KM Nobely Garments Ltd.

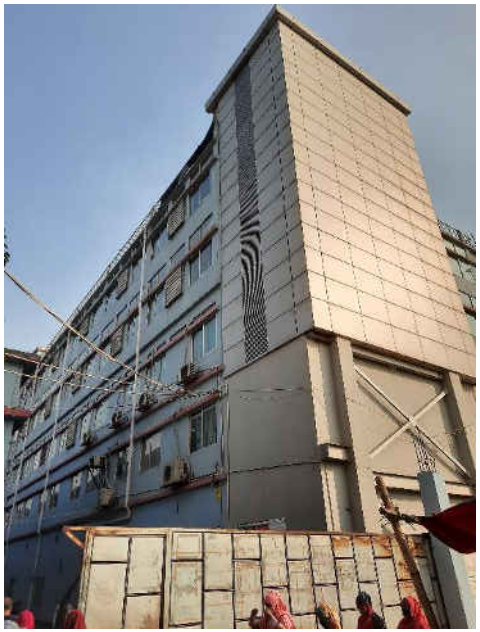
Category Green

Zorun, Konabari Gazipur-1702.
(24.000190N, 90.323820E)
21st December 2020

Structural Inspection Report

Observations & Actions

Authors: Md. Kamruzzaman Mahfuz & U.S.M. Dilruba Mahmud
Reviewed By : Maruf Zindanee
Approved By : Mohammed Shafiq Uddin



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Executive Summary

On 21st December 2020 Kamruzzaman Mahfuz & U.S.M. Dilruba Mahmud of **RMG Sustainability council (RSC)** carried out a visual structural survey of the **KM Nobely Garments Ltd.** at the address and coordinates are given on the cover page of this report.

We met with factory management Md. Fayshal Ahmed (Manager- Admin, HR & Compliance), Md. Fakhrul Alam (Manager- Admin), Md. Shamiul Alom (Assistant Civil Engineer) and many more.

KM Nobely Garments Ltd. is comprised of three structures including Production Building, Production Shed and Utility Building. There are an ETP and temporary wastage shed which are not included in the scope of this report. The whole premises are owned by **KM Nobely Garments Ltd.** We were allowed to survey all the areas of the mentioned structures.

Production Building: The structure is a five storied (G+4) building. Top two floors are steel frame structure and bottom three floors are reinforced concrete frame structure. The building is being used for light garments manufacturing including Finishing, Folding, Iron & Quality Section, Dining, Finished Goods Area, Packing, Office Room & Conference Room, Washing Section & Medical Room. There are three - 1000 liters and a 2000 liters plastic water tanks on the roof top.

The structure was constructed in three phases. Phase-1 : Ground & 1st floor, between January 2005 and December 2006. Phase-2 : Only 2nd floor, between December 2015 and November 2016. Phase-3 : 3rd & 4th floor, between May 2017 and August 2018.

The factory occupied the building since September 2013. Strengthening works on both RC and steel structural members have been carried out by the factory engineer between November 2020 and December 2020. Steel columns at 3rd and 4th floors are encased with reinforced concrete for fire protection. So that we were unable to verify member size, thickness & connection on site.

Executive Summary (Continued)

Production Shed: The structure is a two storied (G+1) prefabricated steel structure with two RC staircases. Ground floor is being used as Bonded Warehouse, Accessories Store, Cutting & Sample Sections. First floor is being used as Sewing, Quality & Cutting Sections. There are two RC over head water tanks above the staircases. The structure was constructed between January 2014 and December 2015. Factory occupied the shed since March 2016. Later, the factory management retrofitted the structure between November 2020 and December 2020 with the supervision of "Z2 Consultancy Solutions".

Utility Building: The structure is a single storied reinforced concrete building which is being used as Generator, Boiler and Compressor Rooms. The structure was constructed between January 2016 and December 2016. Factory occupied the structure since January 2017.

We were provided with a copy of the permit drawing for all the structures from LGED, Gazipur Sadar dated 20th June 2011 and industrial layout permit drawings from Department of Inspection for Factories and Establishments (DIFE), dated 27th March 2018.

The following Documents were available on site for review:

- As-built architectural & Structural drawings for all structures prepared by "Z2 Consultancy Solutions" dated December 2020.
- Load plan considering 4.8 kPa live load for typical floors and 1.5 kPa live load for roof floor for 'Production Building' and considering 3 kPa live load for first floor for 'Production Shed' prepared by "Z2 Consultancy Solutions" dated October 2020.
- Retrofitting drawing for Production Building & Production Shed prepared by "Z2 Consultancy Solutions" dated October 2020.

Executive Summary (Continued)

- Design report and software-based analysis file for Production Building & Production Shed prepared by “Z2 Consultancy Solutions”.
- A set of core test report of Production Building: 3 cores from Columns and 1 core from Slab.
- Concrete cylinder test report: Three sets for Production Building & two sets for Production Shed.
- Tensile strength test of MS plate: Four sets for Production Building & three sets for Production Shed.
- Two sets of Rebar Test report from Production Building & Production Shed each.
- Only one geotechnical investigation report for the whole premises dated July 2013 prepared by “M/S Akanta Enterprise” recommends isolated footing or pile foundation based on ten bore holes. Ground bearing capacity considered 1.5 tsf (143.65 kPa) (FS 3) at a depth of 2.6 meters.

We have checked the column capacity considering prepared live load plan on typical floors and concrete strength from core test report.

A level of non-exhaustive list of key concerns are:

Item 1: Design report not fully comply as per BNBC. (Production Building)
Item 2: Apparently inadequate connection of steel cladding. (Production Building)
Item 3: Apparently partial rigidity in the frame connection. (Production Shed)
Item 4: Inconsistency in the drawings. (Production Building & Shed).

We see no reason to suspend operations in the Building due to structural concerns (subject to the required immediate actions noted in this report).

Executive Summary (Continued)

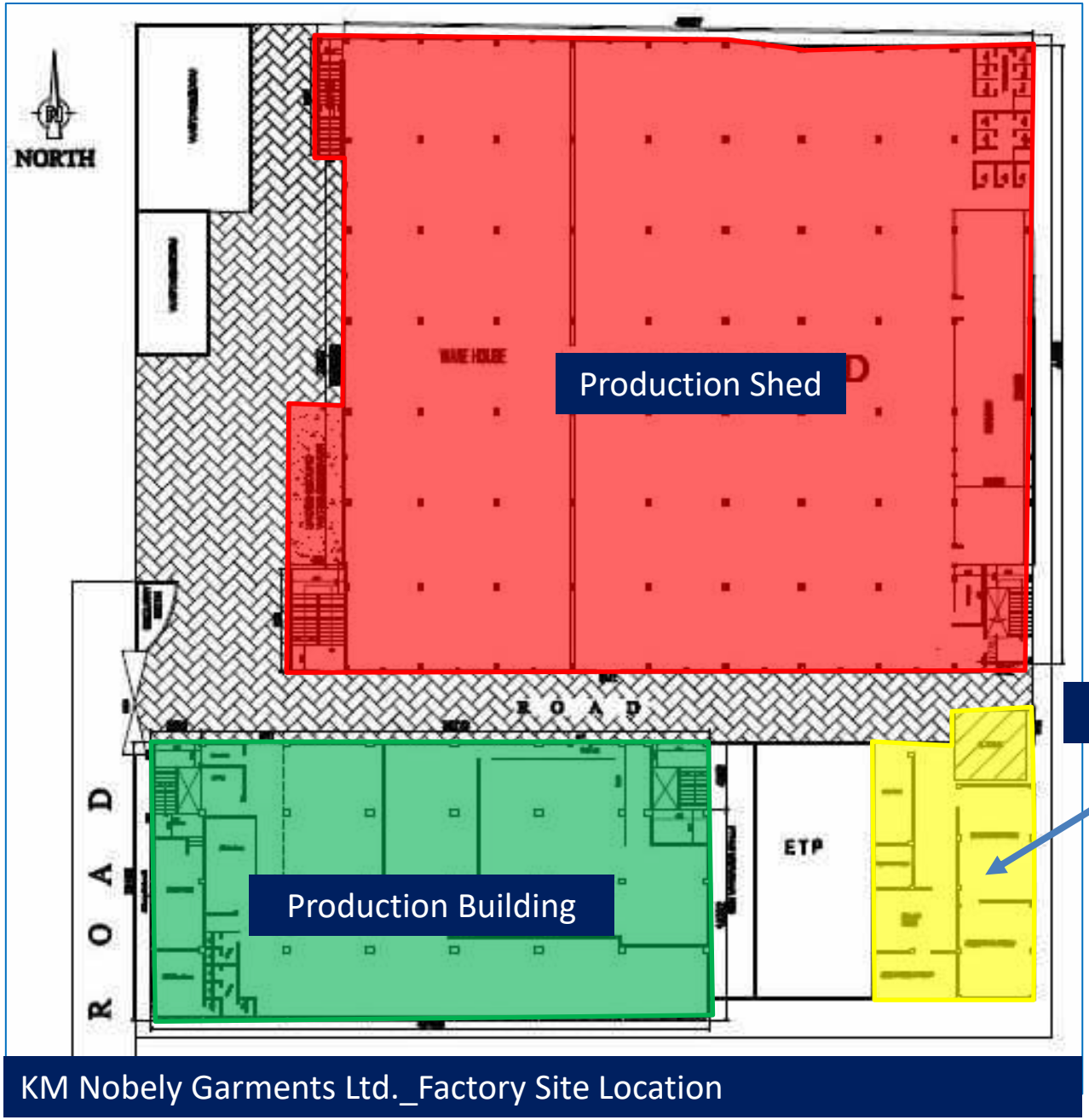
Further actions with associated priorities and timeframes are given at the end of this report. Please note that these actions should be completed as soon as practically possible and certainly within the time frame noted.

We have reviewed the property from an outline seismic perspective and would consider that the building, along with many others in the Dhaka region, to be at significant risk of damage in a major Seismic event.

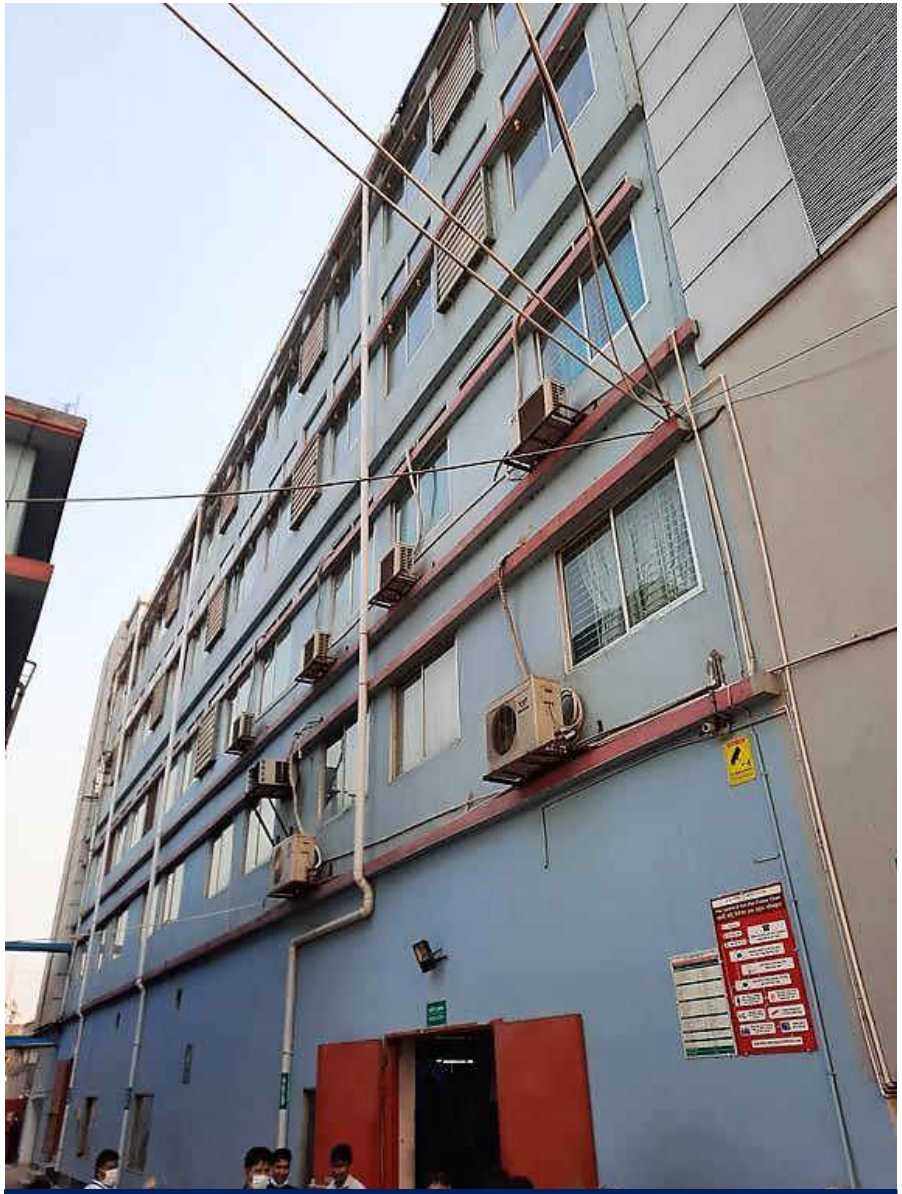
Our Limitations and Assumptions are also noted at the end of this report.

Building Extents

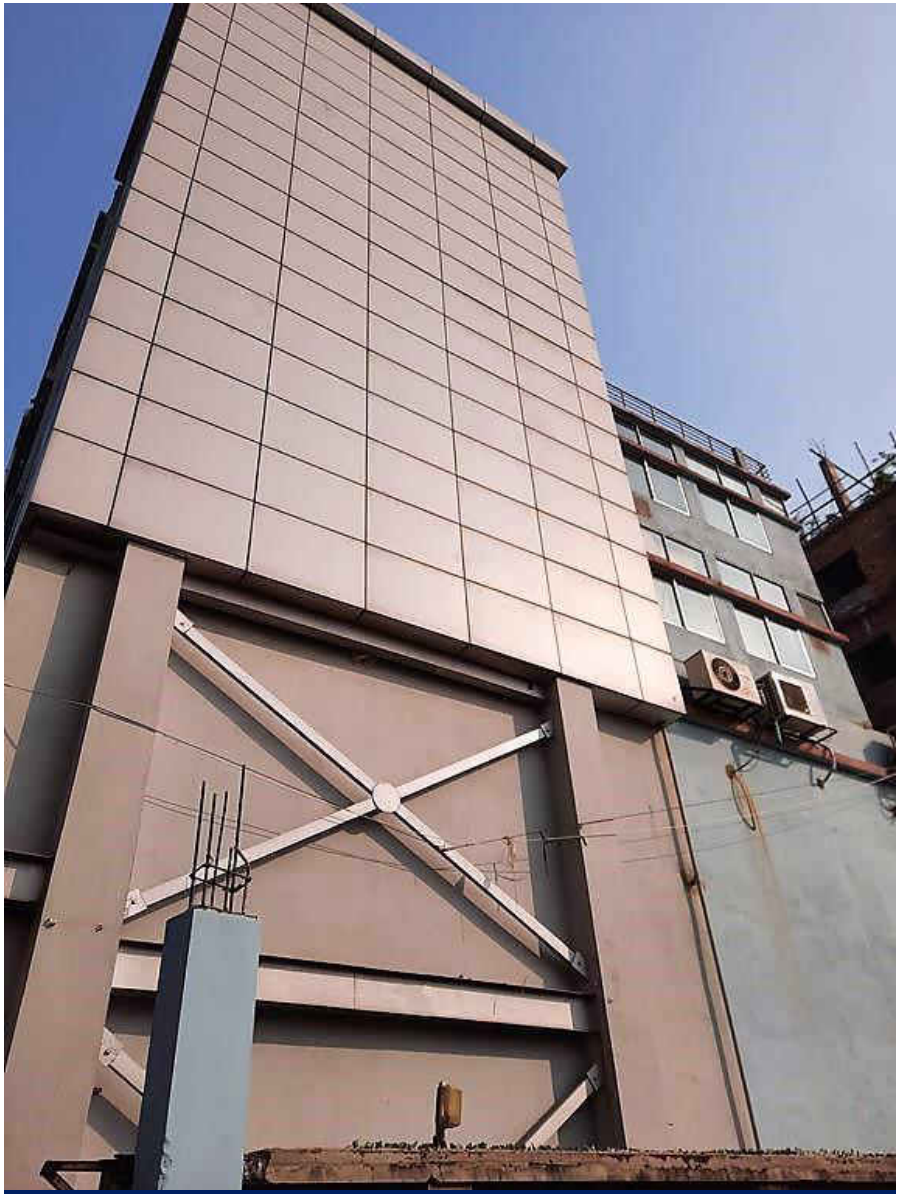
Building Extents



Building Extents: Master layout plan



North Elevation



West Elevation

Building Extents: Production Building

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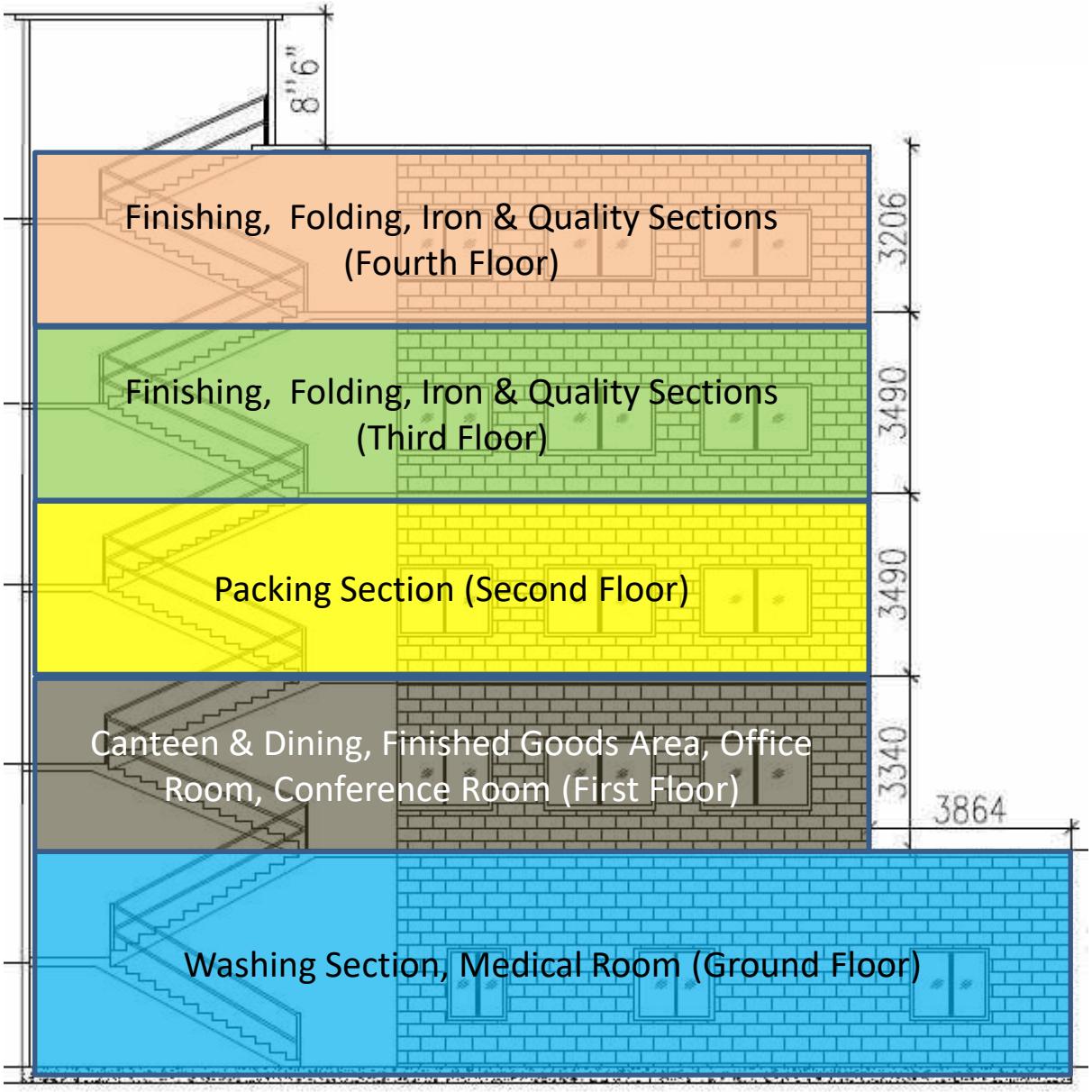
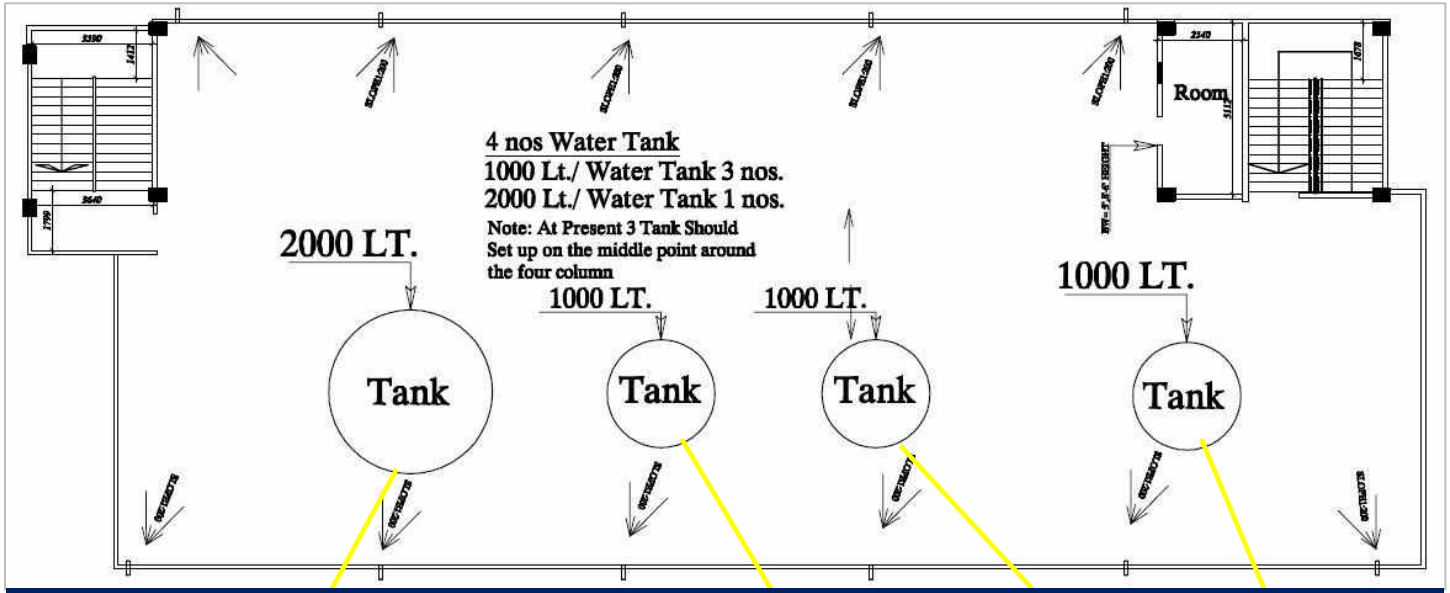


Floor Usages

Building Extents: Production Building



Roof layout

Plastic water tanks on roof top

Observations: Production Building

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Arial View & South Elevation

West Elevation

Building Extents: Production Shed

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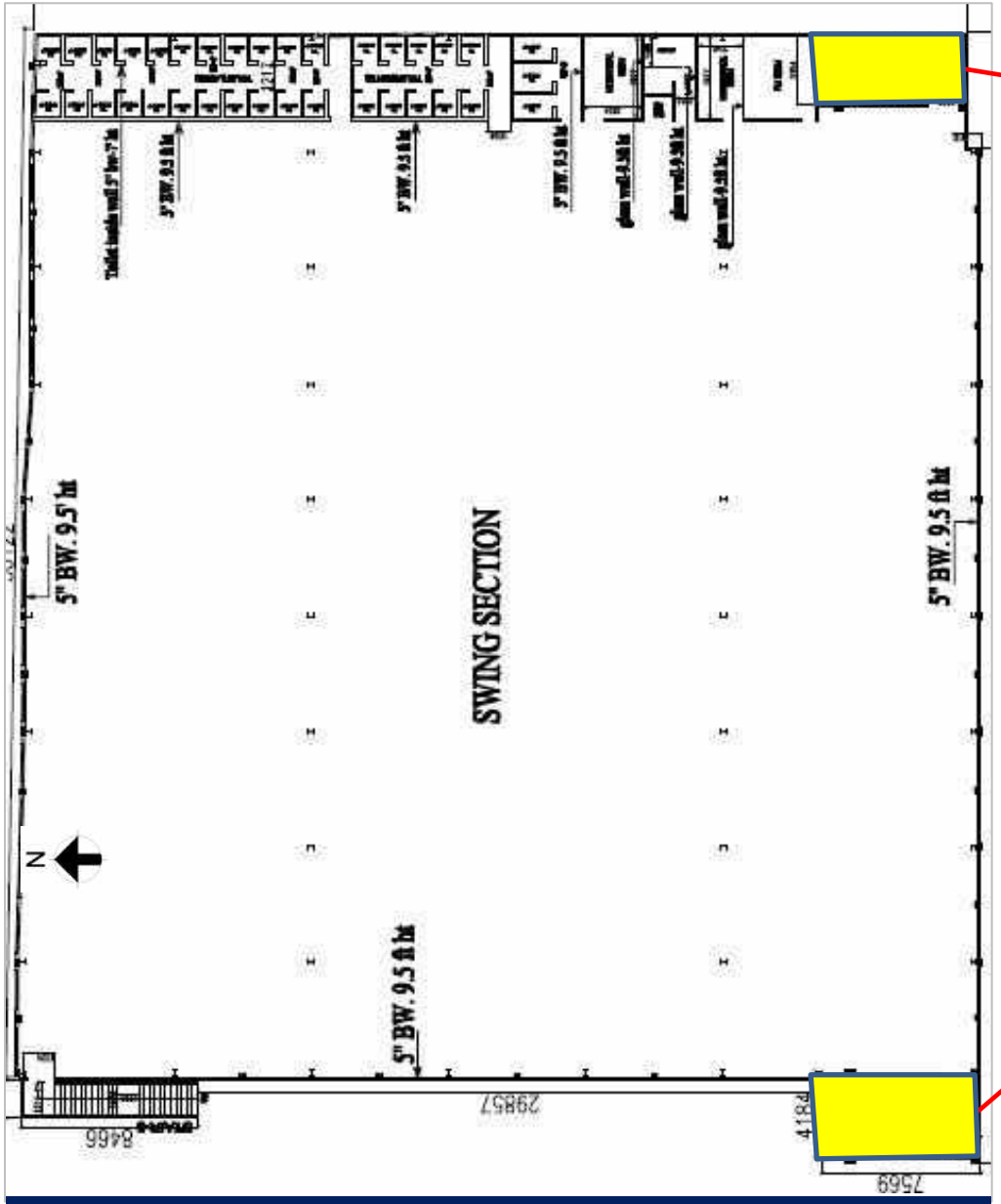
Floor Usages

Building Extents: Production Shed



Over Head Water Tanks on Stair top

OHWT on East Stair

OHWT on West Stair

Observations: Production Shed

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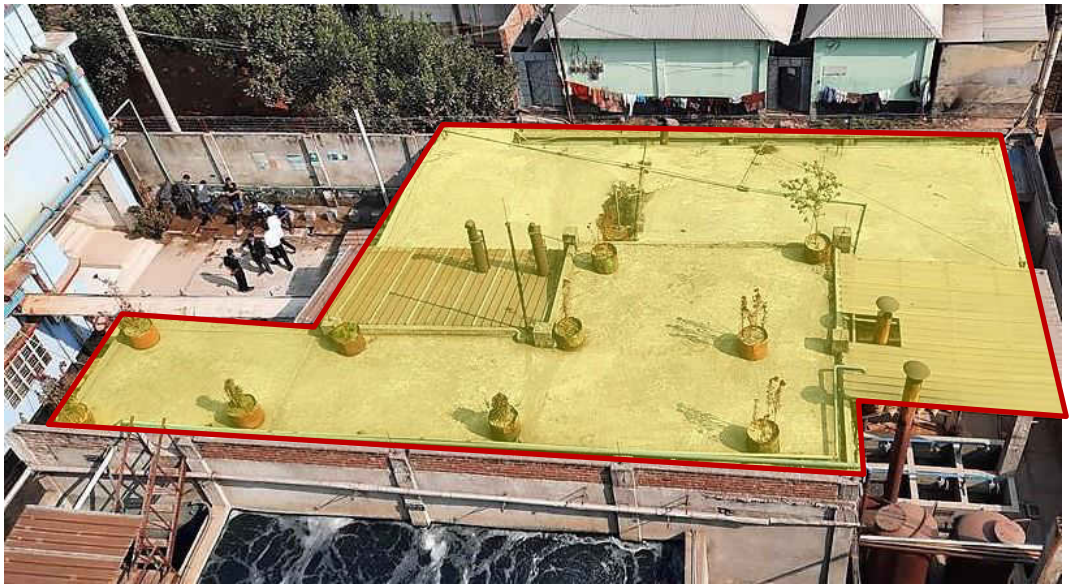
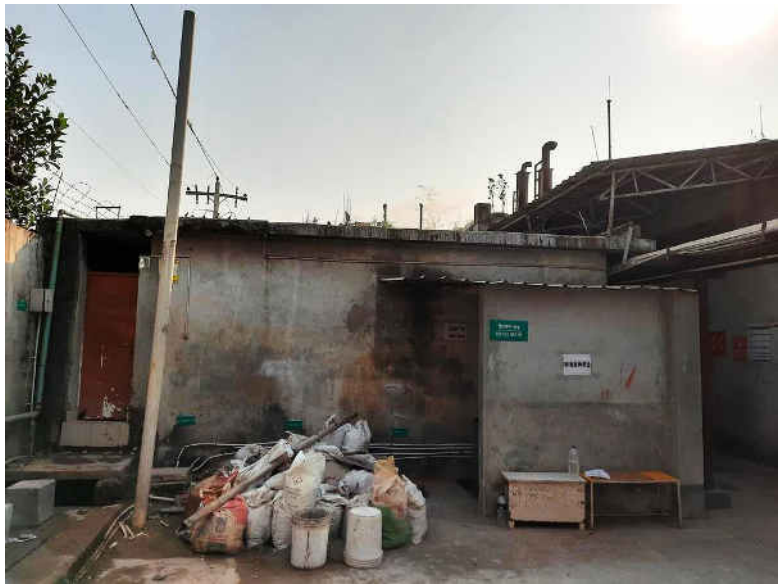
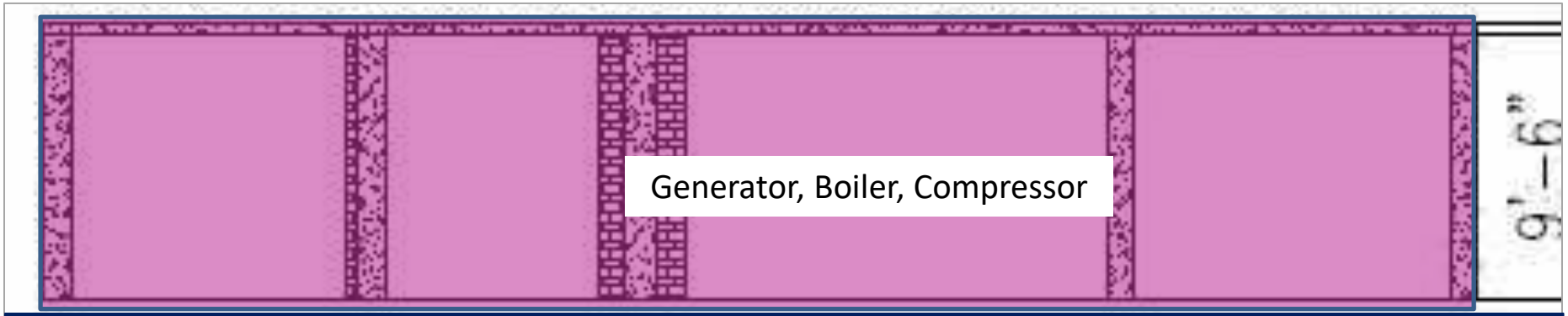


Arial View



Partial North Elevation



Floor Usages

Building Extents: Utility Building

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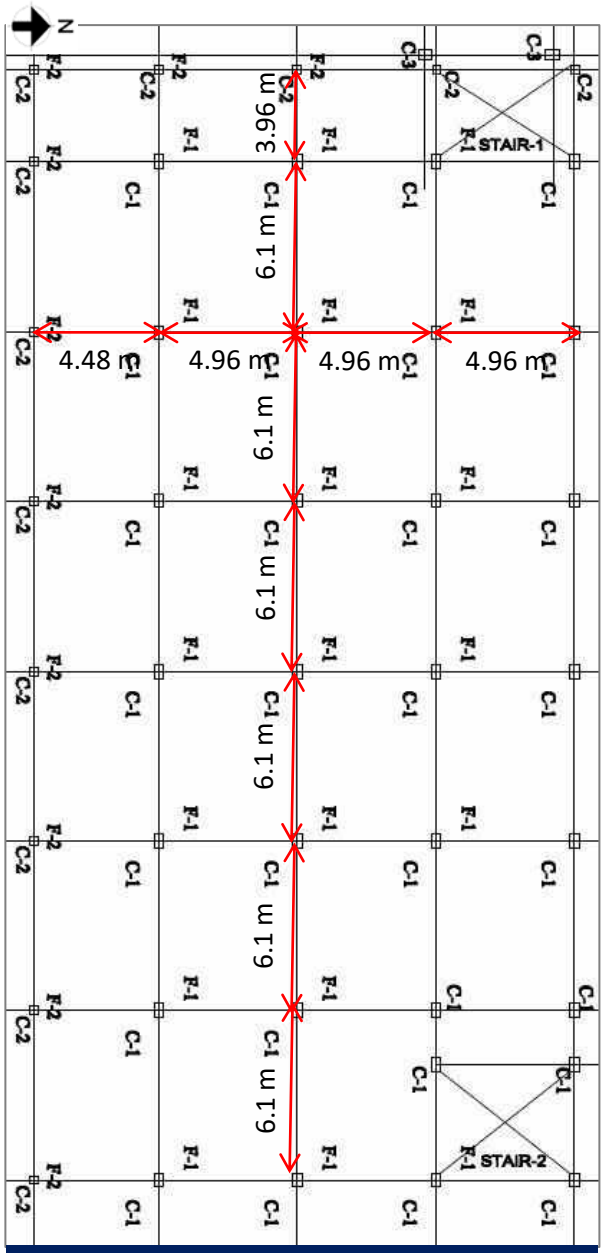
Structural System



Column Layout Plan

Structural System (Ground floor to 2nd floor):

RC beam and column framing with two-way spanning slab.

Lateral stability:

Moment resisting frame.

Column Dimension (mm):

350 X 500
300 X 300
275 X 430

Grid Spacing:

As shown in figure.

Beam Dimension (mm):

250 (w) X 380 (d/s) (Typical)

Slab Thickness:

140 mm excluding finishes

Aggregate type:

Brick chips

Floor to ceiling height:

Ground floor: 4.2 m
Typical floors: 3.35 m

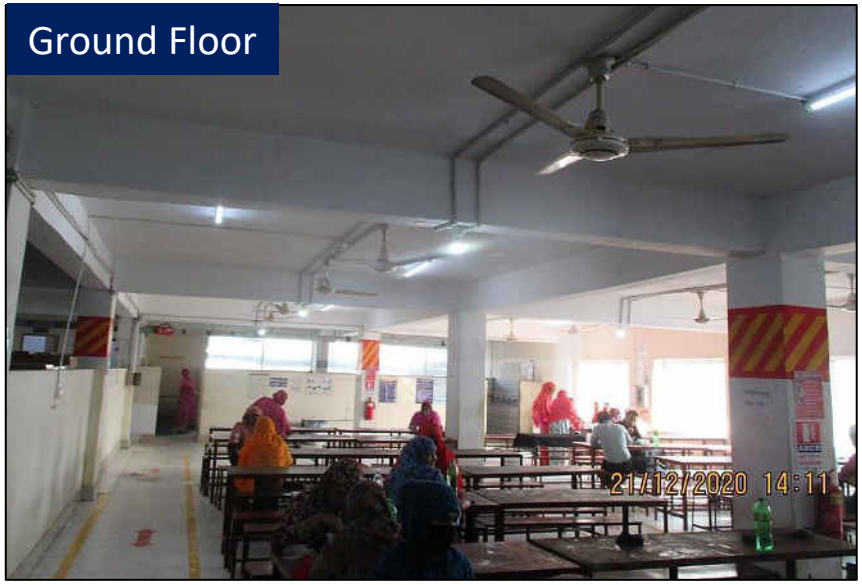
Foundation Type:

Isolated footing foundation. (as per drawing)

Structural System: Production Building (RC Part)

1st Floor

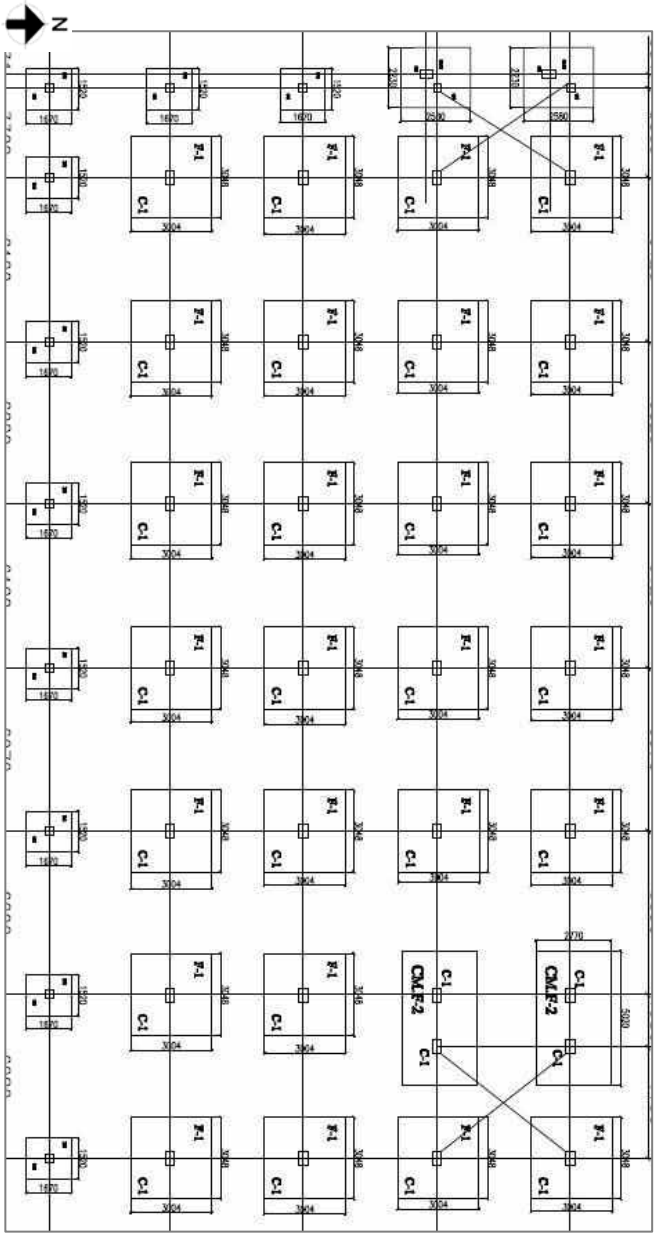
Ground Floor



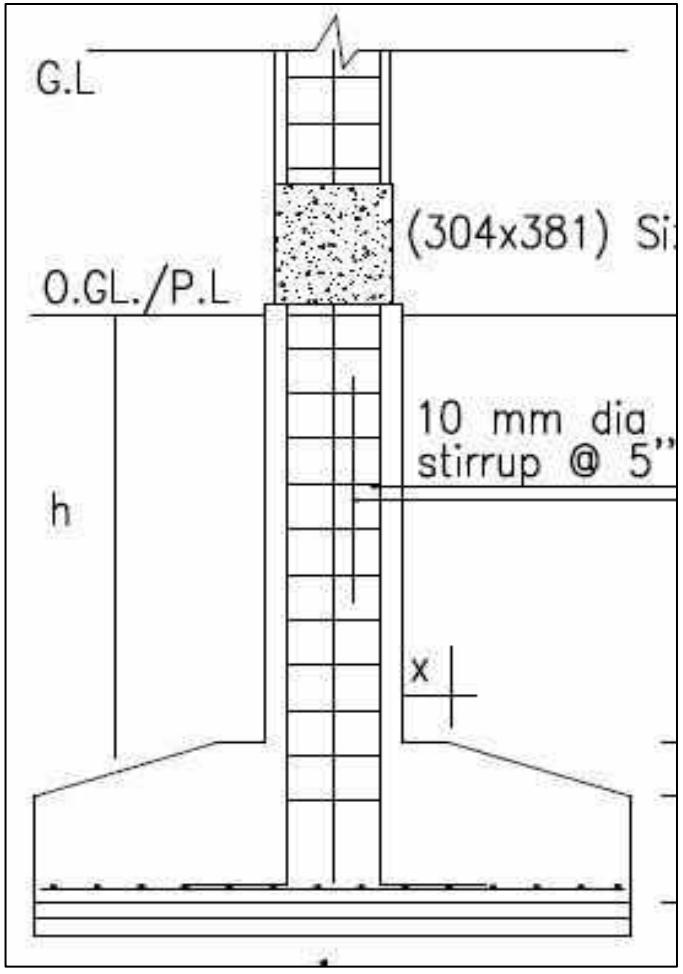
Typical beam column frame structure

Beam Column Joint

Structural System: Production Building (RC Part)

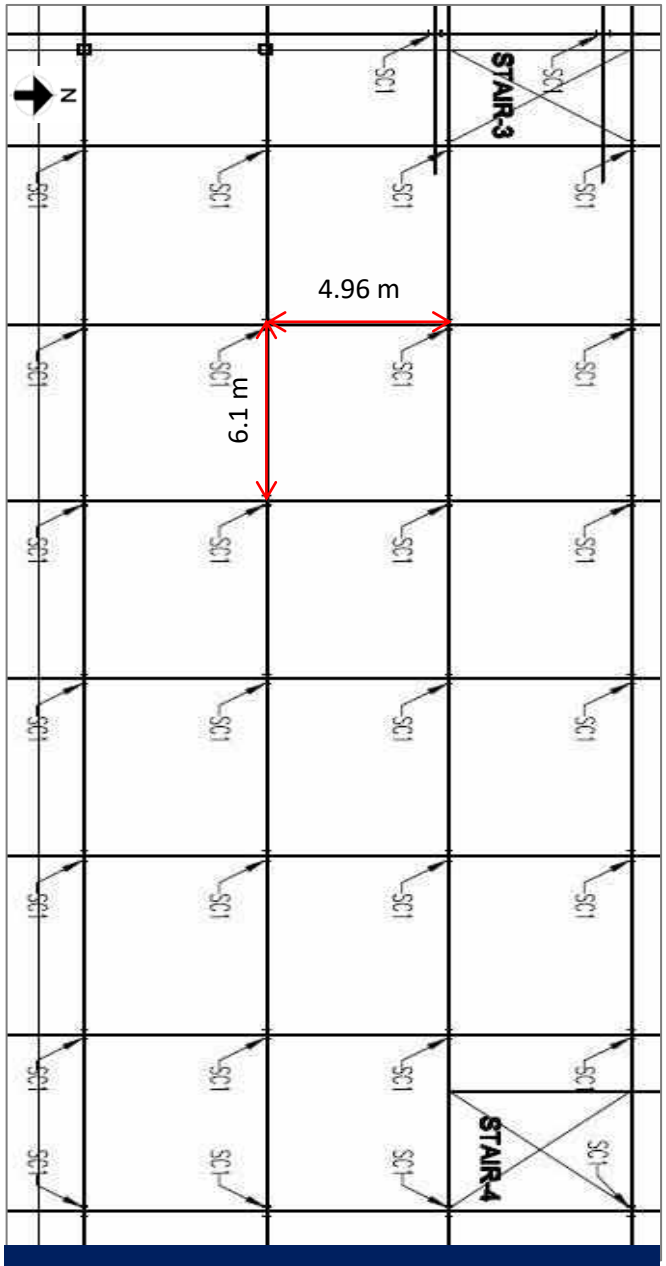


Isolated footing foundation



Section details

Structural System: Production Building (RC Part)



Steel column layout

Structural System (3rd & 4th floor):

Steel beam-column framing with composite deck slab.

Stability System:

Steel frame action and vertical bracing in short direction.

Connection type: Bolted

Grid: As shown in figure.

Column Size (mm):

W 350 (6) X F 175 (8) (As per drawing)

Beam Size: (mm)

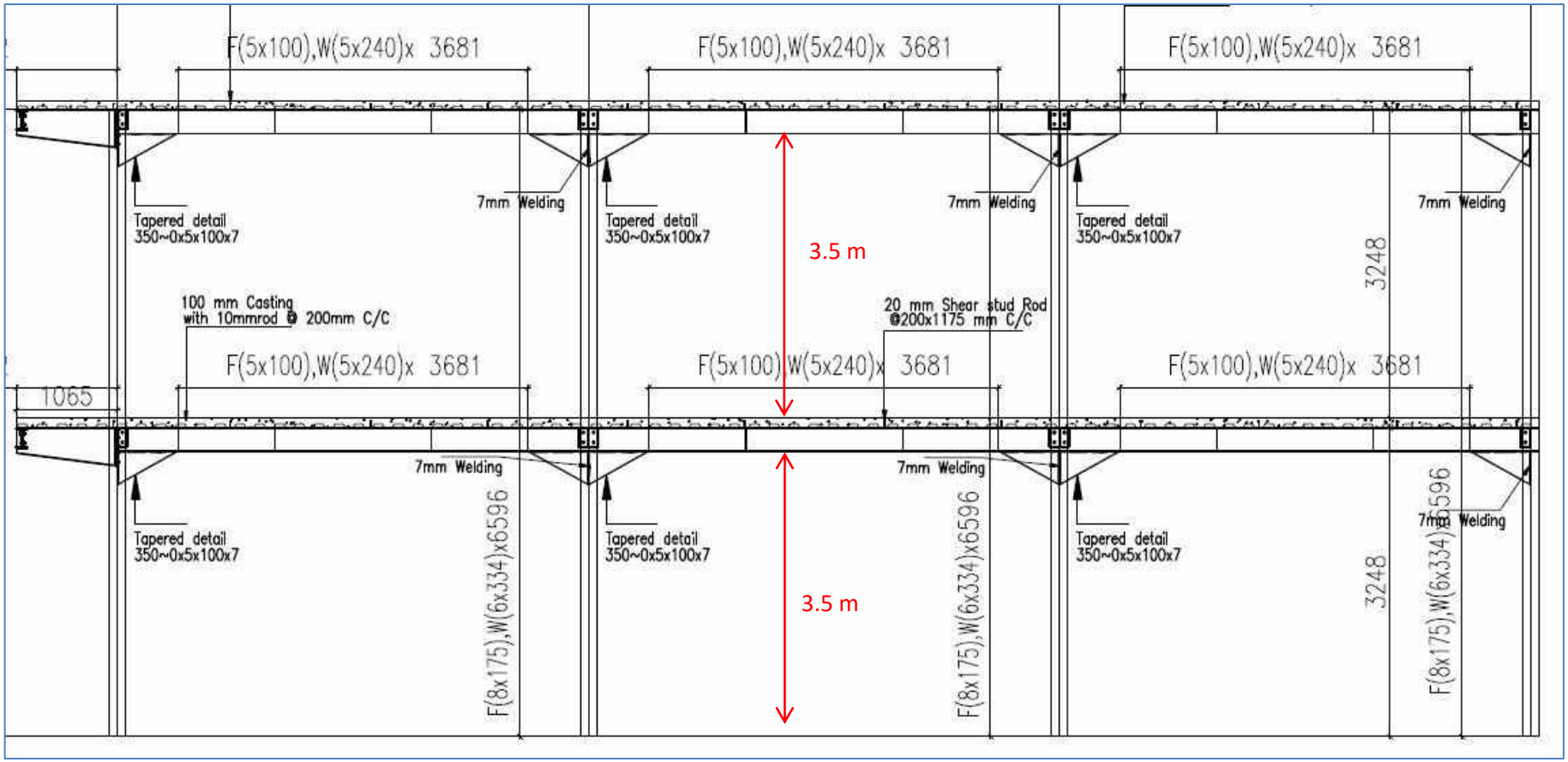
Main beam: W 600~400~600 (5) X F 150 (6)
W 600~250~600 (5) X F 100 (7)
Sub beam: W 250 (5) X F 100 (5)

Deck Slab Thickness: 100 mm

Bracing Size:

100 mm MS pipe (Thickness 5mm)

Structural System: Production Building (Steel Part)



Typical rigid frame section

Structural System: Production Building (Steel Part)

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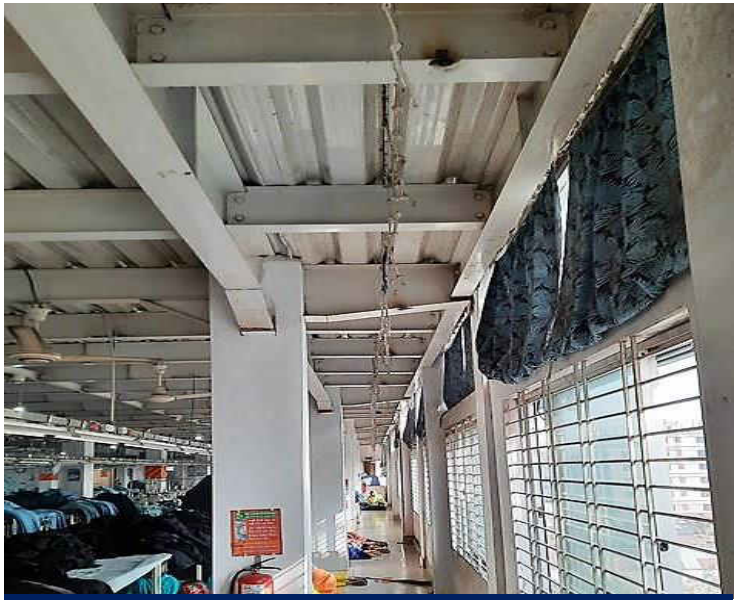
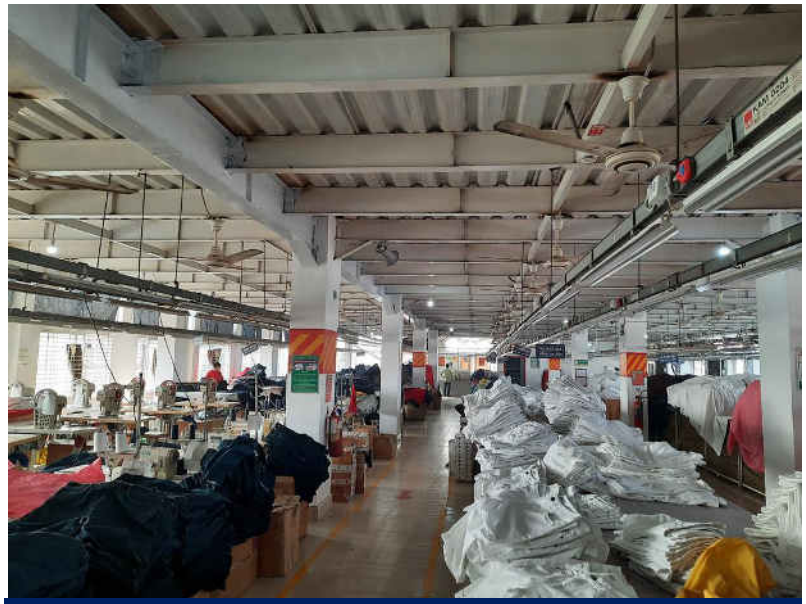
Steel Beam Column frame at 3rd floor



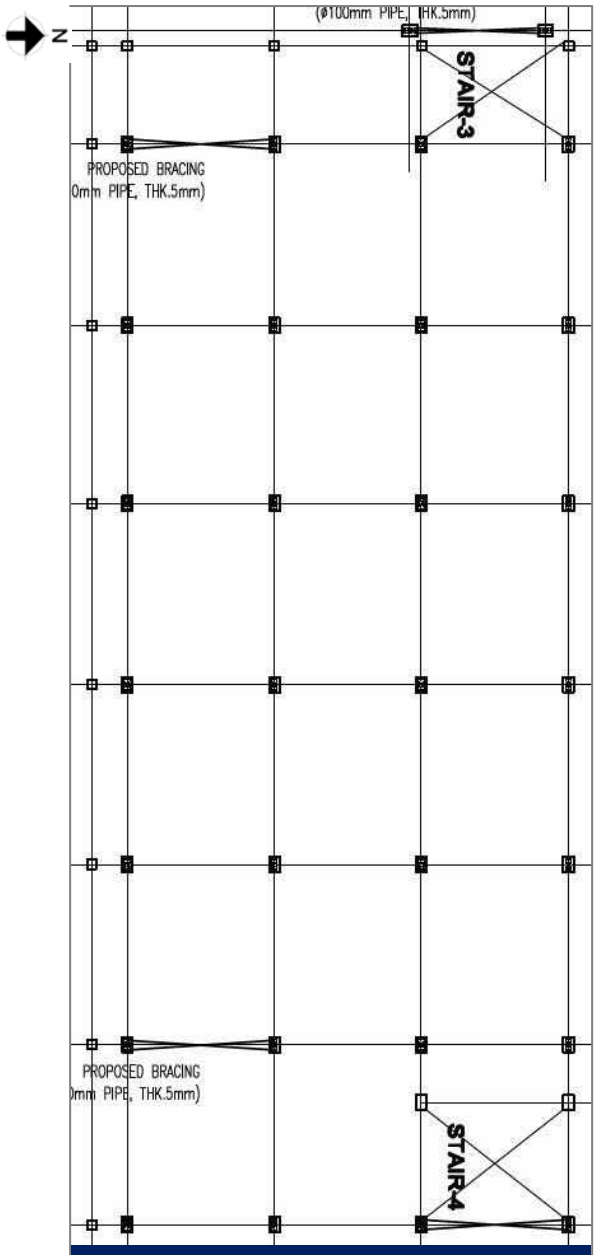
Cantilever beam



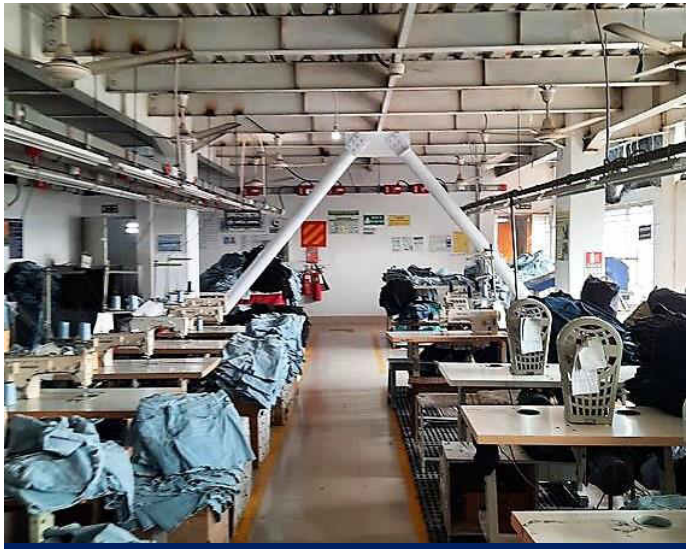
Steel Beam Column frame at 4th floor

Beam-Column Joint

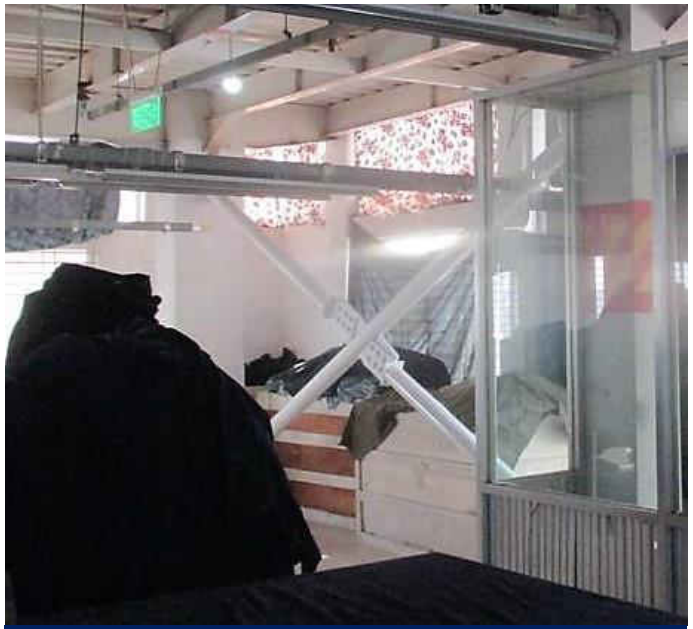
Structural System: Production Building (Steel Part)



Bracing layout plan



Inverted V Bracing at 3rd floor



Cross bracing at 4th floor

Structural System: Production Building (Steel Part)

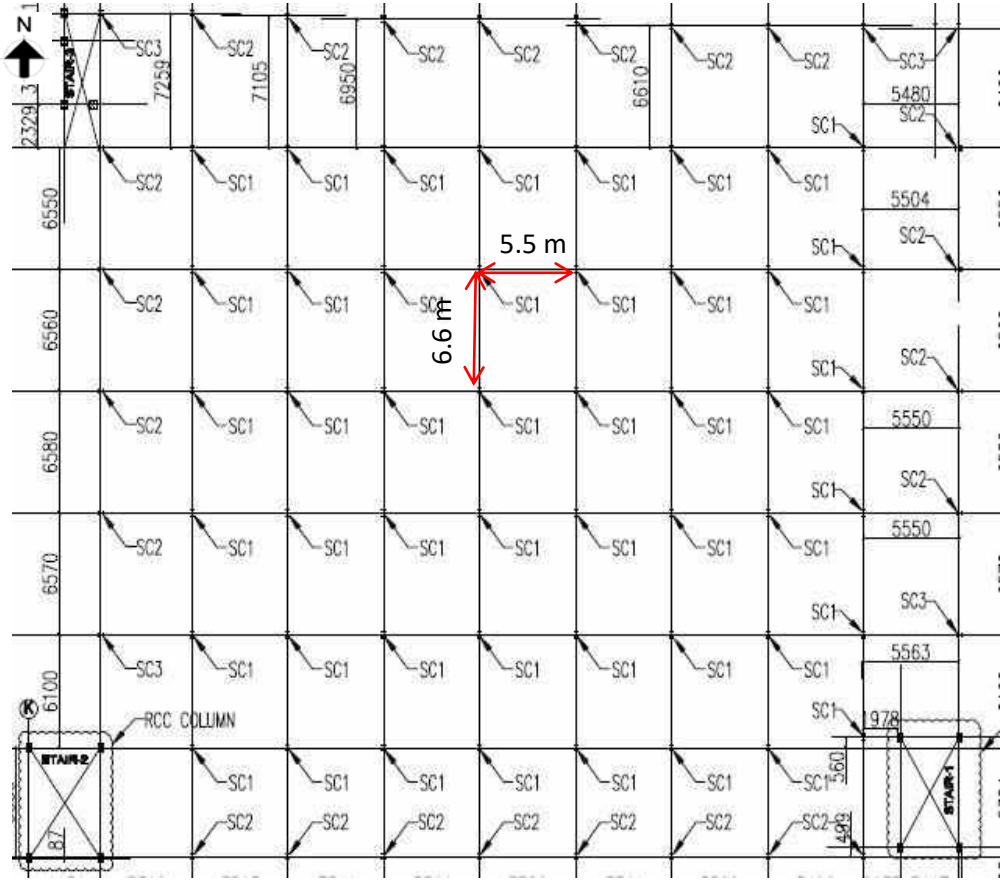
Structural System:

Prefabricated steel portal frame at 1st floor and beam column frame with deck slab at ground floor.

Stability System:

Portal frame in short direction with roof & wall bracing and compression strut in long direction (1st floor)

Steel frame action with wall bracing (Ground floor)



Steel column layout of ground floor

Connection type: Bolted

Grid: As shown in figure.

Rafter Size: (mm)

W 300~550~300 (5) X F 175 (7)

Steel Column Size (mm):

W 300 (4) X F 200 (6) (Internal)

W 300~550 (4) X F 200 (7) (Periphery)

RC Short Column Size (mm):

380 X 450; 300 X 450; 450 X 500 (Only GF)

Steel Beam Size: (mm)

Main beam: W 600~400 (5) X F 150 (6)

Secondary & Sub beam: W 250 (4) X F 125 (6)

Deck Slab Thickness: 100 mm

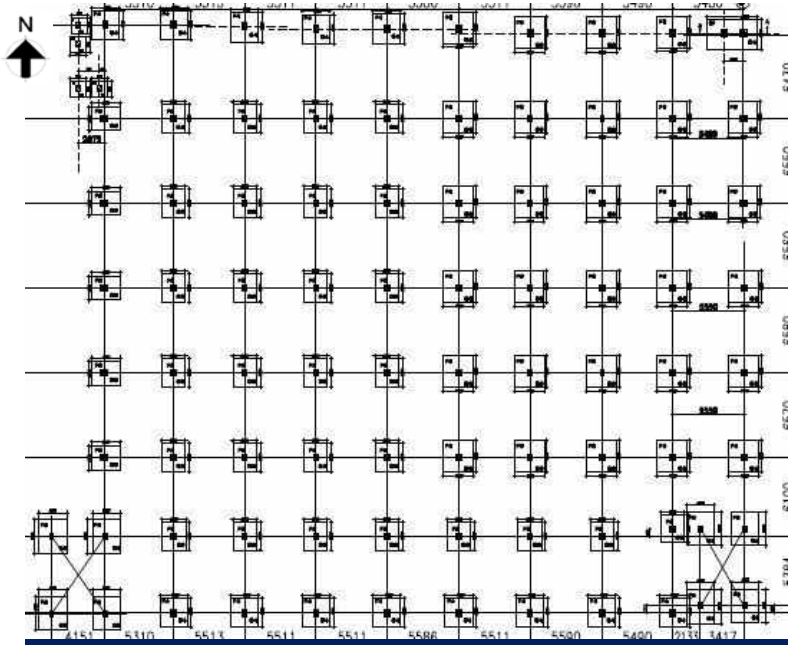
Bracing Size:

100 mm MS pipe (Vertical)

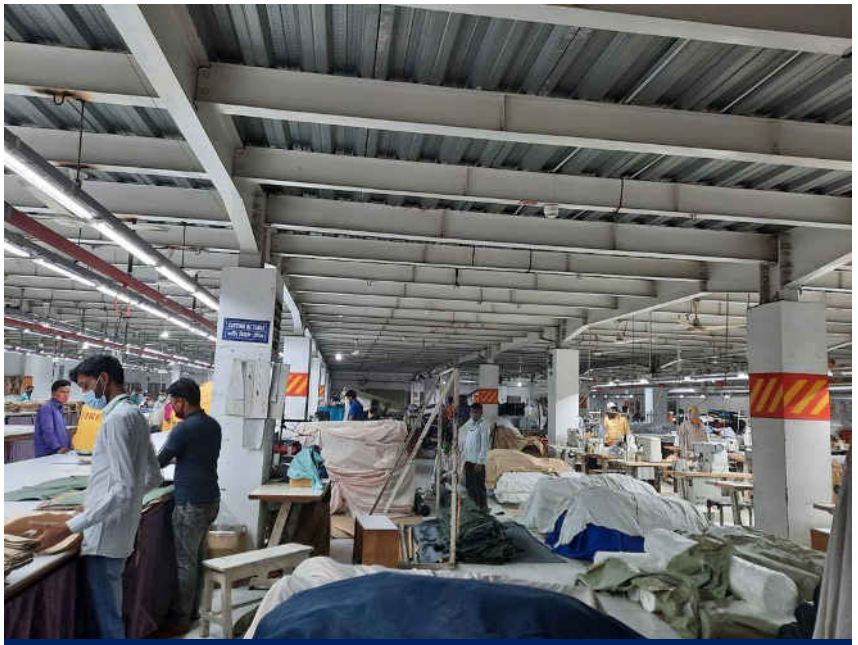
16 mm cable (Roof)

Foundation type: Isolated footing (drawing)

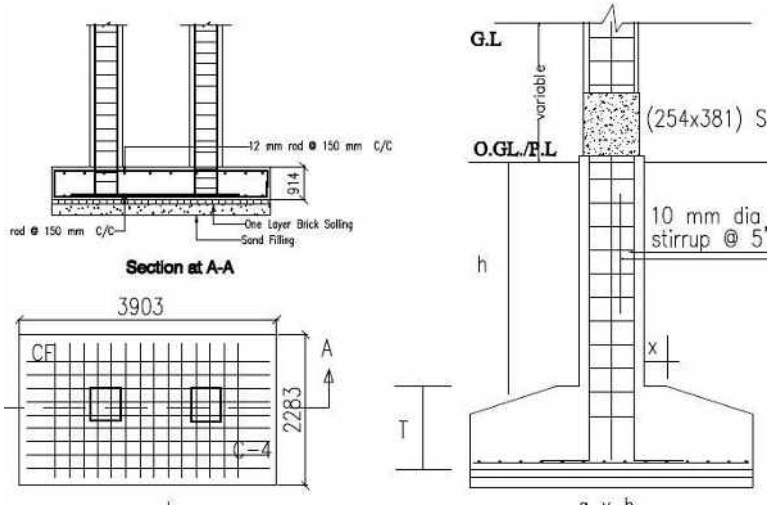
Structural System: Production Shed



Foundation layout plan



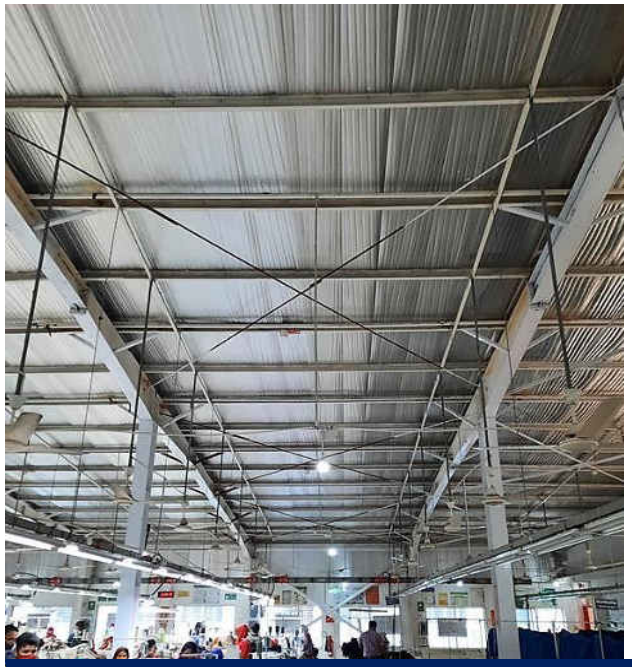
Steel Beam Column frame at GF

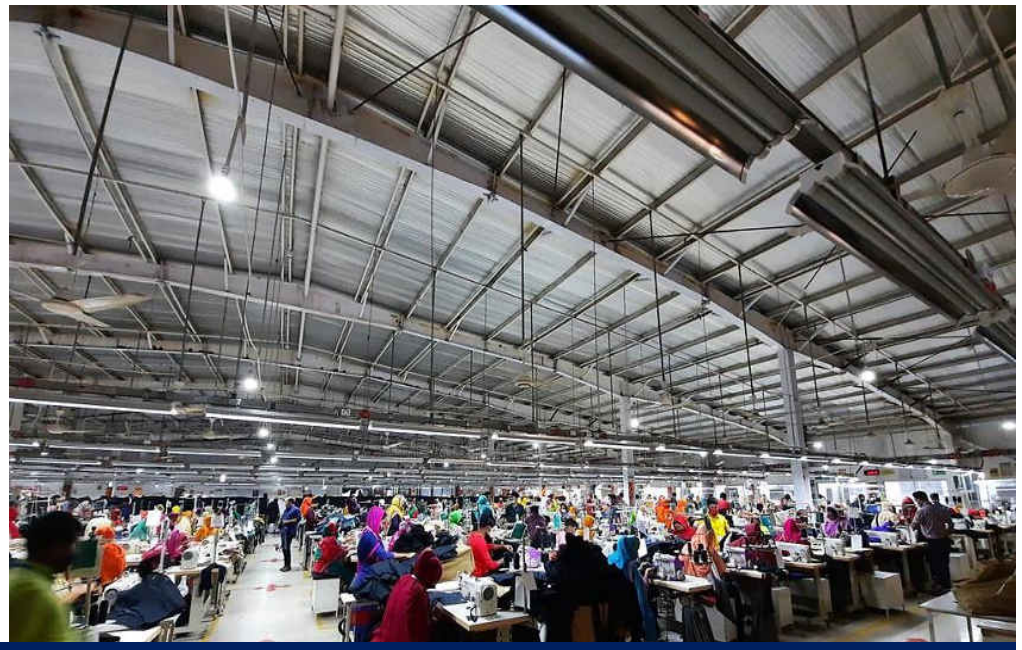


Foundation Section

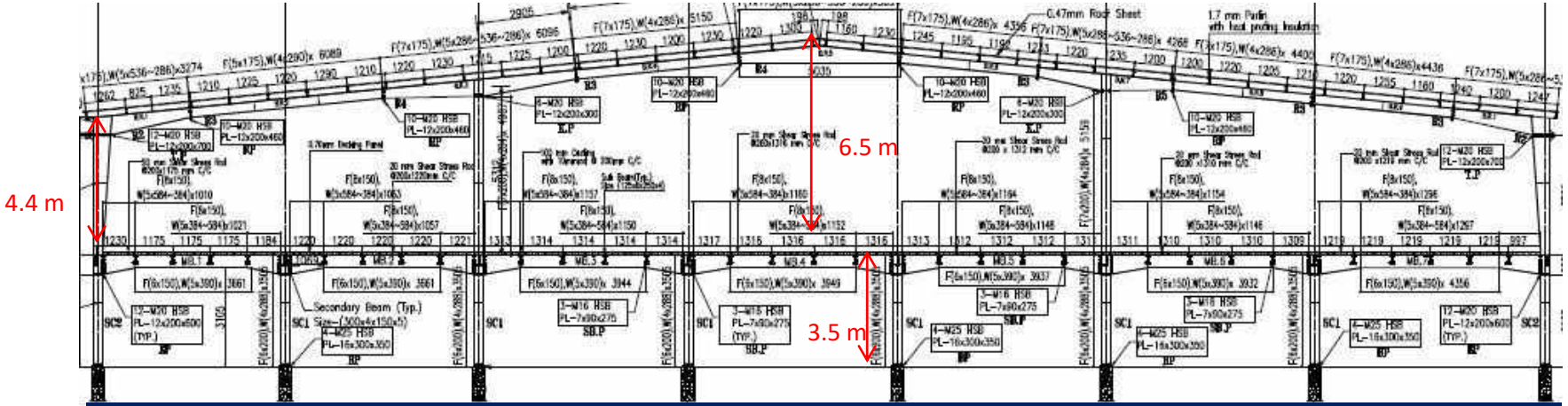
Anchor Bolt

Structural System: Production Shed





Portal frame on 1st floor



Typical rigid frame

Structural System: Production Shed

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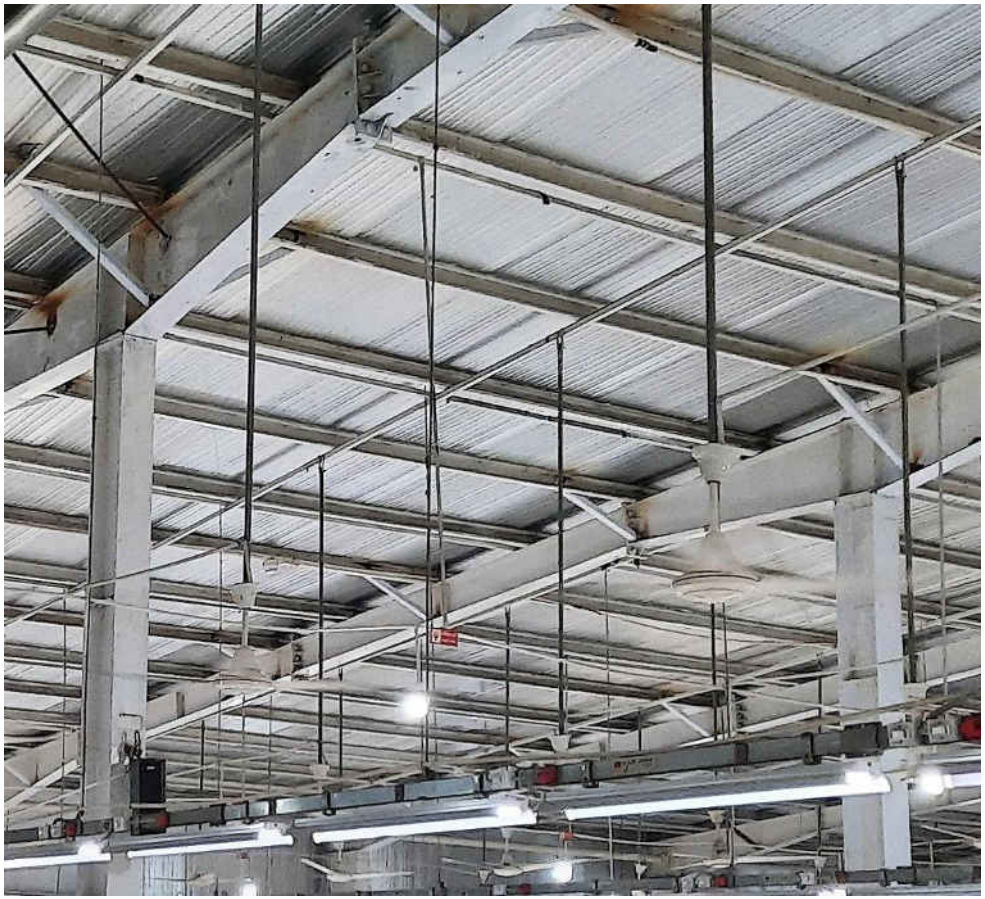
Main Beam-Sub Beam Connection

Column-Main Beam Connection

Column-Main Beam- Sub Beam Connection

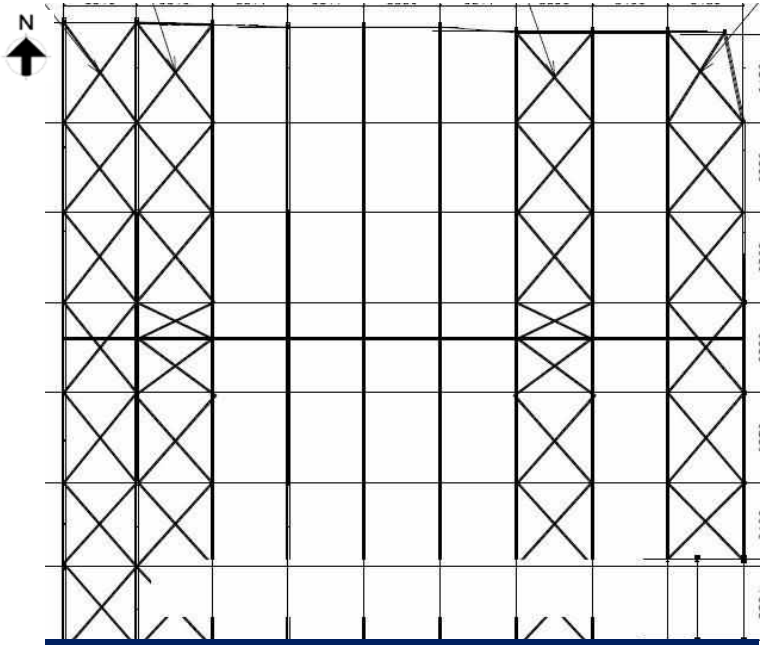
Structural System: Production Shed

Column-Rafter-Tie beam Connection at the periphery

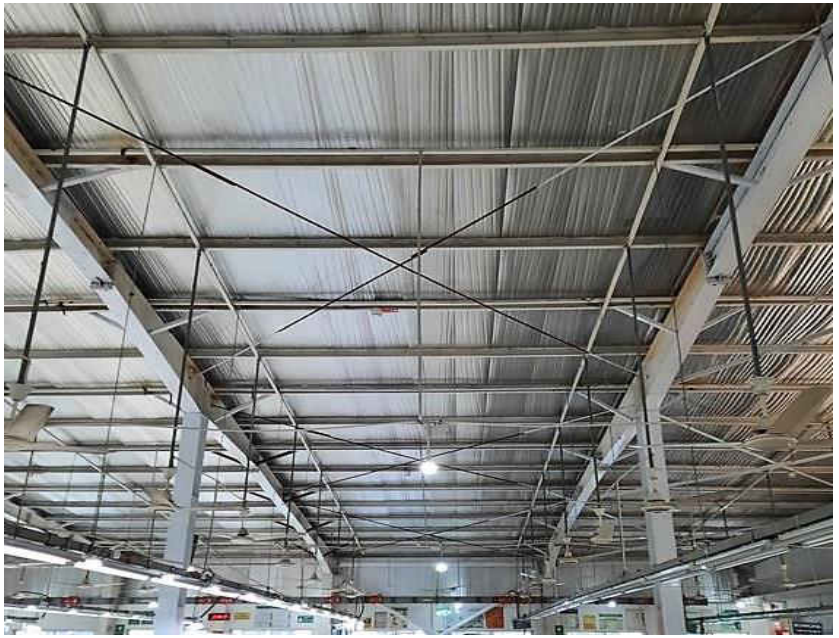


Column-Rafter Connection

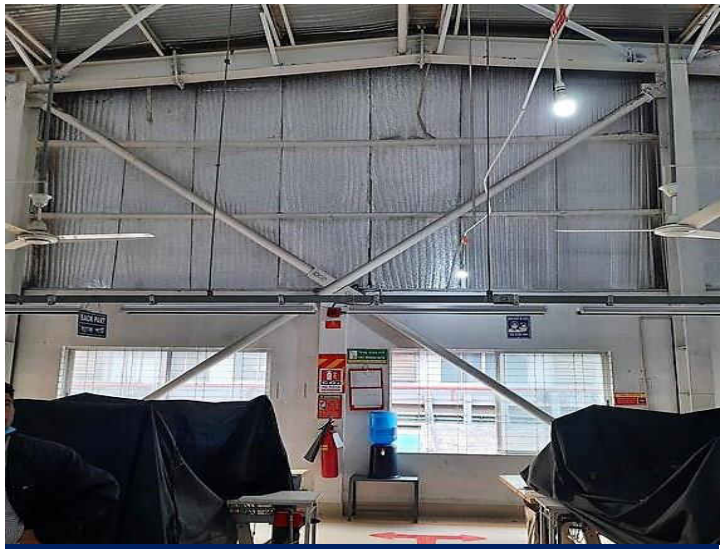
Structural System: Production Shed



Bracing layout plan



Cable bracing on roof

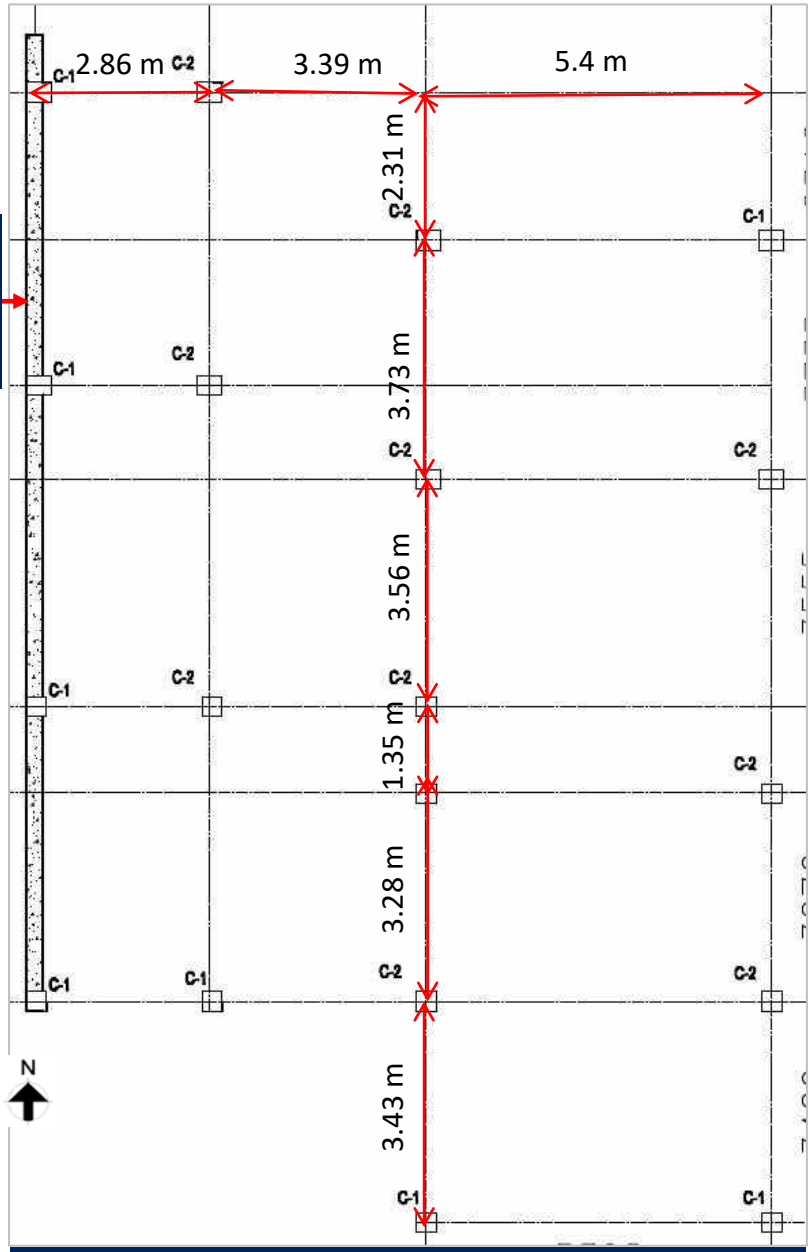


Cross bracing at 1st floor

Compression Strut

Structural System: Production Shed

Retaining wall shared with ETP



Column Layout Plan

Structural System:
RC beam and column framing with two-way spanning slab.

Lateral stability:
Moment resisting frame.

Column Dimension (mm):
300 X 380
300 X 300

Grid Spacing:
As shown in figure.

Beam Dimension (mm):
300 (w) X 300 (d/s) (Typical)

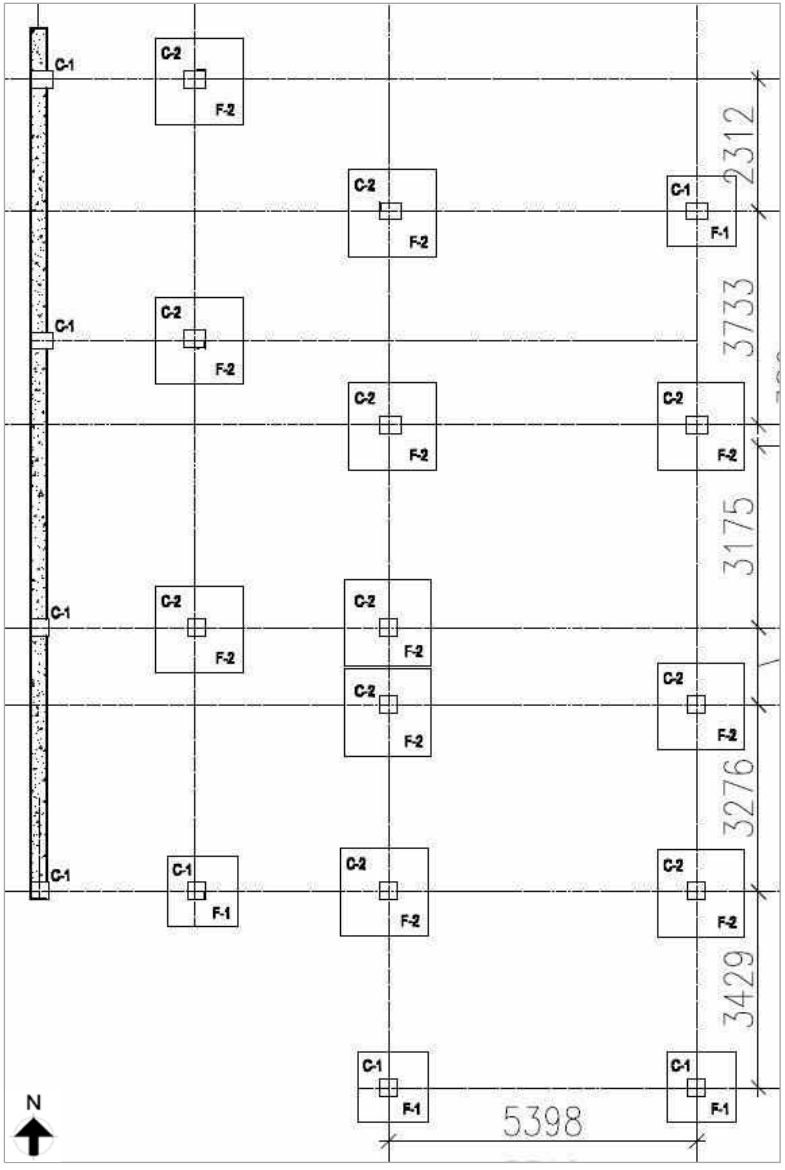
Slab Thickness:
125 mm excluding finishes

Aggregate type:
Brick chips

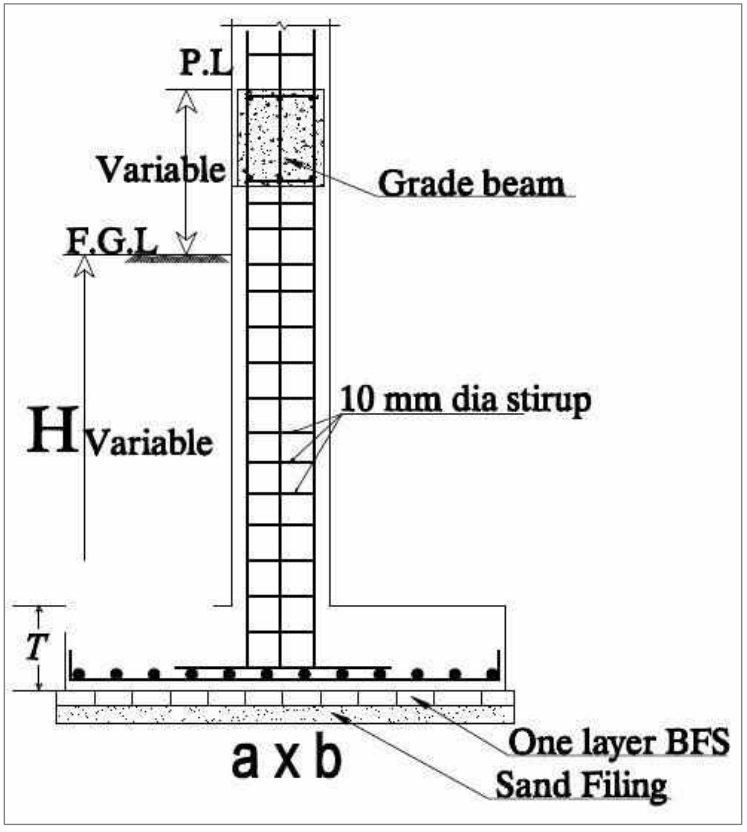
Floor to ceiling height: 4.42m

Foundation Type:
Isolated footing foundation. (as per drawing)

Structural System: Utility Building



Isolated footing foundation



Section details

Structural System: Utility Building

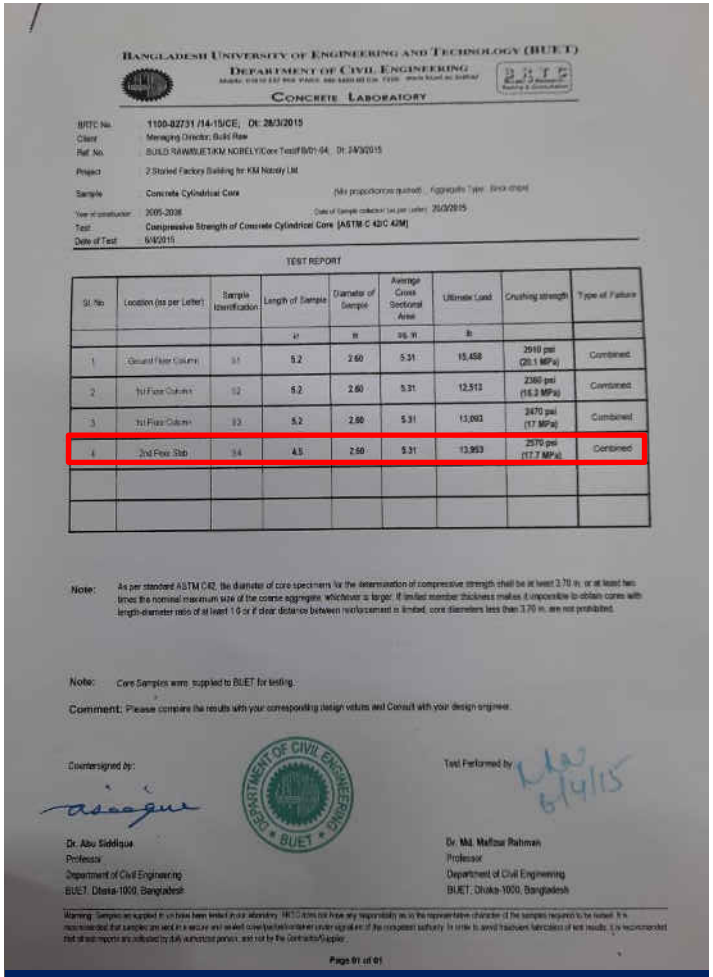
Typical beam column frame structure

Structural System: Utility Building

Observations

Design report not fully comply as per BNBC. (Production Building)

Observation: Production Building



BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY (BUET)
DEPARTMENT OF CIVIL ENGINEERING
CONCRETE LABORATORY

BRTC No. 1100-BZ731 /14-15/CE, Dt: 28/3/2015
Client: Managing Director, Build Raw
Ref. No.: BUILD RAW/BUET/KM NOBELY/Core Test/Bdh /04, Dt: 24/3/2015
Project: 2 Storied Factory Building for KM Nobelty Ltd.
Sample: Concrete Cylindrical Core (Mix proportion not quoted) ; Aggregate Type: Brick chips
Year of construction: 2005-2006 Date of Sample collection (as per Letter): 26/3/2015
Test: Compressive Strength of Concrete Cylindrical Core [ASTM C 42/C 42M]
Date of Test: 6/4/2015

TEST REPORT

Sl. No	Location (as per Letter)	Sample Identification	Length of Sample	Diameter of Sample	Average Cross Sectional Area	Ultimate Load	Crushing strength	Type of Failure
			in	in	sq. in	lb		
1	Ground Floor Column	S1	5.2	2.60	5.31	15,458	2910 psi (20.1 MPa)	Combined
2	1st Floor Column	S2	5.2	2.60	5.31	12,513	2360 psi (16.3 MPa)	Combined
3	1st Floor Column	S3	5.2	2.60	5.31	13,093	2470 psi (17 MPa)	Combined
4	2nd Floor Slab	S4	4.5	2.60	5.31	13,953	2570 psi (17.7 MPa)	Combined

Note: As per standard ASTM C42, the diameter of core specimens for the determination of compressive strength shall be at least 3.70 in. or at least two times the nominal maximum size of the coarse aggregate, whichever is larger. If limited member thickness makes it impossible to obtain cores with length-diameter ratio of at least 1.0 or if clear distance between reinforcement is limited, core diameters less than 3.70 in. are not prohibited.

Note: Core Samples were supplied to BUET for testing.

Comment: Please compare the results with your corresponding design values and Consult with your design engineer.

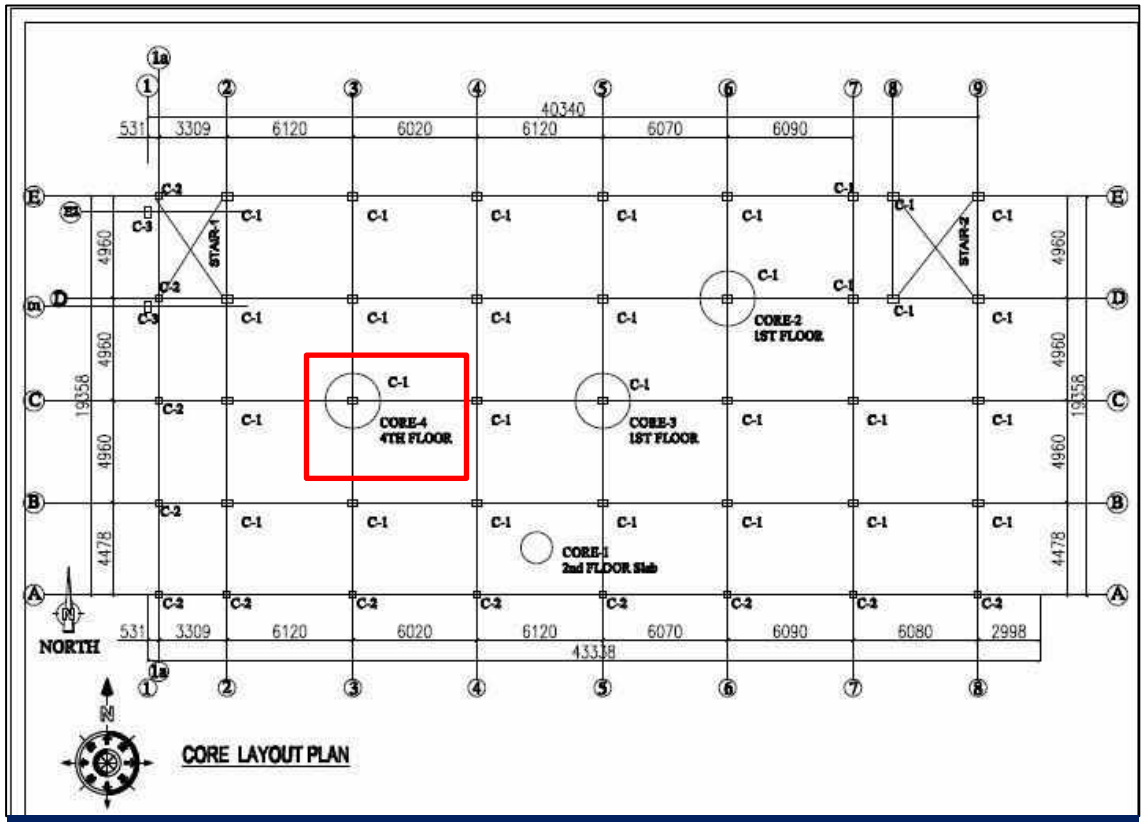
Countersigned by:
Dr. Abu Siddique
Professor
Department of Civil Engineering
BUET, Dhaka-1000, Bangladesh

Test Performed by
Dr. Md. Mafizur Rahman
Professor
Department of Civil Engineering
BUET, Dhaka-1000, Bangladesh

Warning: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. It is recommended that samples are sent in a secure and sealed cover/packet/container under signature of the competent authority. In order to avoid fraudulent fabrication of test results, it is recommended that all test reports are collected by duly authorized person, and not by the Contractor/Supplier.

Page 01 of 01

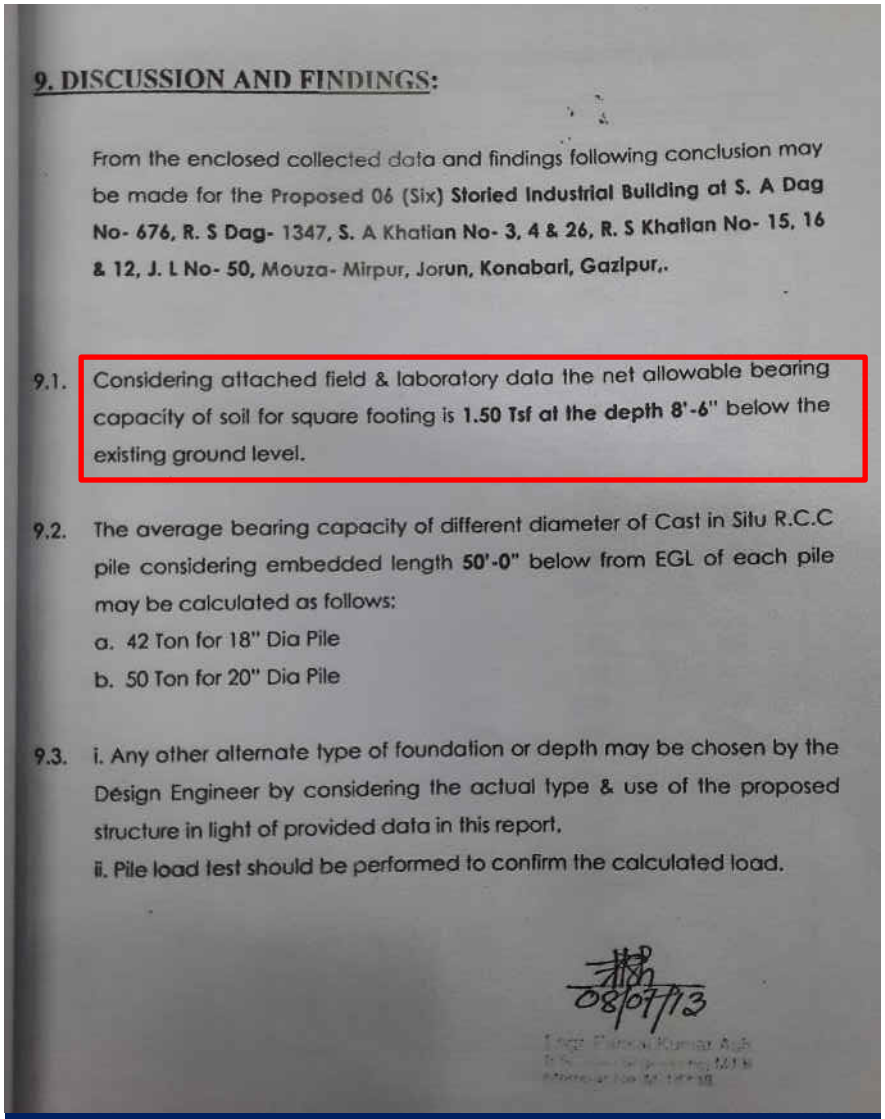
Concrete strength test report



Core layout plan

Total four number of concrete core samples are taken, three samples taken from column & one sample taken from slab. As per core layout plan one core sample was taken from the 4th floor column which is actually constructed for encasing the steel column for fire protection. Factory engineer is required to take minimum number of core samples from columns to evaluate concrete strength.

Observations: Production Building



9. DISCUSSION AND FINDINGS:

From the enclosed collected data and findings following conclusion may be made for the Proposed 06 (Six) **Storied Industrial Building at S. A Dag No- 676, R. S Dag- 1347, S. A Khatian No- 3, 4 & 26, R. S Khatian No- 15, 16 & 12, J. L No- 50,** Mouza- Mirpur, Jorun, **Konabari, Gazipur,.**

9.1. Considering attached field & laboratory data the net allowable bearing capacity of soil for square footing is **1.50 Tsf at the depth 8'-6"** below the existing ground level.

9.2. The average bearing capacity of different diameter of Cast in Situ R.C.C pile considering embedded length **50'-0"** below from EGL of each pile may be calculated as follows:

a. 42 Ton for 18" Dia Pile

b. 50 Ton for 20" Dia Pile

9.3. i. Any other alternate type of foundation or depth may be chosen by the Design Engineer by considering the actual type & use of the proposed structure in light of provided data in this report.

ii. Pile load test should be performed to confirm the calculated load.

08/07/13

Recommendation of geotechnical investigation report (Allowable bearing capacity 1.5 Tsf)

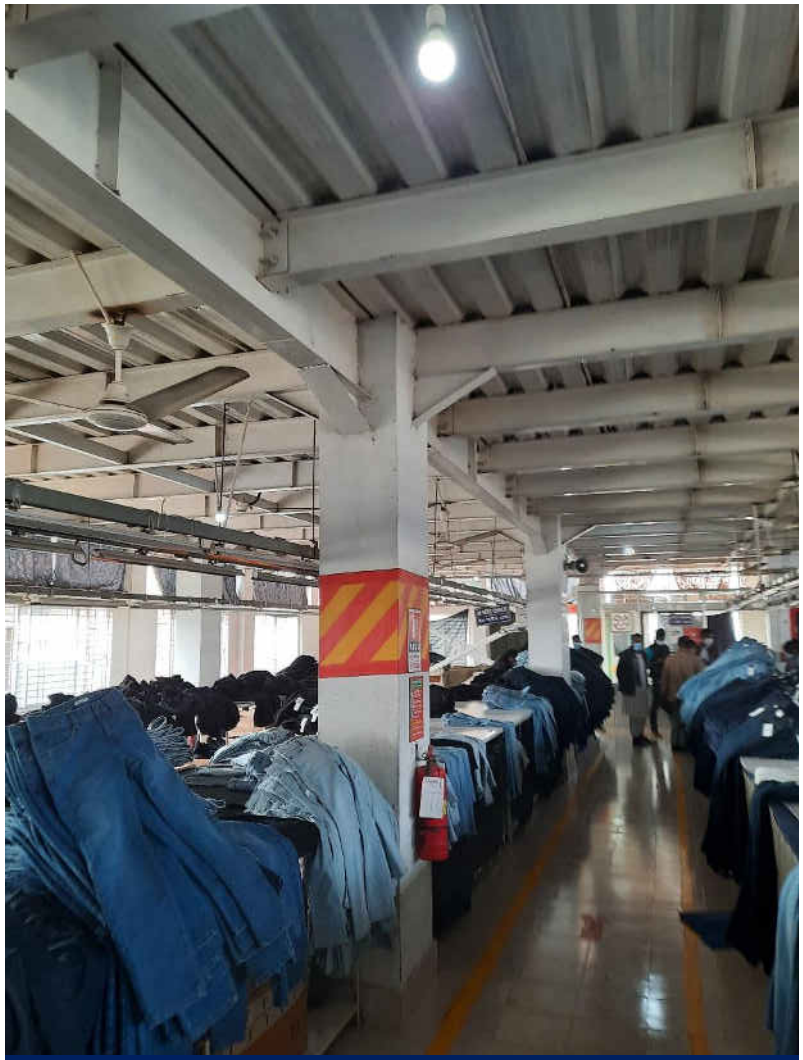
Foundation adequacy check-after retrofitting:

Allowable bearing capacity of soil = 11.6 ksf (FS=3)

Allowable bearing capacity (11.6 ksf) considered in the design report

Allowable bearing capacity considered in the design report does not match with the recommendation of geotechnical investigation report. No calculation is provided regarding the considered value.

Observations: Production Building



Overall stability of 3rd & 4th floor achieved by the frame action (Main beam in long direction, Sub-beam in short direction) & vertical bracings.

The connection of the frame could not be confirmed due to the RC encasement. Building engineer is required to check the connection type & requirement of any additional features. Serviceability and stability check in the design report is required to comply with BNBC.

Observations: Production Building

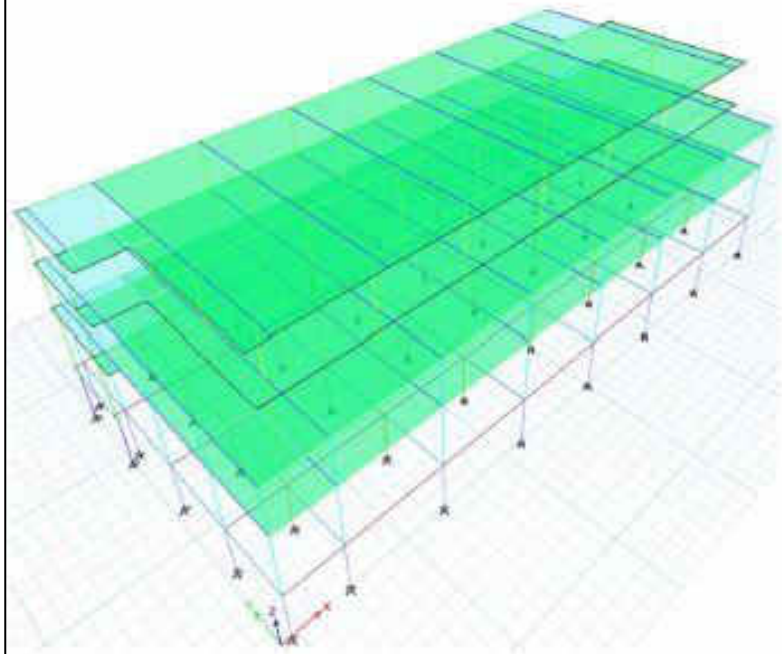
Detailed Engineering Assessment Report

FOR

EXISTING 5 (5) STORIED COMPOSITE BUILDING FOR KM NOBELY GARMENTS LTD AT ZORUN KONA BARI, GAZIPUR

NAME OF THE CLIENT

KM NOBELY GARMENTS LTD.



PREPARED BY

Z2 CONSULTANCY SOLUTIONS

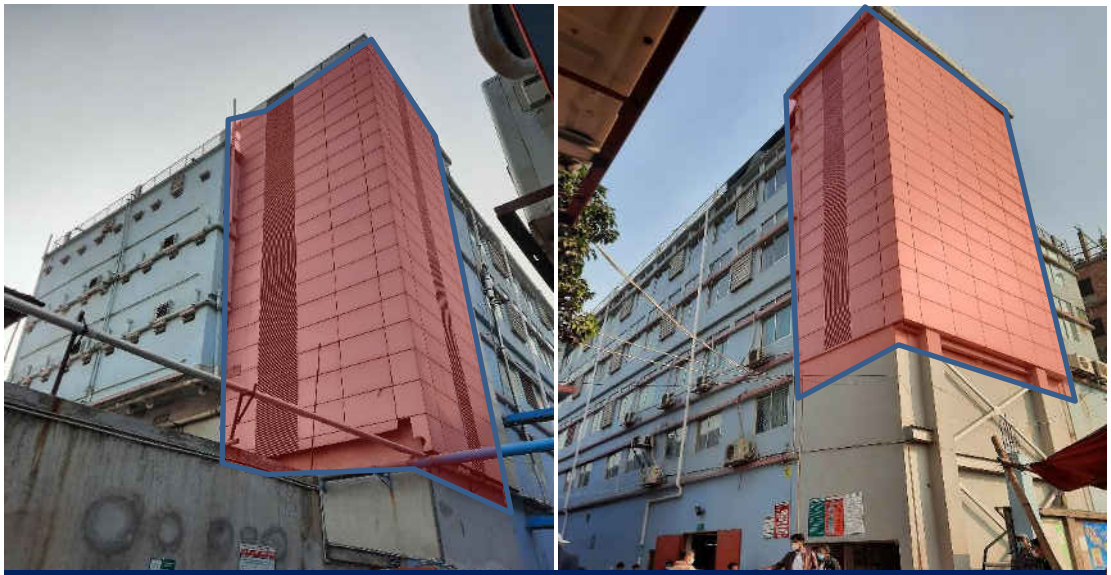
BOAD BAZAR, GAZIPUR SADAR, GAZIPUR

As per BNBC every building or structure designed shall have its design documents prepared in accordance with the provision of Section 1.9.1. The design document shall include a design report, and a set of structural drawings, which shall be prepared in compliance with section 1.9.1.1 and section 1.9.1.2 as per BNBC. During the inspection, the prepared design report has not compliance with section 1.9.1.1(part-6, BNBC) which is mentioned in previous slide.

Observations: Production Building

Apparently inadequate connection of steel cladding. (Production Building)

Observation: Production Building



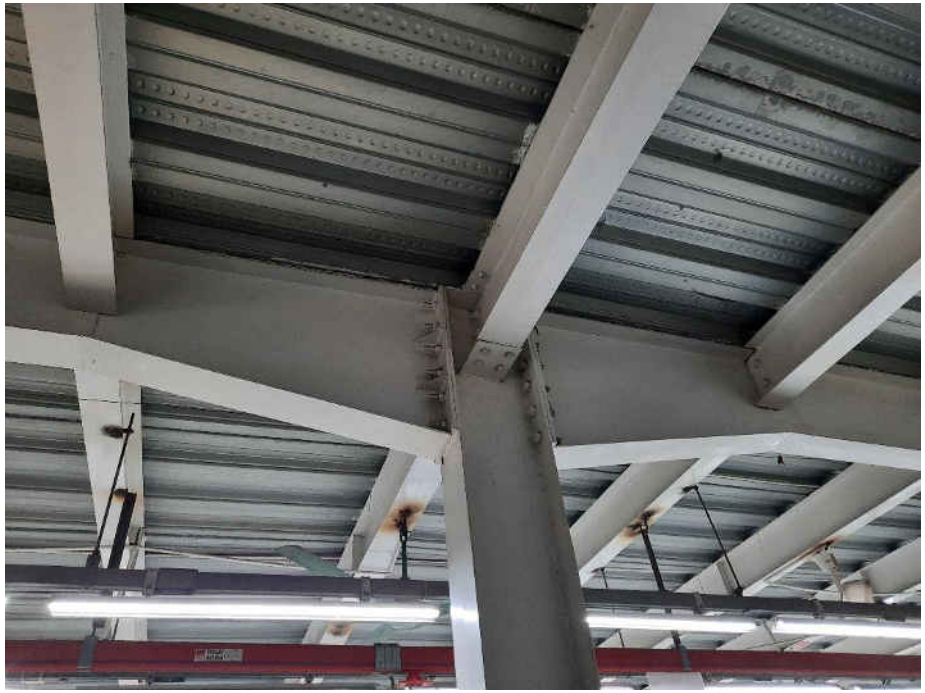
Steel cladding on the stair zone.

Apparently poor connection in the steel cladding system. Building engineer is required to check the connection adequacy against the wind loading.

Observation: Production Building

Apparently partial rigidity in the frame connection. (Production Shed)

Observation: Production Shed



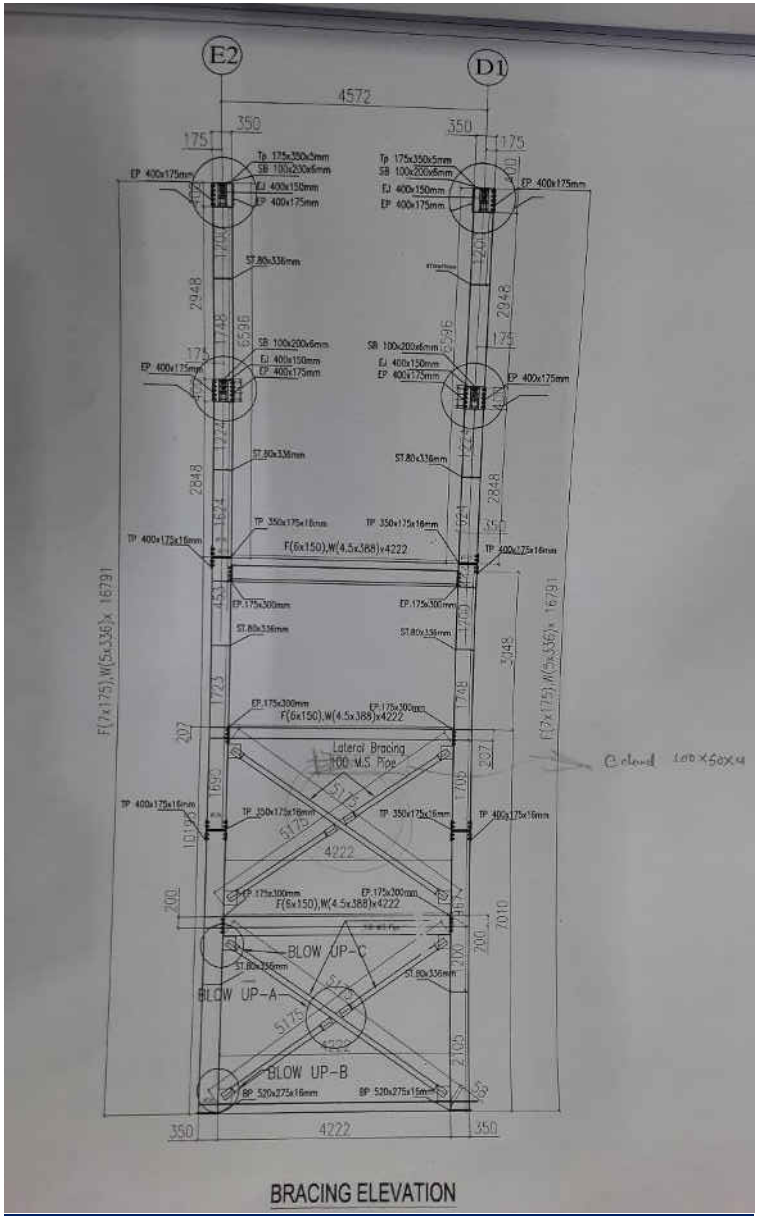
Partially fixed connection was observed at beams and column joint connected by bolts. Apparently partial moment resisting frame action may govern that can affect the stability. Building engineer is required to review the connection adequacy and overall stability system in the design report.

Observation: Production Shed

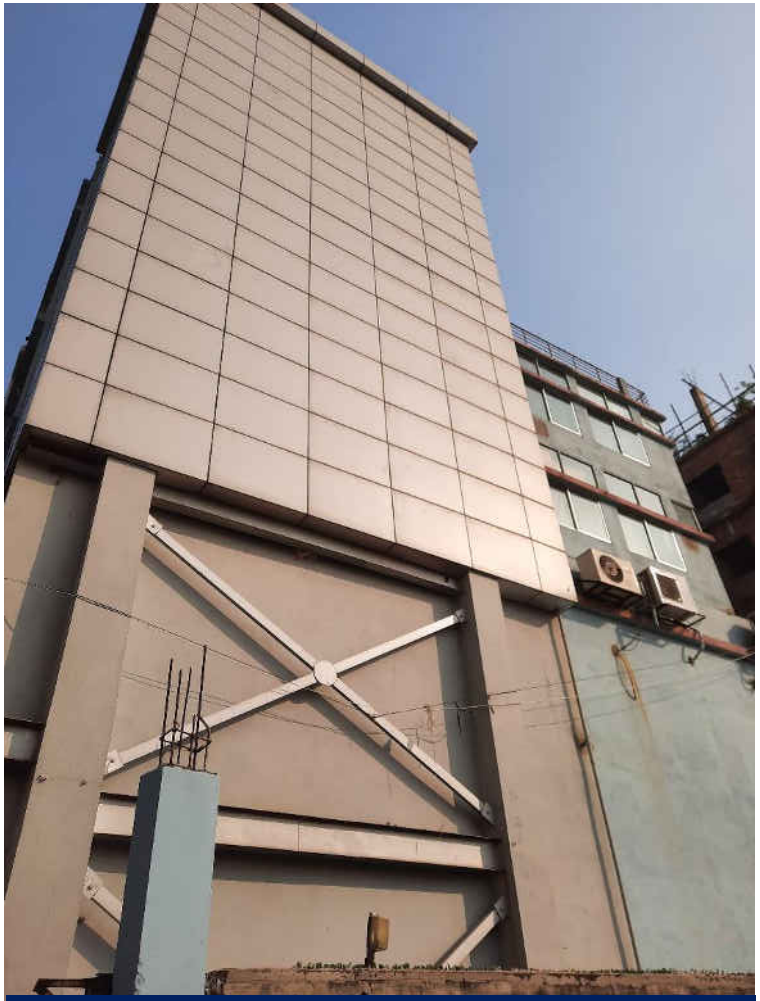
Inconsistency in the drawings.

(Production Building & Shed)

Observation



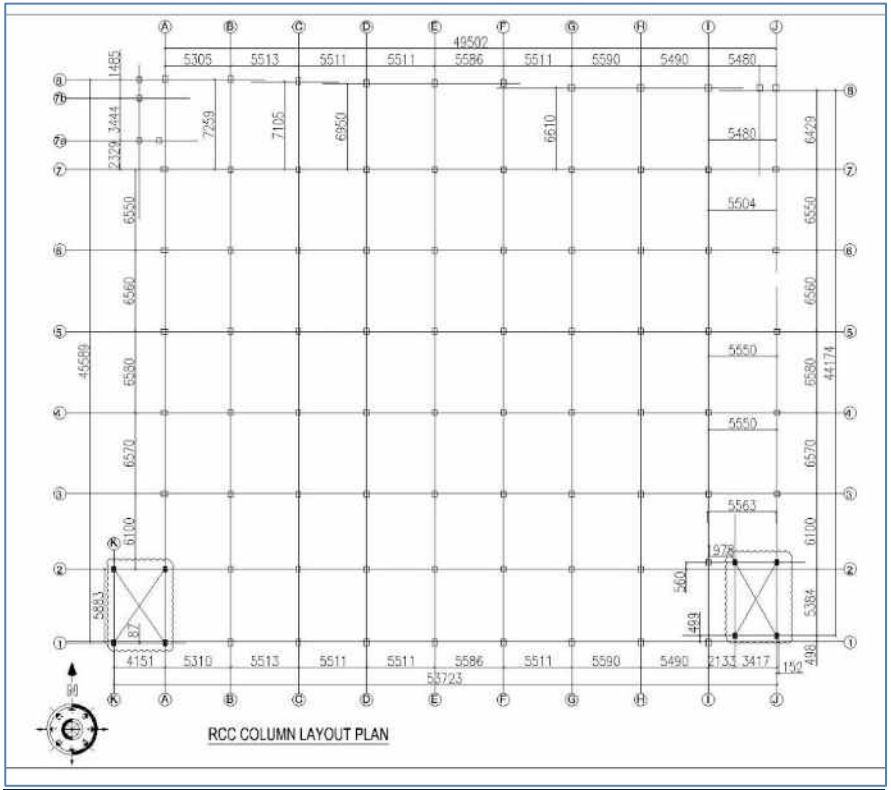
Bracing elevation on drawing



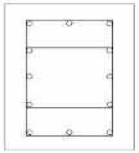
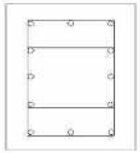
Bracing elevation on site

100 mm diameter pipe bracing shown on drawing, onsite C channel of 100 mm X 50 mm X 4 mm bracing was found.

Observation: Production Building

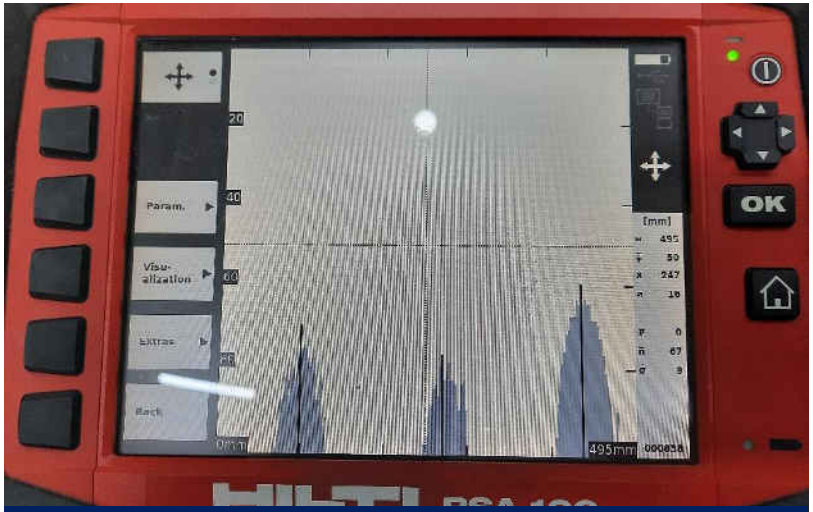


RC column layout plan

	Bellow Gr. Floor	Gr.Floor
C-5		
	380x530 8-20 mm dia rod 4-16 mm dia rod	304x457 8-20 mm dia rod 4-16 mm dia rod

RC column Schedule

As-built drawing shows 12 number of rebars in the C5 column. But on site 8 number of rebars were counted by ferro scanning.

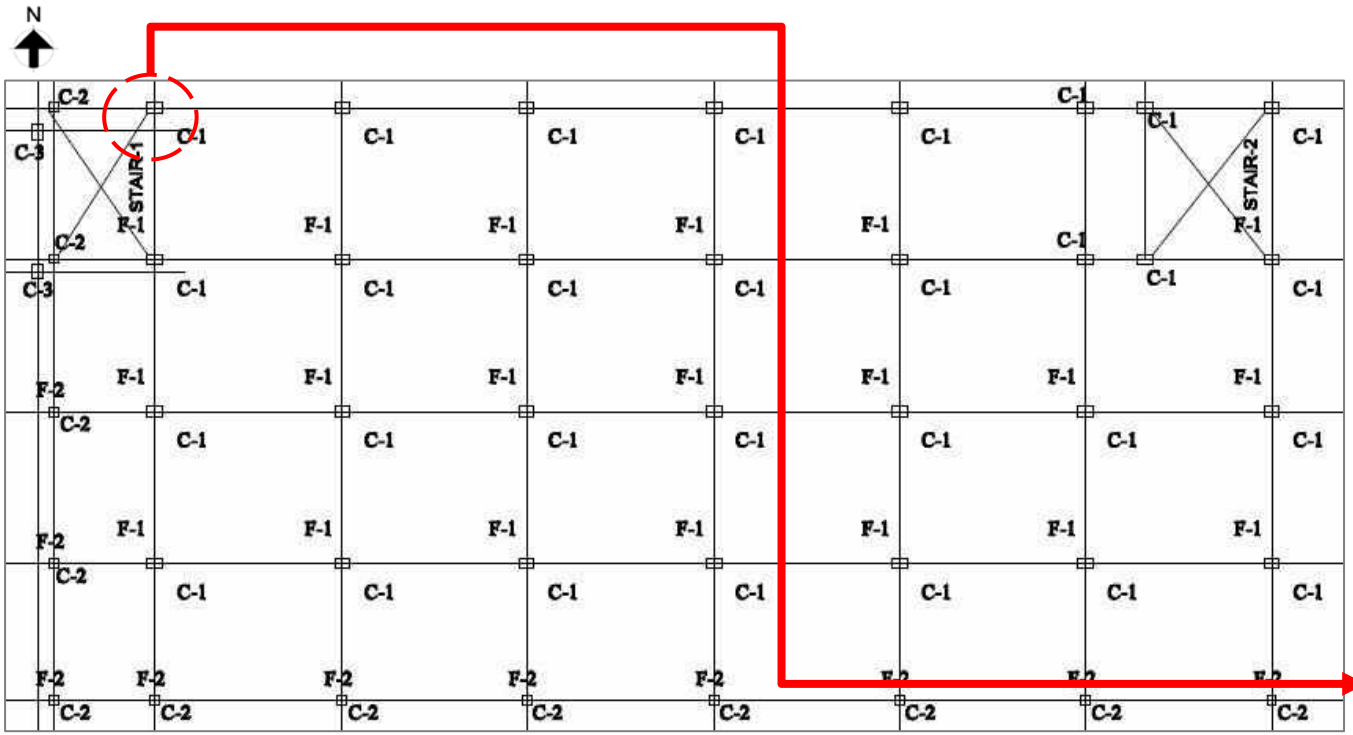


Rebar counted by ferro scanning

Observation: Production Shed

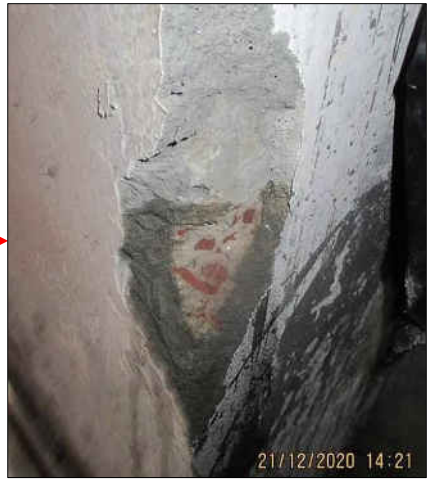
RMG SUSTAINABILITY COUNCIL

Test Carried Out



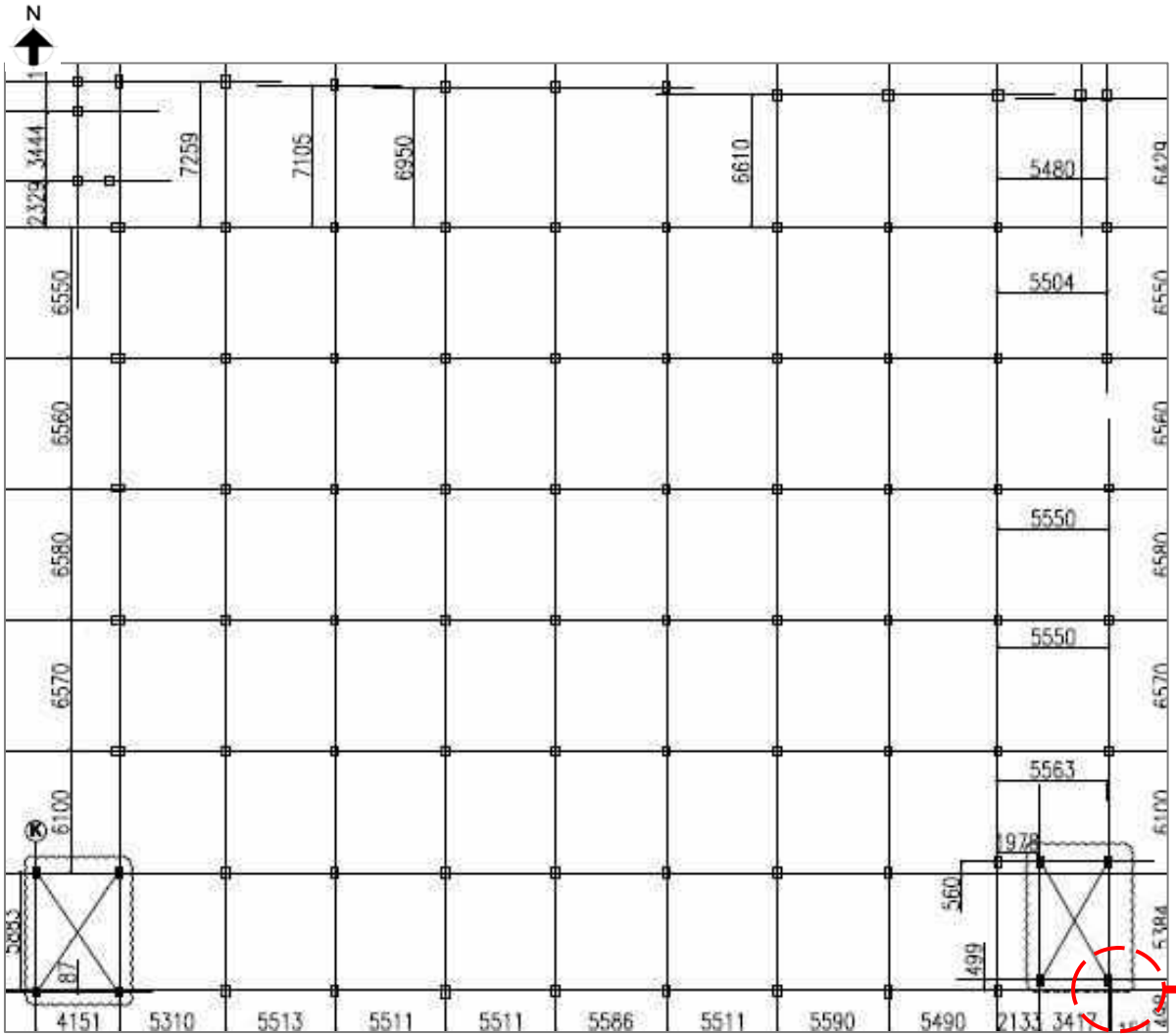
A bit of marked column was broken to determine aggregate type

Rebar Scans



Brick aggregate

Test Carried Out: Production Building

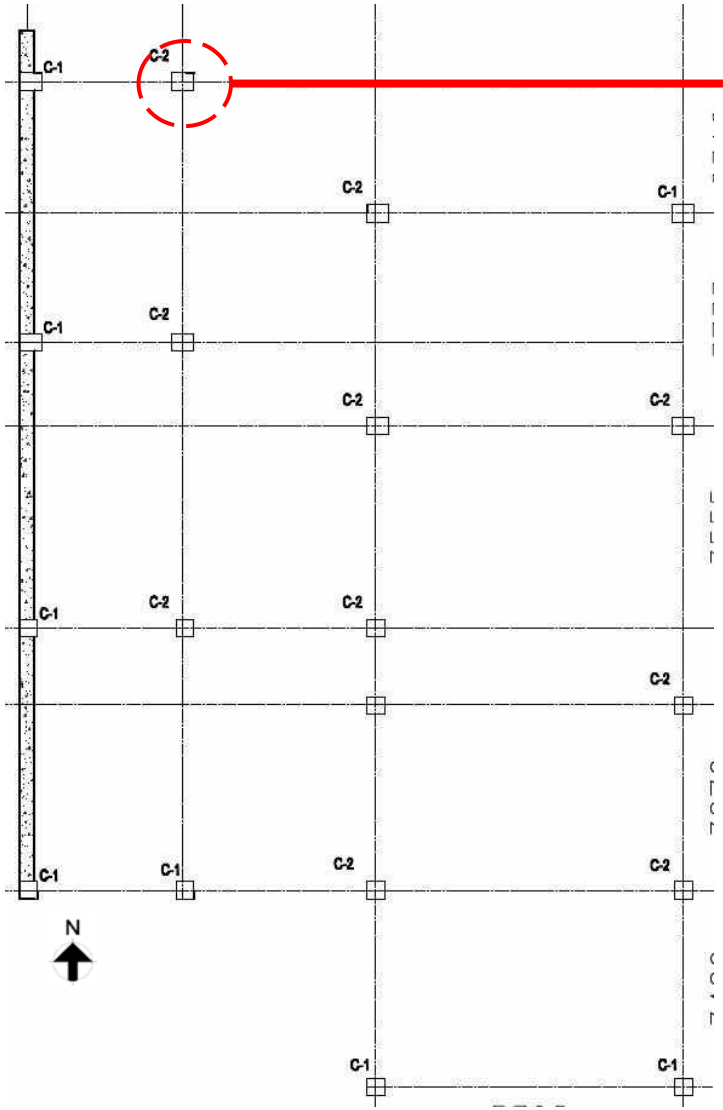


Rebar Scans

Brick aggregate

A bit of marked column was broken to determine aggregate type

Test Carried Out: Production Shed



A bit of marked column was broken to determine aggregate type

Rebar Scans

Brick aggregate

Test Carried Out: Utility Building

Problems Observed

1: Design report not fully comply as per BNBC. (Production Building)
2: Apparently inadequate connection of steel cladding. (Production Building)
3: Apparently partial rigidity in the frame connection . (Production Shed)
4: Inconsistency in the drawings. (Production Building & Shed)

Priority Actions

Item 1 and actions

Design report not fully comply as per BNBC. (Production Building)

Priority 1 (Immediate - Now)	• Not Required.
Priority 2 (within 6-weeks)	• Building Engineer to prepare design report as per BNBC (part-6; Article 1.9.1) by reviewing design, loads and capacity of structural members. • Verify in situ concrete strength by taken 100 mm diameter cores (minimum 4 nos.) from lower tier columns. • Building engineer is required to check the connection type & requirement of any additional features.
Priority 3 (within 6-months)	• Complete implementation of any remedial works deemed necessary by the Design Report. • Continue to implement floor loading plan.

Item 2 and actions

Apparently inadequate connection of steel cladding. (Production Building)

Priority 1 (Immediate - Now)	• Not Required.
Priority 2 (within 6-weeks)	• Building engineer is required to check the connection adequacy against the wind loading.
Priority 3 (within 6-months)	• Complete implementation of any remedial works where necessary.

Item 3 and actions

Apparently partial rigidity in the frame connection. (Production Shed)

Priority 1 (Immediate - Now)	• Not Required.
Priority 2 (within 6-weeks)	• Building engineer is required to review the connection adequacy and overall stability system in the design report. • Building Engineer to prepare design report as per BNBC (part-6; Article 1.9.1) by reviewing design, loads and capacity of structural members.
Priority 3 (within 6-months)	• Carryout remedial works where necessary.

Item 4 and actions

Inconsistency in the drawings. (Production Building & Shed)

Priority 1 (Immediate - Now)	• Not Required.
Priority 2 (within 6-weeks)	• Building engineer is required to survey the both structures and prepared as constructed drawings.
Priority 3 (within 6-months)	• Not required.

Survey Limitations and Assumptions

This report is for the private and confidential use of RSC for whom it was prepared together with their professional advisors as appropriate. It should not be reproduced in whole or in part or relied upon by third parties for any use without the express written permission of RSC.

This report can be used in discussion with the supplier or factory owner as a means to rectify or address any observations made. The report is not comprehensive and is limited to what could be observed during a visual inspection of the building.

This Report is not intended to be treated as a generalised inspection and does not cover the deterioration of structural members through dampness, fungal or insect attack, nor does it deal with problems and defects of a non-structural nature. Other non structural aspects of the building such as fire safety have not been assessed in this survey.

Except as otherwise noted, drains and other services were not viewed or tested during our inspection and are therefore similarly excluded from this Report. We have not inspected any parts of the structure which are covered, unexposed or inaccessible and we are therefore unable to report that any such part of the property is free from defect.

External inspection of the façade walls has generally been carried out from ground level only by visual sighting. No opening up works were carried out (except as noted) and we rely on the Architects and Engineers drawings provided to us for our views on concealed parts of the structure and in particular foundations. Strengths of materials and components are untested and we recommend that the factory owners Building Engineer carries out in situ testing over and above those suggested to satisfy themselves with the material strengths and component details.

Recommendations, where given, are for the purpose of providing indicative advice only, are not exhaustive, relate solely to identifying key and obvious structural defects as identified in this presentation, and do not take the form of or constitute a specification for works. We take no responsibility for the works as constructed. This report does not interfere with the factory owners Building Engineers responsibility for the structural performance of this building, The Building Engineer remains fully responsible for the structural adequacy of the building.

This report does not comment in detail on the future seismic performance of the building and only highlights the fact that the building may experience significant damage or collapse in a seismic event along with many others in the Dhaka region.

The observations in this report are based on the Engineering Judgement of the lead surveyor/engineer at the time of the survey. We assume in making these observations that no covering up of faults defects, filling or plastering over cracking or significant repair work has been carried out by the building owner. Any future alteration or additional work by the building owner will void this report.