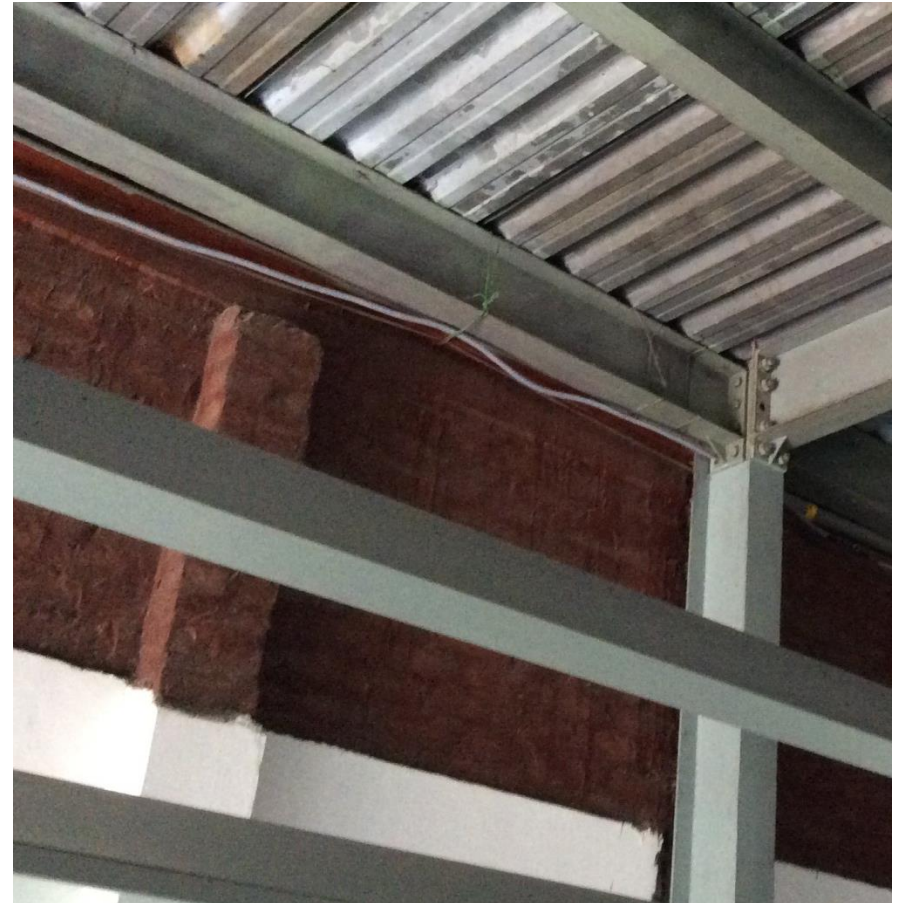
Shed 2 – Single-storey structure – Horizontal bracing missing

Unsupported masonry walls to Sheds 1 and 2

There are concerns over the lateral stability of the masonry walls to sheds 1 and 2. The walls are approximately 4m high and have brick piers, as opposed to RC columns, which appear to be cantilevering from Ground Floor level. There is no connection between the masonry walls and the portal frame structures.



Masonry wall to Shed 2



Brick piers and no connection between masonry walls and portal frame columns

Stability of Vent support beams to roof of Shed 1

There are concerns over the stability of the steel beams erected above the portal frame rafters of Shed 1 to provide support to the air vents. The arrangement appears unstable.



Air vents viewed from Shed 1 floor



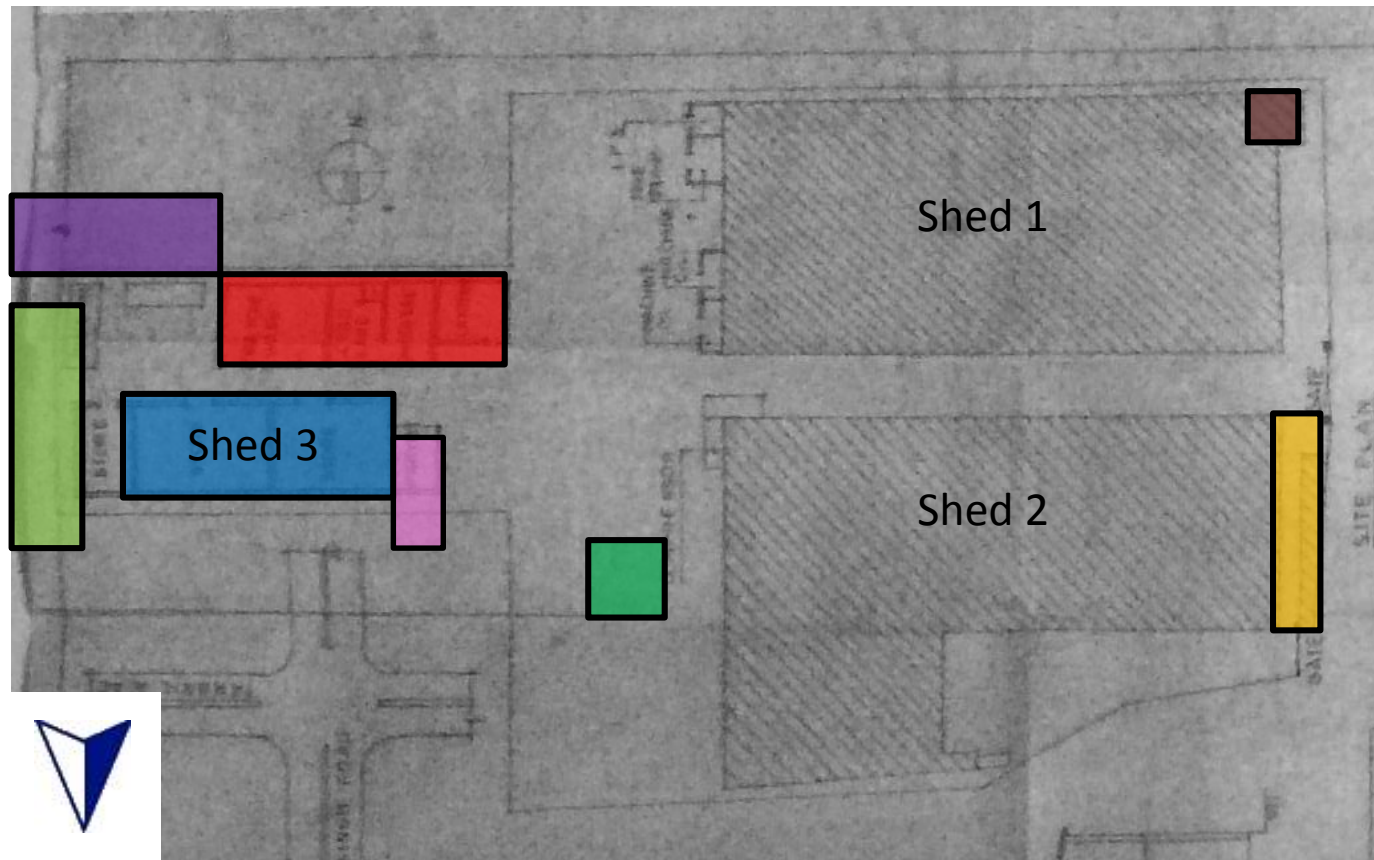
Connection detail unclear – single bracing member only



Air vents viewed from Roof

Lightweight, non-engineered structures / roof structures to Sheds 3, 4, 5 and 6

The factory compound comprises a number of lightweight structures, namely to Sheds 3 and 5, and lightweight roof structures, namely to sheds 4 and 6, as well as to other ancillary structures as indicated. These lightweight structures / roof structures appear to be non-engineered. The design of all lightweight structures will need to be checked against uplift and lateral instability, with particular emphasis on connections and bracing.



	Shed 3 – Main Storage Shed
	Shed 4 – Welfare Building
	Shed 5 – Security Living Compound
	Shed 6 – Leftover Storage Shed
	Prayer Room
	Compressor Room
	Generator Room
	Wash rooms

Site Layout – Extent of Lightweight Structures / Roof Structures



Prayer room, Shed 3 (Main Storage Shed), Shed 4 (Welfare Building), and Shed 6 (Leftover Fabric Storage Shed)



Prayer Room – Corrugated roof on bamboo purlins & posts



Shed 3 – Corrugated roof on timber purlins on concrete posts



Shed 4 – Corrugated roof on steel angles on Masonry walls



Shed 5 – Corrugated roof on steel angles on masonry walls



Shed 6 – Corrugated roof on timber purlins on bamboo posts



Compressor Room – Corrugated roof on steel angles



Generator Room – Corrugated roof on steel angles



Washrooms and canopy to Shed 2



Washrooms - Corrugated roof on steel angles



Main Entrance Canopy to Shed 2 – Corrugated plastic roof on steel angle truss

Non-engineered stair to Shed 2

There are concerns over the structural adequacy of the external steel stair to the North-West corner of Shed 2, including atypical supports, inadequate bracing, poor connections.



External steel stair to NW corner of Shed 2



Atypical supports



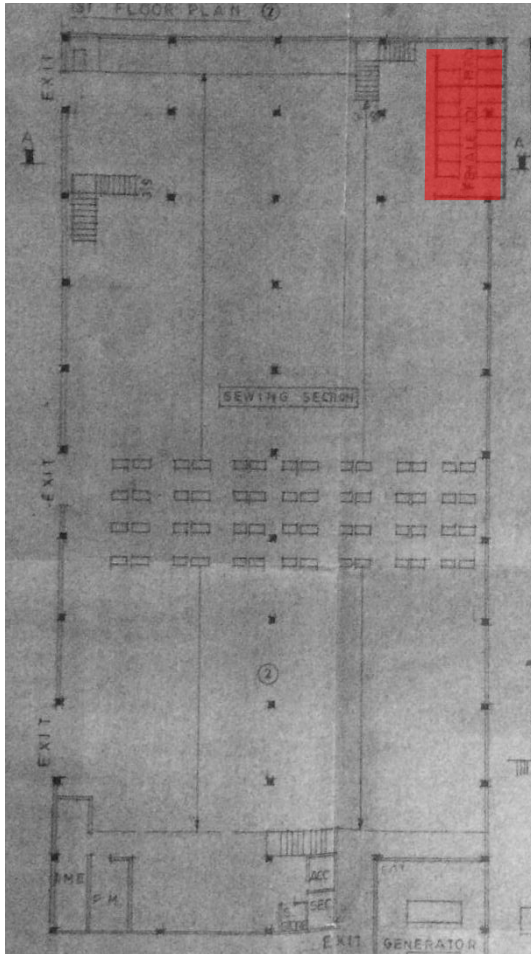
Poor connections



Inadequate bracing

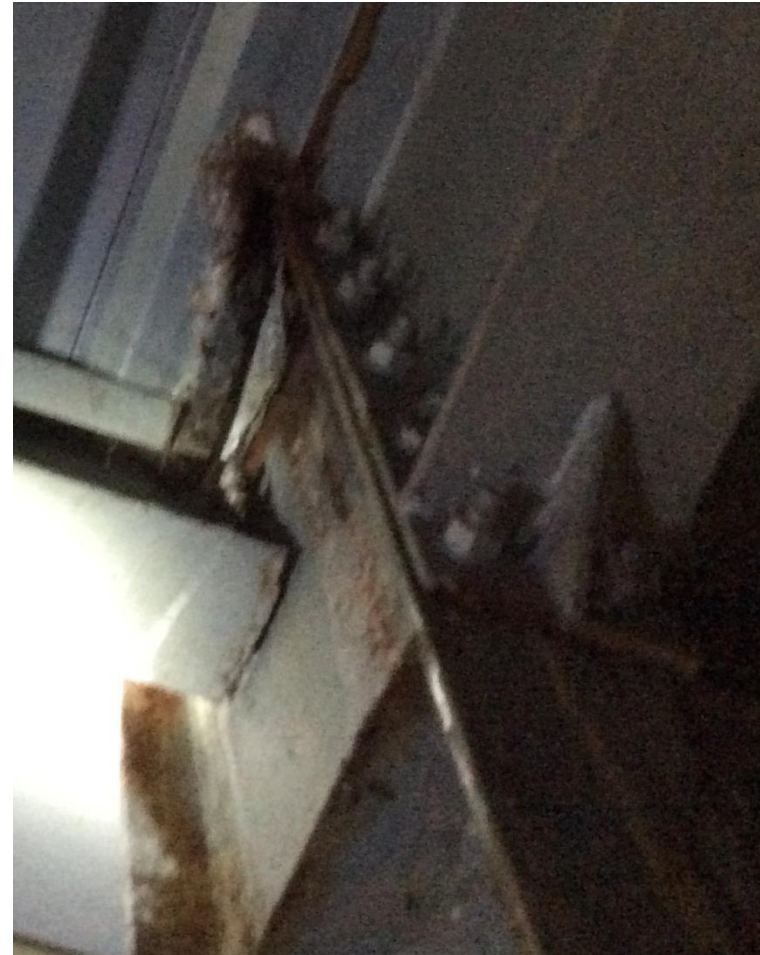
Water ingress from leaking services into Shed 1

Water ingress, believed to be from leaking services, was observed in the toilet extension to the North-West corner of Shed 1, resulting in corrosion to the portal frame steelwork members and to the reinforcement steel which has become exposed in the RC slab. Remedial works are required.



Shed 1 – Ground Floor Plan

Location of toilet extension to North-West corner of Shed 1. Leaking services and resulting corrosion of steelwork was observed.



Corrosion of structural steel members

Missing Original Documentation and inaccuracies in documentation provided

A number of key original documents were not available for review on the day of the survey, namely structural and architectural drawings, and a soil investigation report. There was no documentation available for the ancillary buildings. Two sets of as-built drawings, for Sheds 1 and 2 respectively, were provided for review. While the drawings for Shed 1 appear to be in reasonably good agreement with the constructed building, the drawings for Shed 2 are incomplete and there are important inconsistencies between the drawings and the constructed buildings – the building footprint is incorrect, column and footing layouts are incorrect, steelwork structure is not shown, internal stair to the South-East corner is not shown. For Shed 1, there are missing details for the RC cantilever beam supporting the plastic water tanks at roof level. Building Engineer to check, collect information and produce accurate and fully complete as-built documentation.

Priority Actions

Problems Observed

ITEM 1: Defects and poor workmanship to the steelwork connections in Sheds 1 and 2

ITEM 2: Concerns over support detail to gable-end rafter at 1st floor level of Shed 2

ITEM 3: Lack of / inadequate stability members in Sheds 1 and 2

ITEM 4: Unsupported masonry walls to Sheds 1 and 2

ITEM 5: Concerns over stability of air vent support beams to roof of Shed 1

ITEM 6: Lightweight, non-engineered structures / roof structures to Sheds 3, 4, 5 and 6

ITEM 7: Non-engineered stair to Shed 2

ITEM 8: Water ingress from leaking services into Shed 1

ITEM 9: Missing Original Documentation and inaccuracies in documentation provided

Item No.	Observation	Recommended Action Plan	Recommended Timeline
1	Defects and poor workmanship to the steelwork connections in Sheds 1 and 2	Building Engineer to review all connection details in Sheds 1 and 2 with immediate effect as part of Detailed Engineering Assessment, refer to attached scope.	Immediate - Now
2	Defects and poor workmanship to the steelwork connections in Sheds 1 and 2	Building Engineer to prepare schedule of remedial works, as required.	Immediate - Now
3	Defects and poor workmanship to the steelwork connections in Sheds 1 and 2	Detailed Engineering Assessment to be completed.	6-weeks
4	Defects and poor workmanship to the steelwork connections in Sheds 1 and 2	Building Engineer to implement any actions / supervise any remedial works as identified following the review.	6-months
5	Concerns over support detail to gable-end rafter at 1st floor level of Shed 2	Building Engineer to review stability of said rafter, as part of Detailed Engineering Assessment, and to prepare schedule of remedial works as required.	Immediate - Now
6	Concerns over support detail to gable-end rafter at 1st floor level of Shed 2	Detailed Engineering Assessment to be completed.	6-weeks
7	Concerns over support detail to gable-end rafter at 1st floor level of Shed 2	Building Engineer to implement any actions / supervise any remedial works as identified following the review.	6-weeks

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. This 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	Lack of / inadequate stability members in Sheds 1 and 2	Building Engineer to provide necessary vertical and horizontal bracing to Shed 2 and to tighten bracing to Shed 1.	6-weeks
9	Unsupported masonry walls to Sheds 1 and 2	Building Engineer to review lateral stability of masonry walls and to prepare a schedule of remedial / strengthening works, as required.	6-weeks
10	Unsupported masonry walls to Sheds 1 and 2	Building Engineer to implement any actions / supervise any remedial works as identified following the review.	6-months
11	Concerns over stability of air vent support beams to roof of Shed 1	Building Engineer to carry out review of connection between air vent support beams and the rafters to which they are connected, and to prepare a schedule of remedial / strengthening works, as required.	6-weeks
12	Concerns over stability of air vent support beams to roof of Shed 1	Building Engineer to implement any actions / supervise any remedial works as identified following the review.	6-months
13	Lightweight, non-engineered structures / roof structures to Sheds 3, 4, 5 and 6	Building Engineer to review the design of all lightweight, non-engineered structures / roof structures within the compound, and confirm their ability to withstand wind loading pressure, suctions and uplift forces, with special emphasis on connections and bracing.	6-weeks
14	Lightweight, non-engineered structures / roof structures to Sheds 3, 4, 5 and 6	Building Engineer to implement any actions / supervise any remedial works as identified following the review.	6-months

Item No.	Observation	Recommended Action Plan	Recommended Timeline
15	Non-engineered stair to Shed 2	Building Engineer to review the design of the external steel stair to Shed 2, with special emphasis on connections and bracing, and prepare a schedule of remedial works as required.	6-weeks
16	Non-engineered stair to Shed 2	Building Engineer to implement any actions / supervise any remedial works as identified following the review	6-months
17	Water ingress from leaking services into Shed 1	Building Engineer to identify the cause of leaking and carry out any necessary remedial works.	6-weeks
18	Water ingress from leaking services into Shed 1	Building Engineer to review affected steelwork and prepare a schedule of remedial works as required.	6-weeks
19	Water ingress from leaking services into Shed 1	Building Engineer to implement any actions / supervise any remedial works as identified following the review.	6-months
20	Missing Original Documentation and inaccuracies in documentation provided	Building engineer to check, collect information and produce accurate and fully complete as-built documentation.	6-months