Norp Knit Industries Ltd.
Unit- 02 (Extension)

R.I Park, 93, Islampur,Kodda, Nandun, Gazipur 1700
(23.985522, 90.353672)
17 September 2023

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Building Information

1. **New Admin Building:** This structure is a five storied (G+4) reinforced concrete (RC) building.
2. **Dry Process Building:** This structure is a four storied (G+3) RC building.
3. **Six storied Store Building:** This structure is a six storied (G+5) RC building.
4. **Compressor Building:** This structure is a three storied (G+2) RC building.
5. **North Side Toilet Block:** This structure is a three storied (G+2) RC building.
6. **Boiler Room:** This structure is a single storied RC building.
7. **Wastage Room:** This structure is a single storied masonry structure.
8. **Fire Command Room:** This structure is a single storied RC building.
9. **Single storied Toilet Block:** This structure is a single storied masonry structure.

Observations

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Lack of justification for considering intermediate moment resisting frame

Observation: New Admin Building

- Basic wind speed= 215 km/h
- Exposure type= A
- Importance factor, I= 1.0

The calculation of wind loads conforms to Sub-clause 2.4, Chapter 2, and Part 6 of BNBC.

Seismic Load (as per BNBC-2006)

Z = 0.15 (Seismic zone coefficient given in Fig. 6.2.10 of BNBC)
I = 1.0 (Structural importance coefficient given in Table 6. 2. 23 in BNBC)
R = 8 (Response modification coefficient for Intermediate Moment)
S = 1.5 (Site coefficient for soil characteristics as provided in Table: 6.2.25 of BNBC).

4. LOAD COMBINATIONS

R.C.C structural members have been designed as per BNBC 2006.

1. 1.4D
2. 1.4D+1.7L
3. 0.9D+1.3(W or 1.1E)
4. 0.75[1.4D+1.7(W or 1.1E)]
5. 0.75[1.4D+1.7L+1.7(W or 1.1E)]

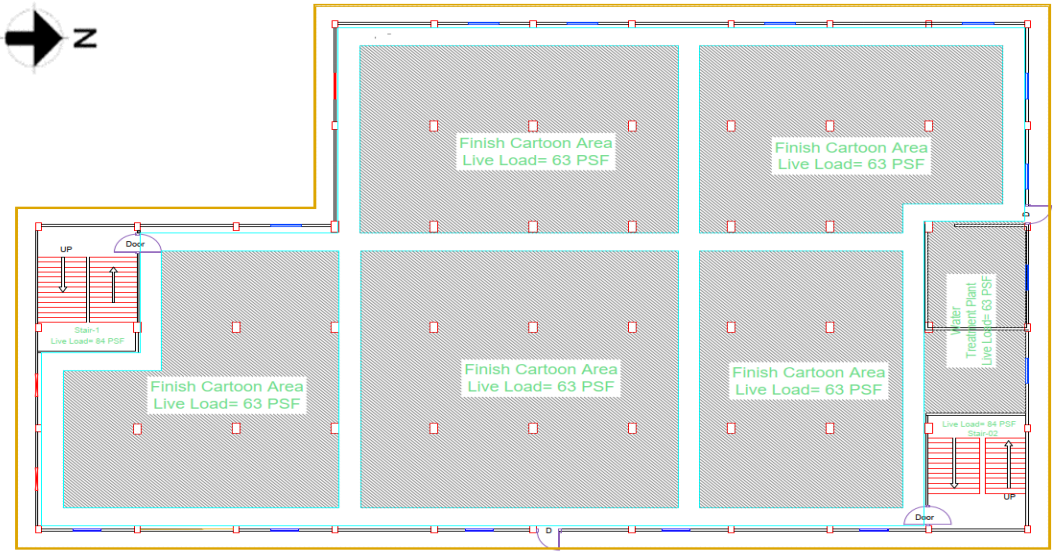
Design report: Value of response modification factor R = 8

The structural framing system is considered as IMRF, and value of response modification factor R is considered as 8. However, no supporting calculation is provided for it. Building engineer is required to provide supporting calculation for R=8 as per 8.3.10 of BNBC.

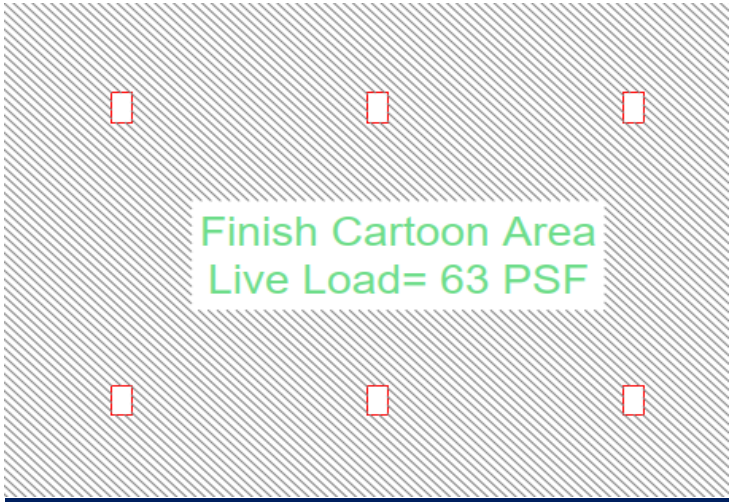
Observations: New Admin Building

Load plan needs to revise

Observations: Dry Process Building



Live load plan- typical floor



Live load considered as 3 KPa for storage areas

Storage on 3rd floor

INDUSTRIAL, STORAGE & HAZARDOUS (Occupancy - G, H & J)	Workshop, factory, warehouse	1 Light workroom without storage	3.0 / 2.7
		2 Machinery hall & circulation area	4.0 / 4.5
		3 Factory, workshop etc.	5.0 / 4.5
		4 Manufacturing : light	6.0 / 4.5
		heavy	12.0 / 9.0 (5)
		ice	15.0 / 9.0 (5)
		5 Printing plant :	(5)
		Press room	7.0 / 11.0
		Composing and linotype room	5.0 / 9.0 (5)
		Paper storage room	12.0 / 9.0 (5)
		6 Motor room, fan room etc. including the weight of machinery	7.5 / 4.5
		7 Cold storage, grain storage	15.0 / 9.0 (5)
		8 Storage warehouses : light	6.0 / 4.5 (5)
		heavy	12.0 / 9.0
		9 Foundries	20.0 / 12.0

Live load table (BNBC part-6)

Live load on typical floor is considered as 3 kPa in prepared load plan. As per BNBC- Part 6, live load for light storage areas is required to be considered minimum 6 kPa. However, the factory engineer is required to revise the load plan as per BNBC requirement and check the design accordingly.

Observations: Dry Process Building

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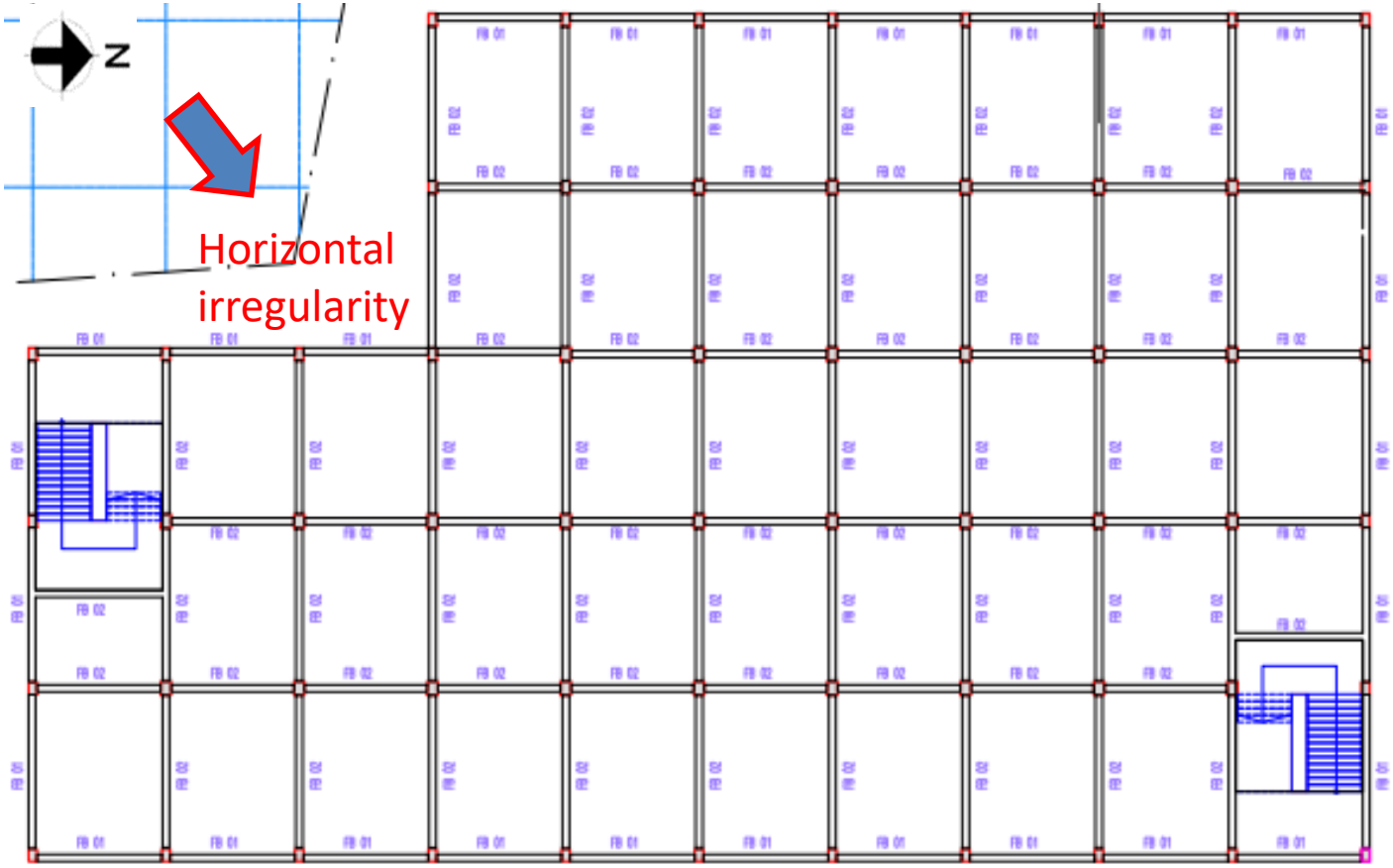


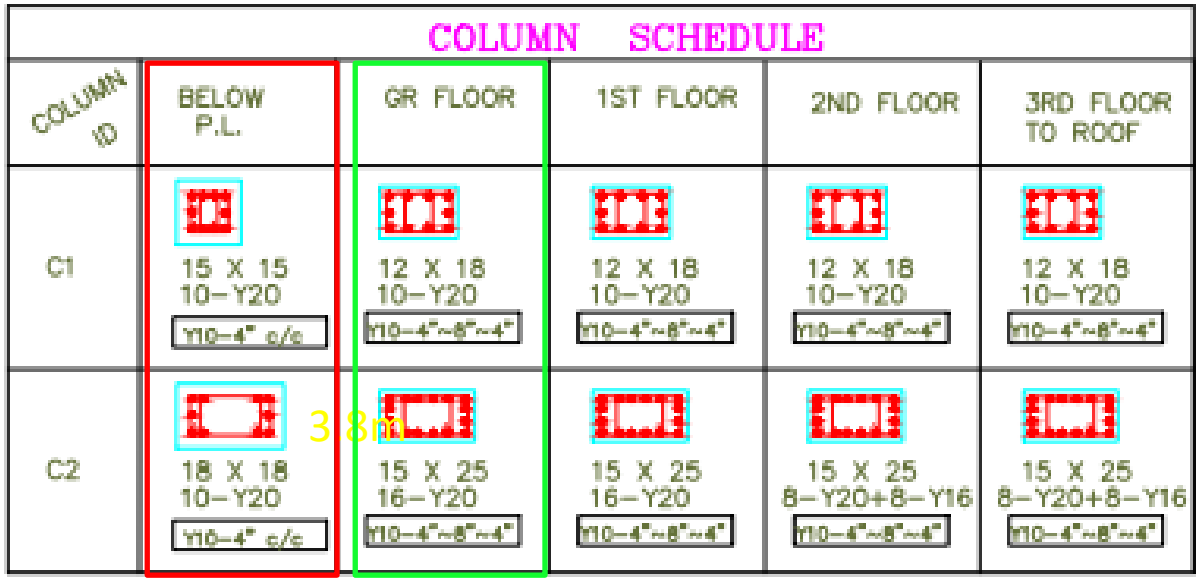
Typical Floor Beam layout

The structure is horizontally irregular at the marked location. Building engineer is required to revise the design report incorporating all irregularities including reentrant corner.

Observations: Dry Process Building

Column size of below PL is larger than above PL in column schedule

Observations: Dry Process Building



COLUMN SCHEDULE

COLUMN ID	BELOW P.L.	GR FLOOR	1ST FLOOR	2ND FLOOR	3RD FLOOR TO ROOF
C1	15 X 15 10–Y20 Y10–4" c/c	12 X 18 10–Y20 Y10–4"~8"~4"	12 X 18 10–Y20 Y10–4"~8"~4"	12 X 18 10–Y20 Y10–4"~8"~4"	12 X 18 10–Y20 Y10–4"~8"~4"
C2	18 X 18 10–Y20 Y10–4" c/c	15 X 25 16–Y20 Y10–4"~8"~4"	15 X 25 16–Y20 Y10–4"~8"~4"	15 X 25 8–Y20+8–Y16 Y10–4"~8"~4"	15 X 25 8–Y20+8–Y16 Y10–4"~8"~4"

Column size for Below PL in column schedule

Column schedule showing impractical column sizes for “Below PL”. Small column mentioned for below plinth level compared to above plinth level which is contradictory. Building engineer is required to investigate for the columns size below plinth level and update the column schedule accordingly.

Observations: Dry Process Building

Apparently inadequate connection

Observations: Dry Process Building-Stair Roof Shed

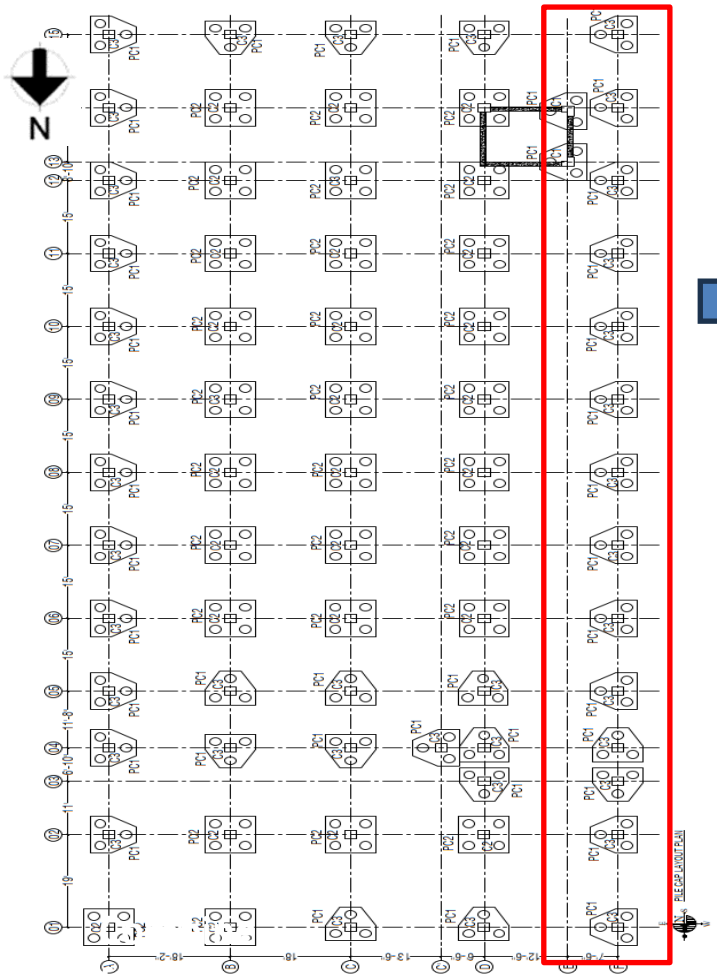
Steel members inserted to brick walls.

Rafter of stair roof was found inserted to brick wall which was appeared to be inadequate. Building engineer is required to check the connection adequacy for uplift forces.

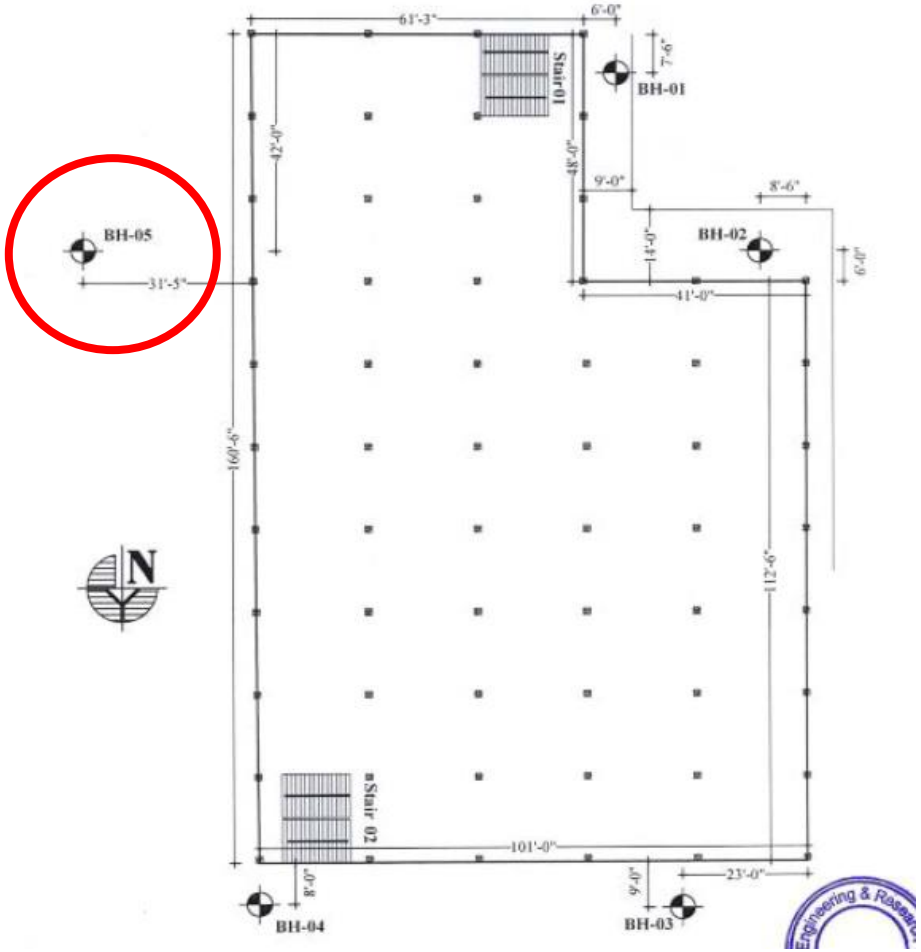
Observations: Dry Process Building-Stair Roof Shed

Design report needs to be updated

Observations: Six storied Store Building



Pile layout of Six storied Store Building



Borehole layout of Dry Process Building

Pile capacity has been checked as per provided soil test report of adjacent Dry Process Building. However, the bore hole-5 covers only the red marked piles of Six storied Store Building. Building engineer is required to check the pile capacity as per in-situ soil bearing capacity.

Observations: Six storied Store Building

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Slab adequacy check is not provided in design report. Building engineer is required to update the design report as per 1.9.1.1 of BNBC including the slab adequacy check.

Slab adequacy check is not provided in design report

Observations: Six storied Store Building

Design report needs to be updated

Observations Compressor Building

3.2 EARTHQUAKE CHARACTERISTICS

Seismic zone co-efficient, Z	Table 6.2.14	Zone-2
Importance factor, I	Table 6.2.17	1.00
Ct	Table 6.2.20	0.0466
m	Table 6.2.20	0.9
Response reduction factor, R	Table 6.2.19	IMRF=5
System Overstrength factor, Ωo	Table 6.2.19	3
Deflection Amplification factor, Cd	Table 6.2.19	4.5
Site Class	Table 6.2.18	SD

Considered Framing system for structure in Site class SD in Design Report.

The structure is design in accordance with BNBC 2020 considering framing system as IMRF. However, for Zonne-2 and site class SD the seismic design category is D which doesn't permit IMRF as per BNBC 2020.
Building engineer is required to revised the design report as per Table 6.2.19 of BNBC 2020.

Table 6.2.18: Seismic Design Category of Buildings

Site Class	Occupancy Category I, II and III				Occupancy Category IV			
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4
SA	B	C	C	D	C	D	D	D
SB	B	C	D	D	C	D	D	D
SC	B	C	D	D	C	D	D	D
SD	C	D	D	D	D	D	D	D
SE, S_1, S_2	D	D	D	D	D	D	D	D

Seismic Force-Resisting System	Response Reduction Factor, R	System Overstrength Factor, Ω_o	Deflection Amplification Factor, C_d	Seismic Design Category B	Seismic Design Category C	Seismic Design Category D
				Height limit (m)		
4. Special reinforced concrete moment frames	8	3	5.5	NL	NL	NL
5. Intermediate reinforced concrete moment frames	5	3	4.5	NL	NL	NP
5. Ordinary reinforced concrete moment frames	3	3	2.5	NL	NP	NP

BNBC 2020 doesn't permit IMRF for SDC-D

Observations: Compressor Building

bearing capacity of the foundation at 9 ft level from EGL (Factor of Safety= 2.5) is 7.14 ksf. Bore hole capacity based on Soil Report given below.

h. Following table summarizes the **average net/gross** allowable bearing capacities of **shallow spread or continuous footing**.

Table: ANALYZED/ESTIMATED Bearing Capacity of Shallow Foundation System

In the Location of Borehole	Depth of Foundation Below EGL $D_{f(EGL)}$ (ft)	Net (Gross) Allowable Bearing Capacity for Smaller Footing (psf) 5 ft x 5 ft	Net (Gross) Allowable Bearing Capacity for Larger Footing (psf) 10 ft x 10 ft	Net (Gross) Allowable Bearing Capacity for Continuous Footing (psf) Width = 5 ft
BH-01	9	3277(4177)	2862(3762)	2729(3629)
	12	4739(5939)	4957(6157)	3947(5147)
	15	5733(7233)	7297(8797)	4775(6275)
BH-02	9	2189(3089)	2387(3287)	1819(2719)
	12	4149(5349)	3969(5169)	3454(4654)
	15	4464(5964)	4699(6199)	3714(5214)
BH-03	9	3277(4177)	3337(4237)	2729(3629)
	12	5329(6529)	5451(6651)	4441(5641)
	15	6367(7867)	6777(8277)	5305(6805)

* Gross Allowable Bearing Capacity = Net Allowable Bearing Capacity + Existing Overburden Pressure
Net Allowable Bearing Capacity = (Gross Ultimate Bearing Capacity –Existing Overburden Pressure)/FS
** The above bearing capacities incorporate a minimum factor of safety on the order of 2.5
*** It should be *strongly noted that* the depth of foundations as tabulated above should have to be strictly maintained in order to achieve the corresponding capacities.

So, the Average Ultimate bearing capacity of the foundations are = (2856*2.5)/1000 = 7.14. ksf, where factor of safety is= 2.5.

Soil Bearing capacity in Design Report

3.5 OBSERVATION AND RECOMMENDATION:

According to our observation regarding the Sub-Soil condition of the proposed area we are giving the following opinion:

On the basis of information available from geotechnical investigation report the allowable bearing capacity of different depths is given in the following table.

Net allowable bearing capacity for Shallow Foundations

Borehole No	Width (m) / Depth (m)	Net Allowable Bearing Capacity (kPa) 1.0	2.0	2.5	3.0	3.5
BH-01	1.0	124.1	196.0	200.7	180.9	162.0
	2.0	283.8	285.3	232.1	194.1	164.0
	3.0	400.1	298.2	248.0	209.8	180.3
	4.0	443.1	292.2	234.7	204.9	196.2
BH-02	1.0	165.3	122.6	106.7	104.7	108.4
	2.0	252.7	158.6	138.4	132.4	133.1
	3.0	207.3	167.7	170.3	178.3	177.7
	4.0	150.8	163.7	175.8	190.9	194.4
BH-03	1.0	162.6	121.7	106.0	107.2	112.9
	2.0	190.9	138.0	131.1	132.4	137.6
	3.0	169.7	149.7	158.1	169.5	202.1
	4.0	136.3	164.9	177.9	226.8	240.2

From the bearing capacity evaluations and summary of Table # 4, observed that the bearing capacity values are found higher than 150 kPa. Considering the soil condition and depth influence of footing, we recommend the shallow foundations with bearing capacity of <=200 kPa for smaller to medium loads. According to BNBC for lightly and small size structure safe bearing capacity 150 kPa for silt, clayey silt, clayey sand, clay sandy clay.

Bearing capacity as per soil test report.

Different value is used for foundation adequacy check in design report other than that recommended in provided soil test report. Building engineer is required to calculate actual soil bearing capacity from soil profile & classification and revise the foundation adequacy accordingly.

Observations: Compressor Building

Punching capacity of foundation not provided in design report

Observations: North Side Toilet block

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(NORTH SIDE TOILET BLOCK)

BASE	1	13	DLL	65.53	149.89	87.5	1.71	4	Safe
BASE	2	15	DLL	84.36					
BASE	3	17	DLL	60.03	136.96	87.5	1.57	4	Safe
BASE	4	19	DLL	76.92					
BASE	5	21	DLL	123.60	274.63	140	1.96	4	Safe
BASE	12	35	DLL	151.03					
BASE	6	23	DLL	129.00	285.20	140	2.04	4	Safe
BASE	11	33	DLL	156.20					
BASE	7	25	DLL	124.20	278.52	140	1.99	4	Safe
BASE	10	31	DLL	154.32					
BASE	8	27	DLL	108.24	244.95	140	1.75	4	Safe
BASE	9	29	DLL	136.71					

Soil Allowable bearing pressure below footing considered = 2 tsf or 4 ksf from Soil Test Report for factor of safety 2.50.

Bearing capacity at measured depth (FOS 2.5):

For Trail pit 2

Measured foundation depth (including thickness): 9'-9"

Test name	TP 2 (tsf)	BH 1 (tsf)	BH 2(tsf)	BH 3(tsf)
SPT	-	1.90	2.51	2.15
VST	-	1.07	0.89	1.26
LABORATORY VANE (TORVANE) SHEAR TEST	-	7.36	3.43	0.98
Unconsolidated Undrained Shear Test	-	1.66	1.78	1.75
Direct shear test	-	0.02	-	0
(if any)	-	-	-	-
(if any)	-	-	-	-

All the footings are found adequate in size to carry the prescribed building load.

Foundation capacity check is only provided for bearing but capacity of punching is not provided in design report. Building engineer is required to update the design report in compliance with BNBC 1.9.1.1 including the punching capacity of foundation.

Punching capacity of foundation not provided in design report

Observations: North Side Toilet block

Connection found between two structures

Observations: Wastage Room and Fire Command Room

Connection observed between two structures

Connection observed between tow structures. Building engineer is required to investigate the connection and update as-built drawing accordingly.

Observations: Wastage Room and Fire Command Room

Lack of structural drawing

Observations: Boiler Room, Wastage Room, Fire Command Room

Boiler Room

Wastage Room and Fire Command Room

As-built structural drawing was not available for any of the structures. Building engineer is required to produce As-built structural drawing for all of these structures.

Observations: Boiler Room, Wastage Room, Fire Command Room

Problems Observed

New Admin Building:

Item 01: Lack of justification for considering intermediate moment resisting frame

Dry Process Building:

Item 02: Load plan needs to revise

Item 03: Column size of below GL is larger than above GL in column schedule

Item 04: Apparently inadequate connection

Six Storied Store Building:

Item 05: Design report needs to be updated.

Compressor Building:

Item 06: Design report needs to be updated.

North Side Toile Block:

Item 7: Punching capacity of foundation not provided in design report.

Wastage Room and Fire Command Room:

Item 8: Connection found between two structures

Boiler Room, Wastage Room, Fire Command Room:

Item 9: Lack of structural drawing

Priority Actions

Item No.	Observation	Recommended Action Plan	Recommended Timeline
01	Lack of justification for considering intermediate moment resisting frame (New Admin Building)	Building engineer is required to provide supporting calculation for consideration of intermediate moment frame co-efficient and revise the design documents accordingly.	6-weeks
02	Lack of justification for considering intermediate moment resisting frame (New Admin Building)	Carry out remedial works if required.	6-months
03	Load plan needs to be revised. (Dry Process Building)	Factory the factory engineer is required to revise the load plan as per BNBC requirement and check the design accordingly.	6-weeks
04	Load plan needs to be revised. (Dry Process Building)	Building engineer is required to revise the design report incorporating all irregularities including reentrant corner.	6-weeks

Item No.	Observation	Recommended Action Plan	Recommended Timeline
05	Load plan needs to be revised. (Dry Process Building)	Carry out suggested remedial work if required.	6-months
06	Column size of below GL is larger than above GL in column schedule (Dry Process Building)	Building engineer is required to investigate for the column size below plinth level and update the column schedule accordingly.	6-weeks
07	Apparently inadequate connection (Dry Process Building-Stair Roof Shed)	Building engineer is required to check the connection adequacy for uplift forces.	6-weeks
08	Apparently inadequate connection (Dry Process Building-Stair Roof Shed)	Implement suggested remediation works.	6-months
09	Design report needs to be updated. (Six Storied Store Building)	Building engineer is required to check the pile capacity as per in-situ soil bearing capacity.	6-weeks

Item No.	Observation	Recommended Action Plan	Recommended Timeline
10	Design report needs to be updated. (Six Storied Store Building)	Building engineer is required to update the design report as per 1.9.1.1 of BNBC including the slab adequacy check.	6-weeks
11	Design report needs to be updated. (Six Storied Store Building)	Carry out suggested remedial work if required.	6-months
12	Design report needs to be updated. (Compressor Building)	Building engineer is required to revised the design report as per BNBC-2020 considering actual site classification and framing system.	6-weeks
13	Design report needs to be updated. (Compressor Building)	Carry out suggested remedial work if required.	6-months
14	Punching capacity of foundation not provided in design report. (North Side Toilet block)	Building engineer is required to incorporate the punching check in the design report and revise the report in compliance with BNBC 1.9.1.1.	6-weeks

Item No.	Observation	Recommended Action Plan	Recommended Timeline
15	Punching capacity of foundation not provided in design report. (North Side Toilet block)	Carry out suggested remedial work if required.	6-months
16	Connection found between two structures (Wastage Room and Fire Command Room)	Building engineer is required to update the as-built drawing.	6-weeks
17	Lack of structural drawing (Boiler Room, Wastage Room, Fire Command Room)	Building engineer is required to produce as-built structural drawing.	6-weeks

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.