Square Denims Limited (Garments Unit) (Extension)

Dubaliapara, Zamirdia, Bhaluka, Mymensingh

(24.295085, 90.374068)

26 December 2024

Structural Inspection Report

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1. Building Information

1) **Building-3 (Washing Building):** The building is a five-storied (G+M+4) reinforced concrete (RC) structure.

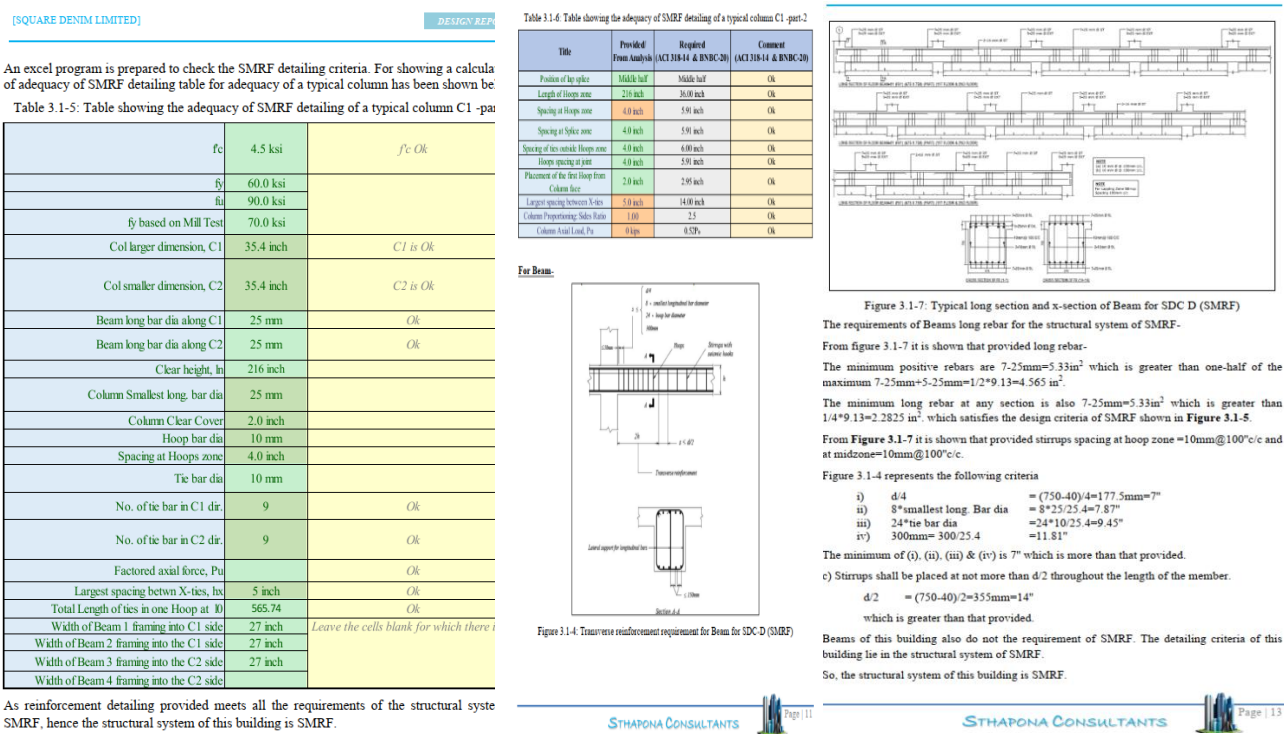
2) **ETP:** The ETP structure consists of two parts (Part-A: ETP Service Building and Part-B: ETP tanks). The Service building is a two-storied (G+1) reinforced concrete (RC) structure which is structurally separated from the ETP tank.

3) **Process Water Tank:** The building is a single-storied reinforced concrete structure with a basement.

4) **RMS:** The structure is a single-storied steel shed.

2. Observations:

Observation-1: Lack of information for the SMF detailing in the design report (Building-3 Washing Building).



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An excel program is prepared to check the SMRF detailing criteria. For showing a calcula of adequacy of SMRF detailing table for adequacy of a typical column has been shown be

Table 3.1-5: Table showing the adequacy of SMRF detailing of a typical column C1 -pa

f'c	4.5 ksi	*f'c Ok*
fy	60.0 ksi	
fu	90.0 ksi	
fy based on Mill Test	70.0 ksi	
Col larger dimension, C1	35.4 inch	*C1 is Ok*
Col smaller dimension, C2	35.4 inch	*C2 is Ok*
Beam long bar dia along C1	25 mm	*Ok*
Beam long bar dia along C2	25 mm	*Ok*
Clear height, ln	216 inch	
Column Smallest long. bar dia	25 mm	
Column Clear Cover	2.0 inch	
Hoop bar dia	10 mm	
Spacing at Hoops zone	4.0 inch	
Tie bar dia	10 mm	
No. of tie bar in C1 dir.	9	*Ok*
No. of tie bar in C2 dir.	9	*Ok*
Factored axial force, Pu		*Ok*
Largest spacing betwn X-ties, hx	5 inch	*Ok*
Total Length of ties in one Hoop at l0	565.74	*Ok*
Width of Beam 1 framing into C1 side	27 inch	*Leave the cells blank for which there i*
Width of Beam 2 framing into the C1 side	27 inch	
Width of Beam 3 framing into the C2 side	27 inch	
Width of Beam 4 framing into the C2 side		

As reinforcement detailing provided meets all the requirements of the structural syste SMRF, hence the structural system of this building is SMRF.

Table 3.1-6: Table showing the adequacy of SMRF detailing of a typical column C1 -part-2

Title	Provided From Analysis	Required (ACI 318-14 & BNBC-20)	Comment (ACI 318-14 & BNBC-20)
Position of lap splice	Middle half	Middle half	Ok
Length of Hoops zone	216 inch	36.00 inch	Ok
Spacing at Hoops zone	4.0 inch	5.91 inch	Ok
Spacing at Splice zone	4.0 inch	5.91 inch	Ok
Spacing of ties outside Hoops zone	4.0 inch	6.00 inch	Ok
Hoops spacing at joint	4.0 inch	5.91 inch	Ok
Placement of the first Hoop from Column face	2.0 inch	2.95 inch	Ok
Largest spacing between X-ties	5.0 inch	14.00 inch	Ok
Column Proportioning: Sides Ratio	1.00	2.5	Ok
Column Axial Load, Pu	0 kips	0.5Pb	Ok

For Beam-

Figure 3.1-4: Transverse reinforcement requirement for Beam for SDC-D (SMRF)

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Figure 3.1-7: Typical long section and x-section of Beam for SDC D (SMRF)

The requirements of Beams long rebar for the structural system of SMRF-

From figure 3.1-7 it is shown that provided long rebar-

The minimum positive rebars are 7-25mm=5.33in^2 which is greater than one-half of the maximum 7-25mm+5-25mm=1/2*9.13=4.565 in^2.

The minimum long rebar at any section is also 7-25mm=5.33in^2 which is greater than 1/4*9.13=2.2825 in^2. which satisfies the design criteria of SMRF shown in **Figure 3.1-5**.

From **Figure 3.1-7** it is shown that provided stirrups spacing at hoop zone =10mm@100"c/c and at midzone=10mm@100"c/c.

Figure 3.1-4 represents the following criteria

i) d/4 = (750-40)/4=177.5mm=7"
ii) 8*smallest long. Bar dia = 8*25/25.4=7.87"
iii) 24*tie bar dia =24*10/25.4=9.45"
iv) 300mm= 300/25.4 =11.81"

The minimum of (i), (ii), (iii) & (iv) is 7" which is more than that provided.

c) Stirrups shall be placed at not more than d/2 throughout the length of the member.

d/2 = (750-40)/2=355mm=14"

which is greater than that provided.

Beams of this building also do not the requirement of SMRF. The detailing criteria of this building lie in the structural system of SMRF.

So, the structural system of this building is SMRF.

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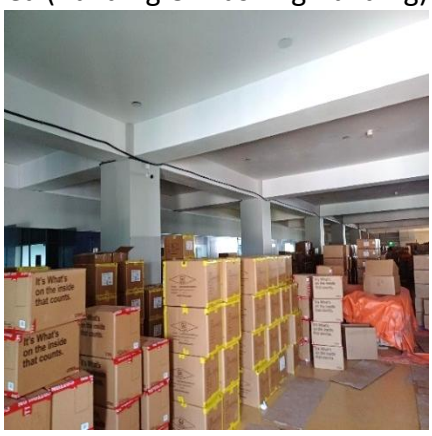
<u>SMF detailing checks provided in the design report</u>

Description: The building engineer has prepared the design report based on Special Reinforced Concrete Moment Frames (SMF). However, several key detailing checks have not been adequately addressed in the report as per BNBC 2020 Part VI, Section 8.3.
The building engineer must ensure the check in compliance with all SMF detailing requirements outlined in BNBC 2020 Sections 8.3.4, 8.3.5, 8.3.7, 8.3.8, and 8.3.11. These checks should be verified and incorporated into the design report to ensure full alignment with the code provisions.

Observation-2: Lack of information in as-built drawing (Building-3 Washing Building).

Description: During inspection, floor raises, and false ceiling were found in the toilet zone which were not mentioned in the drawing. The building engineer is required to survey the structure and update the accurate as-built drawing as per actual site condition.

Observation-3: Lack of height marking in the storage area (Building-3 Washing Building).

Description: Load restriction height marking was not provided in the storage areas. The factory is required to provide load restriction height marking in the storage areas as per the floor loading capacity and compliance requirement.

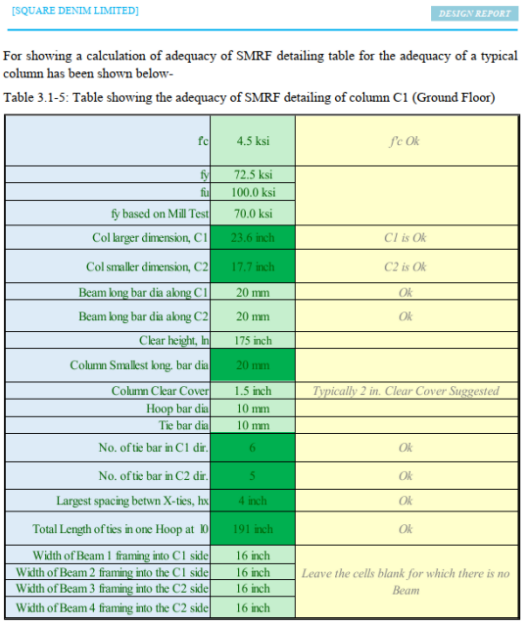
Observation-4: Lack of anchorage of the non-structural elements (Building-3 Washing Building).


Description: The anchorage of ground floor storage rack was missing. Non-structural elements suspended from, attached to, or resting atop the structure shall be adequately anchored and braced to resist earthquake forces. The factory is required to brace/anchor all storage racks.

Observation-5: Possible falling hazard at the loading-unloading zone (Building-3 Washing Building).

Description: During the inspection, it was noted that the elevated loading-unloading platform lacked railings or barriers at its edges, creating a potential falling hazard. The factory is required to install appropriate safety barriers or railings to mitigate the risk of falls and ensure compliance with safety standards.

Observation-6: Lack of information for the SMF detailing and structural irregularity checks in the design report. (ETP Service Building).



[SQUARE DENIM LIMITED] DESIGN REPORT

For showing a calculation of adequacy of SMRF detailing table for the adequacy of a typical column has been shown below-

Table 3.1-5: Table showing the adequacy of SMRF detailing of column C1 (Ground Floor)

f'c	4.5 ksi	*f'c Ok*
fy	72.5 ksi	
fu	100.0 ksi	
fy based on Mill Test	70.0 ksi	
Col larger dimension, C1	23.6 inch	*C1 is Ok*
Col smaller dimension, C2	17.7 inch	*C2 is Ok*
Beam long bar dia along C1	20 mm	*Ok*
Beam long bar dia along C2	20 mm	*Ok*
Clear height, ln	175 inch	
Column Smallest long. bar dia	20 mm	
Column Clear Cover	1.5 inch	*Typically 2 in. Clear Cover Suggested*
Hoop bar dia	10 mm	
Tie bar dia	10 mm	
No. of tie bar in C1 dir.	6	*Ok*
No. of tie bar in C2 dir.	5	*Ok*
Largest spacing betwn X-ties, hx	4 inch	*Ok*
Total Length of ties in one Hoop at l0	191 inch	*Ok*
Width of Beam 1 framing into C1 side	16 inch	*Leave the cells blank for which there is no Beam*
Width of Beam 2 framing into the C1 side	16 inch	
Width of Beam 3 framing into the C2 side	16 inch	
Width of Beam 4 framing into the C2 side	16 inch	

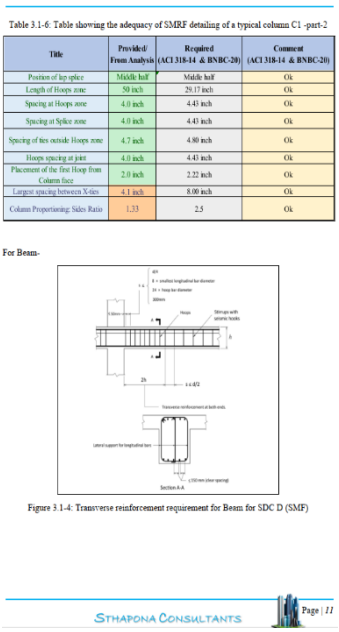


Table 3.1-6: Table showing the adequacy of SMRF detailing of a typical column C1 -part-2

Title	Provided/ From Analysis	Required (ACI 318-14 & BNBC-20)	Comment (ACI 318-14 & BNBC-20)
Position of lap splice	Middle half	Middle half	Ok
Length of Hoops zone	50 inch	29.17 inch	Ok
Spacing at Hoops zone	4.0 inch	4.43 inch	Ok
Spacing at Splice zone	4.0 inch	4.43 inch	Ok
Spacing of ties outside Hoops zone	4.7 inch	4.80 inch	Ok
Hoops spacing at joint	4.0 inch	4.43 inch	Ok
Placement of the first Hoop from Column face	2.0 inch	2.22 inch	Ok
Largest spacing between X-ties	4.1 inch	8.00 inch	Ok
Column Proportioning: Sides Ratio	1.33	2.5	Ok

For Beam-

Figure 3.1-4: Transverse reinforcement requirement for Beam for SDC D (SMF)

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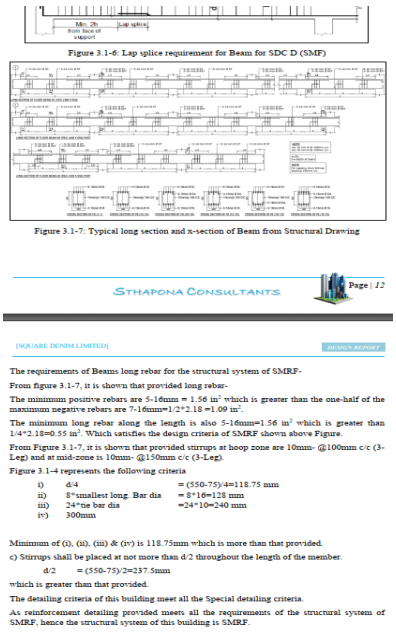

Figure 3.1-6: Lap splice requirement for Beam for SDC D (SMF)

Figure 3.1-7: Typical long section and x-section of Beam from Structural Drawing

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The requirements of Beams long rebar for the structural system of SMRF-

From figure 3.1-7, it is shown that provided long rebar-

The minimum positive rebars are 5-16mm = 1.56 in^2 which is greater than the one-half of the maximum negative rebars are 7-16mm=1/2*2.18 =1.09 in^2.

The minimum long rebar along the length is also 5-16mm=1.56 in^2 which is greater than 1/4*2.18=0.55 in^2. Which satisfies the design criteria of SMRF shown above Figure.

From Figure 3.1-7, it is shown that provided stirrups at hoop zone are 10mm- @100mm c/c (3-Leg) and at mid-zone is 10mm- @150mm c/c (3-Leg).

Figure 3.1-4 represents the following criteria

i) d/4 = (550-75)/4=118.75 mm
ii) 8*smallest long. Bar dia =8*16=128 mm
iii) 24*tie bar dia =24*10=240 mm
iv) 300mm

Minimum of (i), (ii), (iii) & (iv) is 118.75mm which is more than that provided.

c) Stirrups shall be placed at not more than d/2 throughout the length of the member.

d/2 = (550-75)/2=237.5mm

which is greater than that provided.

The detailing criteria of this building meet all the Special detailing criteria.

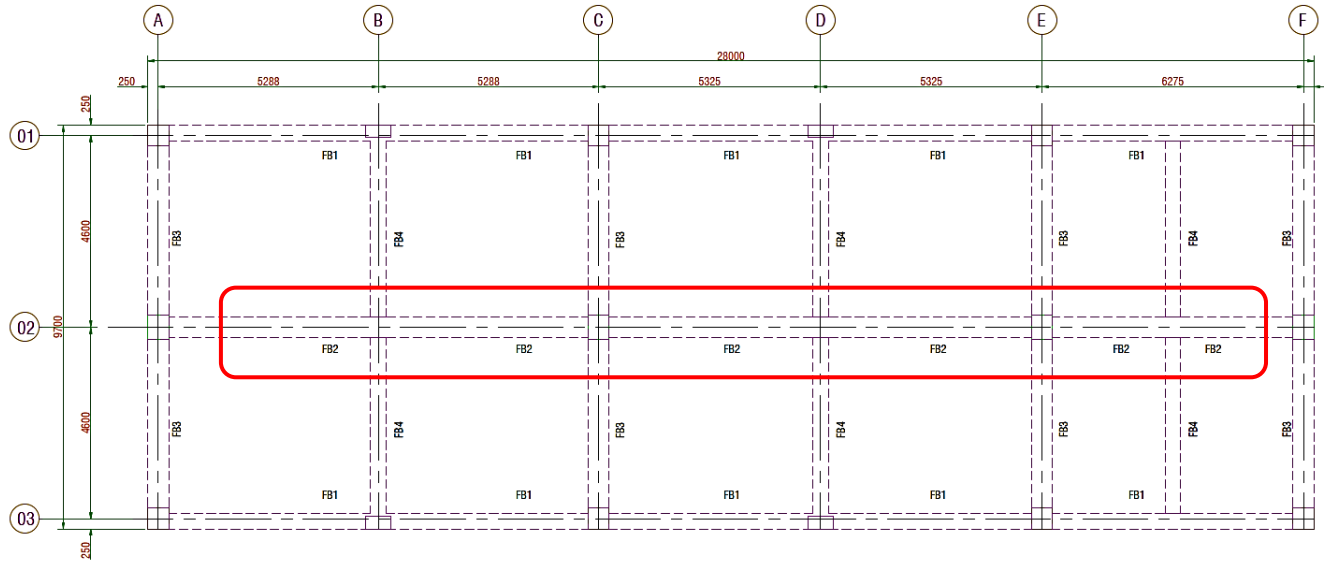
As reinforcement detailing provided meets all the requirements of the structural system of SMRF, hence the structural system of this building is SMRF.

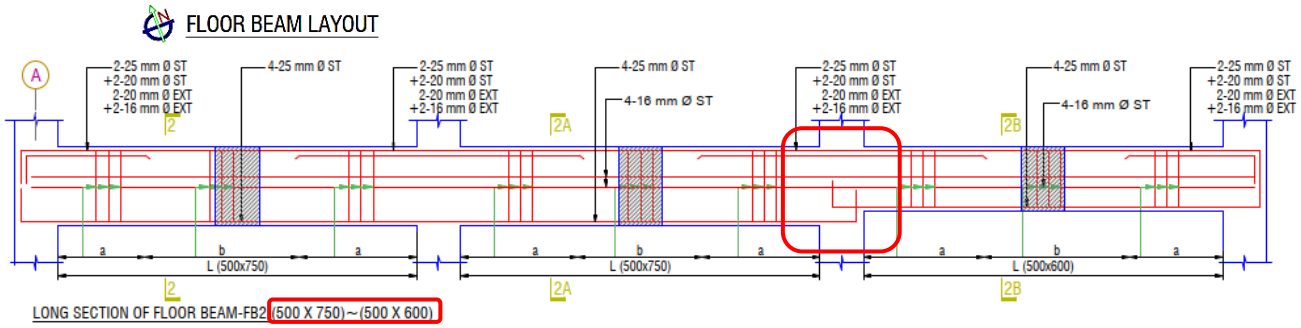
SMF detailing checks in the design report

Description: The building engineer has prepared the design report based on Special Reinforced Concrete Moment Frames (SMF). However, several key detailing checks have not been adequately addressed in the report as per BNBC 2020 Part VI, Section 8.3. Apparently the two-storied ETP building has irregular shape. In the irregularity check section, the building engineer has not incorporated all horizontal and vertical irregularity checks as BNBC 2020 Table 6.1.4 and 6.1.5.

The building engineer must ensure the check in compliance with all SMF detailing requirements outlined in BNBC 2020 Sections 8.3.4, 8.3.5, 8.3.7, 8.3.8, & 8.3.11 and all irregularities checks as per BNBC 2020 section 1.3.4.2. These checks should be verified and incorporated into the design report to ensure full alignment with the code provisions.

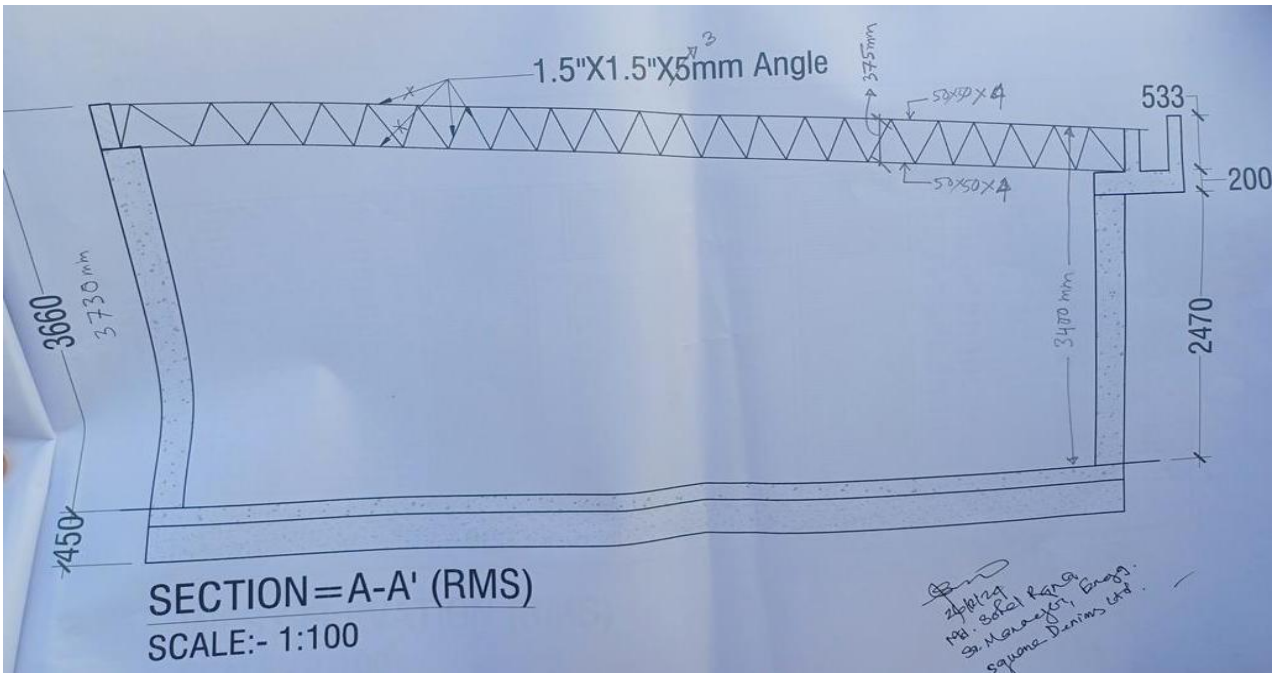
Observation-7: Mismatch between as-built drawing and onsite condition (Process Water Tank).





Description: During inspection, mismatch was found between the provided as-built drawing and actual site condition. The depth of the roof beam FB2 was found 500 X 600 instead of (500 X 750) in two spans. The building engineer is required to survey the structure and update the accurate as-built drawing as per actual site condition.

Observation-8: Mismatch and lack of information in provided drawing (RMS).



Description: During inspection, mismatch and lack of information were observed between the provided drawing and actual site condition. The size of truss member differed with provided drawing- top and bottom chords found L-50x50x4 instead of L-38x38x4. The elevation heights were measured as 3.73 m & 3.4 m, where drawing shown 3.6 m and 3.2 m respectively. Additionally, the drawings lacked information on the truss depth and vertical chord dimensions, foundation, and RC columns were inaccurately shown as masonry columns in the provided drawing.

The building engineer is required to survey the whole structure and prepare accurate as-built drawing as per actual site condition.

Observation-9: Absence of bracing system (RMS Shed).

Description: Roof truss system observed along the north-south direction. No bracing or strut member observed in the east-west direction.

The building engineer is required to suggest adequate size of roof bracing and strut member. Submit the design of bracing system as part of safety check report to RSC for review.

3. Action Plan:

Item No	Observation	Action Plan	Timeline
1.	Lack of information for the SMF detailing in the design report (Building-3).	The building engineer is required to incorporate all the SMF detailing and requirements as per BNBC 2020 in the design report. Submit the revised design documents to RSC for review.	within 6 weeks
2.		Carry out remedial work if required.	within 6 months
3.	Lack of information in as-built drawing (Building-3)	The building engineer is required to survey the whole structure and update the as-built drawing reflecting actual site condition.	within 6 weeks
4.	Lack of height marking in the storage area (Building-3).	The factory is required to provide load restriction height marking in the storage areas as per the floor loading capacity and compliance requirement.	within 6 weeks
5.	Anchorage of the non-structural elements (Building-3).	The factory is required to brace/anchor all storage racks.	within 6 months
6.	Possible falling hazard at the loading-unloading zone (Building-3).	The factory is required to install appropriate safety barriers or railings to mitigate the risk of falling and ensure compliance with safety standards.	within 6 weeks
7.	Lack of information for the SMF detailing and structural irregularity checks in the design report (ETP Service Building).	The building engineer is required to incorporate all the SMF detailing and irregularity checks as per BNBC 2020 in the design report. Submit the revised design documents to RSC for review.	within 6 weeks
8.		Carry out remedial work if required.	within 6 months
9.	Mismatch between as-built drawing and onsite condition (Process Water Tank).	The building engineer is required to survey the structure and update the accurate as-built drawing as per actual site condition.	within 6 weeks
10.	Mismatch and lack of information in provided drawing (RMS).	The building engineer is required to survey the whole structure and prepare accurate as-built drawing as per actual site condition.	within 6 weeks
11.	Absence of bracing system (RMS Shed).	The building engineer is required to suggest adequate size of roof bracing and strut member. Submit the design of bracing system as part of safety check report to RSC for review.	within 6 weeks