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(24.264389, 90.401611)

7th May 2014

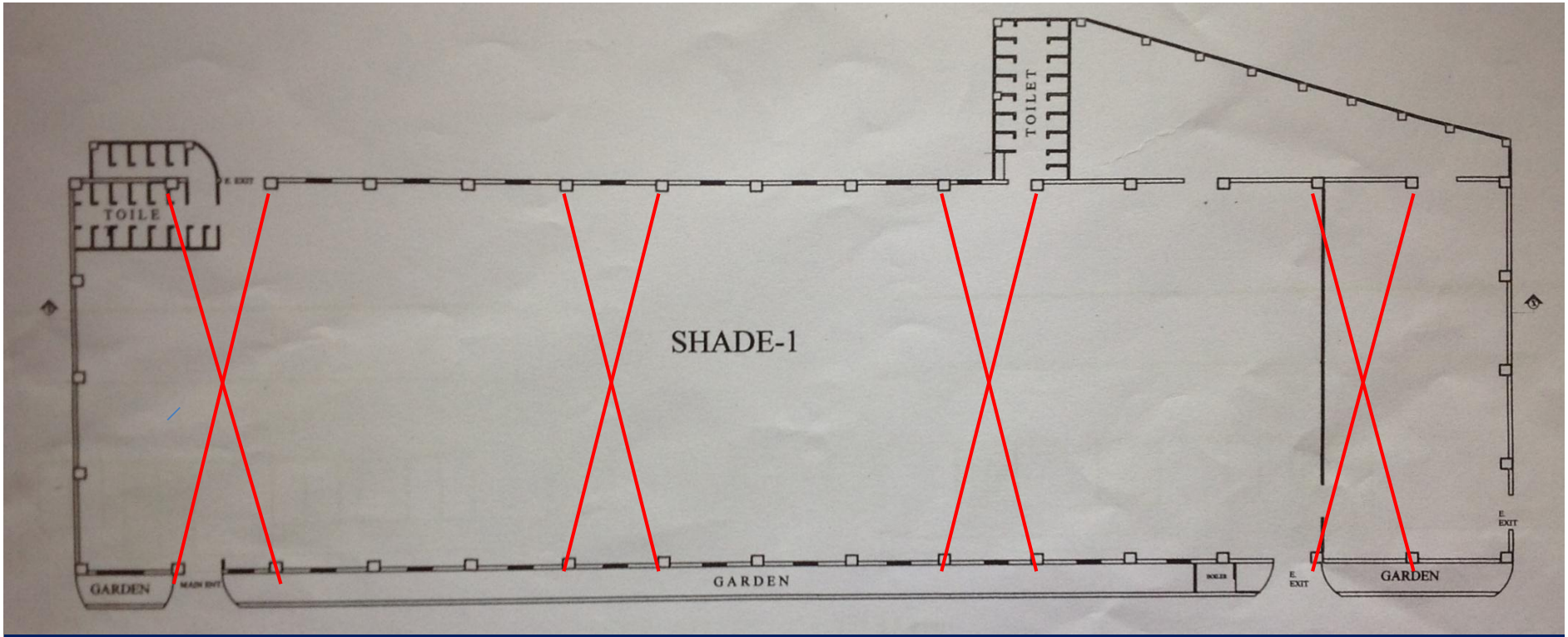
ACCORD on Fire and Building Safety in Bangladesh

ARUP

Observations

Lateral stability system unclear in Main Production Building

The lateral stability system to the Main Production structural steel shed is unclear – vertical bracing and eaves beams have not been provided. Note that provision for lateral stability is not shown in the as-built drawings. Building Engineer to carry out a lateral stability analysis of the shed and specify the necessary remedial works. Furthermore, Building Engineer to review the design of the cantilevered columns to ensure they can adequately resist the horizontal loads imposed by the portal frame.



Main Production & Office Building

Extent of Horizontal Bracing

Lateral Stability System of Main Building

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Vertical bracing system missing to Main Building

Bracing connection detail for horizontal bracing is provided to stanchion but not used. Eaves beam missing.

Only Horizontal Bracing provided to Main Building

Lateral Stability System of Main Building

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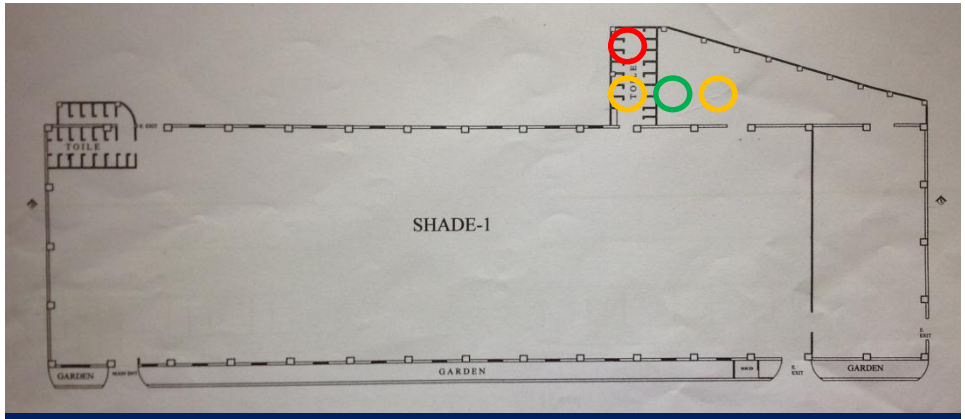
Eaves beams missing to Main Production Building

Pin connection between portal frame and cantilevering RC columns – The horizontal force transferred into the top of the columns will need to be transferred into the foundation through cantilever action

Lateral Stability System of Main Building

Heavy Loading due to Water Tanks

An area of high loading was observed above the toilet area to the South of the main Production / Office building where there are four plastic water tanks located at Roof level. There is one 5000L capacity tank on a 160mm plinth, two 2000L capacity tanks on 900mm plinths, and one 2000L capacity tank that is damaged and appears to be out of use. Building Engineer to check that the roof structure has been adequately designed to accommodate this loading.



Main Production / Office Building Layout Plan

5000L water tank on 160mm plinth at Roof level

2000L water tanks on 900mm plinths at Roof level

Damaged 2000L water tank on damaged plinth at Roof Level

Water Tanks to Roof

Heavy Loading due to Water Tanks

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Check adequacy of existing splice connections to rafters in Main Production Building

There appears to be inadequate bearing of the endplates in a number of splice connections to the rafters in the Main Production / Office Building. Building Engineer to review connections, and direct remedial works to the structure as required.

Splice Detail to Rafters in the Main Production / Office Building

Steel Connection Details

Lightweight Roof Structures to Ancillary Buildings

The factory compound comprises a number of ancillary buildings with lightweight roof structures, namely Storage Sheds 1 & 2, the Dining Area and the Leftover Storage Shed. These roof structures, which are typically supported on concrete piers, do not appear to be engineered. Building Engineer to review the design of these structures, with special emphasis on connections and bracing, and to implement any upgrade works as required.

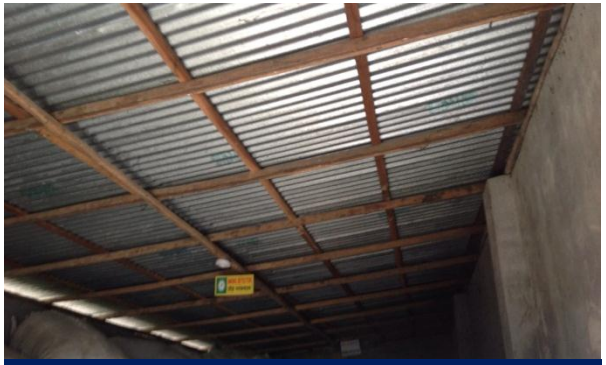
Storage Shed 1

Storage Shed 1

Storage Shed 2

Dining Shed

Connection detail to Dining Shed



Leftover Storage Shed

Lightweight Roof Structures

Priority Actions

Problems Observed

ITEM 1: Lateral stability system unclear in Main Production Building (Shed 1)
ITEM 2: Heavy loading due to water tanks
ITEM 3: Check adequacy of existing splice connections to rafters in Main Production Building
ITEM 4: Lightweight Roof Structures to Ancillary Buildings

Item 1 and actions

Lateral stability system unclear in Main Production Building (Shed 1)

Priority 1 (Immediate - Now)	None required.
Priority 2 (within 6-weeks)	Building Engineer to review the design of the portal frame with regard to lateral stability. The Building Engineer should provide guidance on the requirement or otherwise for vertical bracing and eaves beams in the external wall to enable the horizontal wind loads to be transferred down to foundation level. Furthermore the Building Engineer is to review the design of the cantilevered concrete columns to ensure that they are adequate to resist the horizontal loads imposed by the steel portal frame.
Priority 3 (within 6-months)	Carry out any remedial works as determined by the Building Engineer

Item 2 and actions

Heavy loading due to water tanks

Priority 1 (Immediate - Now)	None required.
Priority 2 (within 6-weeks)	Building Engineer to be appointed to review the design of the roof slab over the male toilets to ensure that the structure as-built is adequate to carry the applied loads. Carry out strengthening works if required.
Priority 3 (within 6-months)	None required.

Item 3 and actions

Check adequacy of existing splice connections to rafters in Main Production Building

Priority 1 (Immediate - Now)	None required.
Priority 2 (within 6-weeks)	Building Engineer to check the design and capacity of the splice connection details and make any necessary alterations.
Priority 3 (within 6-months)	None required.

Item 4 and actions

Lightweight roof structures to ancillary buildings

Priority 1 (Immediate - Now)	None required.
Priority 2 (within 6-weeks)	None required.
Priority 3 (within 6-months)	Additional structures to be design checked to ensure adequacy for code vertical and wind loads by the Building Engineer. Undertake strengthening if required. Building Engineer to produce appropriate documentation and as built drawings.