

Arunima Sportswear Ltd (Extension)

Holding-08/63/4, Road No-01, Ward-08, Block-D, Zirabo, Ashulia, Savar, Dhaka

Geographic Coordinates: (23.913481, 90.310511)

27 August 2023



Building Information

1. Block-B (Single Storied Compressor & Office building): This structure is a single storied RC building.
2. Block-E (Single Storied boiler & Generator shed): This structure is a single storied steel shed.
3. Block-G (Single storied store shed): This structure is a single storied steel shed.
4. Block-H2 (Single storied day care & medical shed): This structure is a single storied steel shed.
5. Block-L (Fire pump room): This structure is a single storied RC building.
6. Block-N2 (Security room): This structure is a single storied RC building.
7. Block-P (Underground water tank): This structure is a RC structure.

Observations

Lack of lateral stability



No load transfer media/roof bracing is provided



Eccentric vertical bracing

Stability is provided only by frame action and vertical bracing in some locations. However, roof bracing and load transfer media are not provided from frame to frame to transfer the lateral load therefore lateral stability system of the shed is apparently incomplete. Building engineer is required to check the lateral stability system of the structure and suggest necessary remedial actions accordingly.

Corrosion on steel member



Corrosion found in steel members at several locations. Building engineer is required to identify all corroded member, remove the corrosion and apply suitable anti-corrosive coating to the affected steel members.

Inconsistencies in design report & inadequate structural members

3.4.4 Earthquake Load (E)

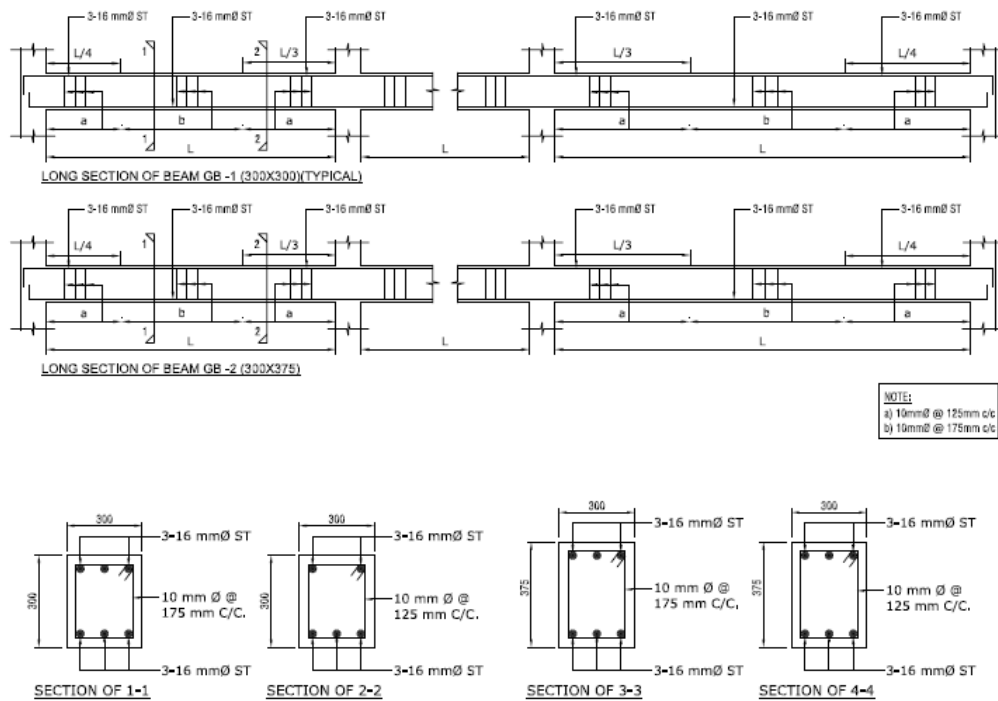
Proper structural design of any building structure must include loads due to earthquake shaking. Although there has been no major incident of earthquake hazard in the recent past of Bangladesh, earthquakes are not uncommon in this area. Scientific geological study of the earth crust below Bangladesh shows that Bangladesh does fall in moderate to high seismic risk zone. Statistical evidence from past major and minor earthquake incidents shows that a major earthquake is overdue in the recent times of geological scale. Therefore, it is necessary to prepare against any possible earthquake hazard. It should be kept in mind that the objective of earthquake resistance building design is not to make a strong building which can resist any damage due to earthquake. Instead, earthquake resistant design basically aims at minimizing the possible damage and casualty to an acceptable level.

Regarding the earthquake resistant structural design, it is essential that the specific design code is followed. For the analysis and design of this building, Equivalent Static Force Method of BNBC (2020) is followed. The main considerations for calculation of earthquake load are given below.

- ❖ Zone co-efficient, $Z = 0.20$ (zone 2, As Per BNBC 2020)
- ❖ Structure importance co-efficient, $I = 1.00$ (Standard Occupancy, Table 6.2.17, BNBC)
- ❖ Response modification co-efficient, R (For Steel) = 6.0 (Table 6.2.19, BNBC)
- ❖ Site co-efficient, $F_a = 1.35$, $F_v = 2.7$ (type 4 soil as suggested in Table 6.C.2, BNBC)
- ❖ Spectral response acceleration parameter, $S_s = 0.5$, $S_1 = 0.2$ (For Zone-2 in Table 6.C.1)

Detail seismic load calculation not included in the design report.

Response modification co-efficient factor R considered for Special steel concentrically braced frames, but no calculation provided in the design report.



In grade beam adequacy check the provided existing top rebar shows 1.33 in². However, the as-built drawing shows 0.933 in². Building engineer is required to review the design of marginally overstressed grade beams.

Table 4.2.3.1: Grade Beam Adequacy Check

Beam Id	Grade beam Dimension (in)	Existing Rebar (in ²) Support Section	Existing Rebar (in ²) Mid-Section	Required Rebar (in ²) Support Section	Required Rebar (in ²) Mid-Section	Comp
150	12x12	1.33	0.93	1.00	0.60	ok
154	12x12	1.33	0.93	1.00	0.60	ok
147	12x12	1.33	0.93	0.93	0.60	ok

5.2 CHECKING ADEQUACY OF RCC MEMBERS

5.2.1 Footing adequacy check

As per soil test report minimum bearing capacity of 2.0 Ksf has considered for checks the footings.

Table 5.2.1.1: Support Reaction Chart Due to DL+LL+LR

Node	Axial Force (Kip)	Required Area (Sft)	Provided Area (Sft)	Comp	Node	Axial Force (Kip)	Required Area (Sft)	Existing Area (Sft)	Comp
74	25	12.50	25.00	ok	82	30	15.00	25.00	ok
77	25	12.50	25.00	ok	83	30	15.00	25.00	ok
94	25	12.50	25.00	ok	86	30	15.00	25.00	ok
97	25	12.50	25.00	ok	87	30	15.00	25.00	ok
75	31	15.50	25.00	ok	79	23	11.50	25.00	ok
76	31	15.50	25.00	ok	80	23	11.50	25.00	ok
95	31	15.50	25.00	ok	84	23	11.50	25.00	ok
96	31	15.50	25.00	ok	85	23	11.50	25.00	ok
78	30	15.00	25.00	ok	88	23	11.50	25.00	ok

Single Storied Store Shed (Block-G)

DESIGN REPORT

After retrofitting foundation adequacy check shows several foundation have FoS below 2 considering the minimum bearing capacity of soil 2 ksf.

Punching check of foundation not included in design report.

S T P L

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81	30	15.00	25.00	ok	89	23	11.50	25.00	ok
90	30	15.00	25.00	ok	92	23	11.50	25.00	ok
91	30	15.00	25.00	ok	93	23	11.50	25.00	ok

EXECUTIVE SUMMARY

This Block-G Single Storied Store Shed of ARUNIMA SPORTS WEARS LIMITED. is located at Holding# 08/63/4, Road# 01, Ward# 08, Block# D, Zirabo, Ashuliya, Savar, Dhaka-1341, Bangladesh.

The authority of Arunima Sports Wears Limited. has engaged Steeltech Products Limited. for performing Structural analysis & design along with preparation of structural drawing and design report of the building.

Considering BNBC-2020 referred loading, we have analyzed the structure & found some member is inadequate. After retrofit all the members are adequate.

Column Capacity: All columns are adequate.

Beam Capacity: All beams are adequate.

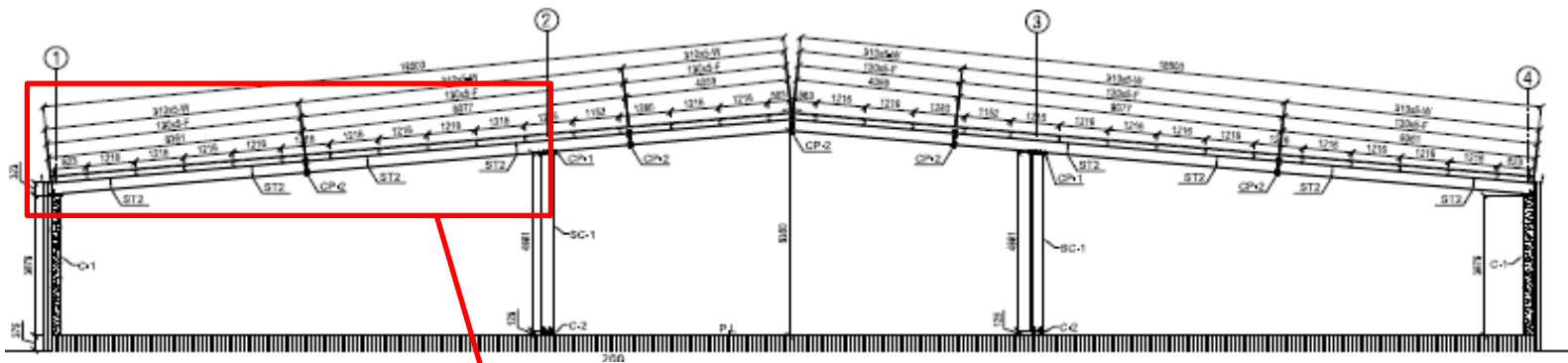
Foundation Capacity: All base is adequate.

Deflection: All the beams are within the deflection limit.

Horizontal Sway: The Horizontal sway of the building is within the acceptable limit.

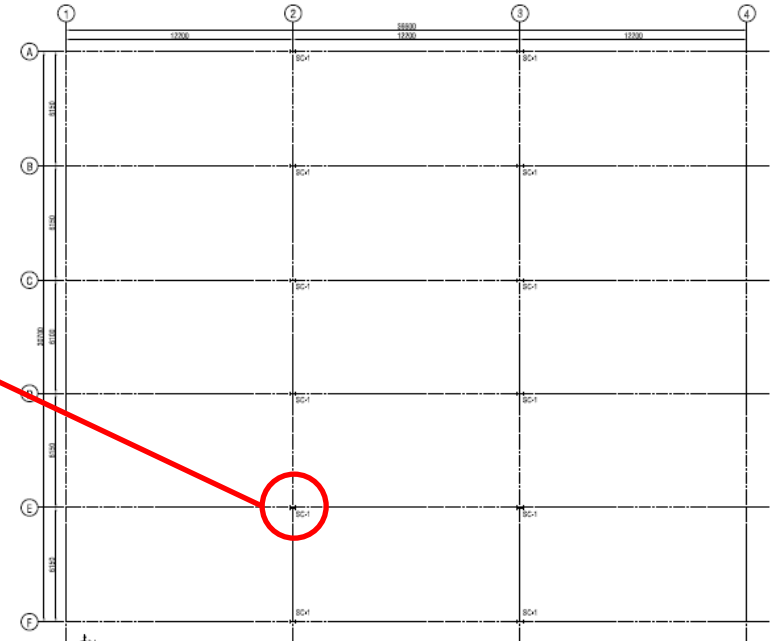
Story Displacement: The story displacement due to lateral loading are adequate.

Detail calculation and adequacy check of lateral serviceability not included in the design report. Building engineer is required to check the lateral stability of the shed.



Unsupported long rafter

The rafter unsupported length is much higher considering the size of rafter section, which can cause local buckling failure in the rafter. The building Engineer is required to check the capacity of the rafter for local buckling failure.



Inadequate base plate connection

Column connection with base plate found apparently inadequate in grid E-2. Building Engineer is required to check the base plate connection with steel column.

Lack of lateral stability



No load transfer media/bracing system is provided

Stability is provided through frame action only and load transfer media/bracing system is not provided for the structure. Building engineer is required to check the lateral stability system of the structure.

Crack on retaining wall



Retaining Wall Crack

Crack observed in the retaining wall. Building engineer is required to investigate the reason of crack and repair as per suggestion of investigation report.

Problems Observed

Block E:

Item 01: Lack of lateral stability.

Item 02: Corrosion in steel member.

Block G :

Item 03: Inconsistencies in design report & inadequate structural members.

Block H2:

Item 04: Lack of lateral stability.

Block L:

Item 05: Crack on retaining wall.

Priority Actions

Item No.	Observation	Recommended Action Plan	Recommended Timeline
01	Lack of lateral stability (Block E- Single Storied Compressor & Office building)	Building engineer is required to check the lateral stability system of the structure.	6-weeks
02	Lack of lateral stability (Block E- Single Storied Compressor & Office building)	Carry out suggested remedial works if required.	6-months
03	Corrosion in steel member. (Block E- Single Storied Compressor & Office building)	Building is required to identify all corroded member, remove the corrosion and apply suitable anti-corrosive coating to the affected steel members.	6-weeks
04	Inconsistencies in design report & inadequate structural members. (Block G)	Building engineer is required to prepare the design report according to the BNBC 1.9 (Part VI).	6-weeks
05	Inconsistencies in design report & inadequate structural members. (Block G)	Building engineer is required to review the design of marginally overstressed grade beams & foundation.	6-weeks

Item No.	Observation	Recommended Action Plan	Recommended Timeline
06	Inconsistencies in design report & inadequate structural members. (Block G)	Building engineer is required to check the lateral stability of the shed.	6-weeks
07	Inconsistencies in design report & inadequate structural members. (Block G)	Building engineer is required to check the member and connection adequacy.	6-weeks
08	Inconsistencies in design report & inadequate structural members. (Block G)	Carry out suggested remedial works if required.	6-months
09	Lack of lateral stability (Block H2-Single storied day care & medical shed)	Building engineer is required to check the lateral stability system of the structure.	6-weeks
10	Lack of lateral stability (Block H2-Single storied day care & medical shed)	Carry out suggested remedial works if required.	6-months
11	Crack on retaining wall (Block L-Fire pump room).	Building engineer is required to investigate the reason of crack and repair as per suggestion of investigation report.	6-weeks