COLD STORAGE

DESIGN BASIS REPORT (DBR)

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CONTENTS

1. INTRODUCTION

This report covers the structural design basis for proposed construction of shed at Haryana

2. SALIENT FEATURES OF THE PROJECT

2.1 Site Location

The site is located in Haryana

2.2 Building Description

Project consists of following:

- Shed building: Ground floor, Mezzanine and steel truss. There are some portions of double height

2.3 Description of structure

Tubular Steel columns, N girder and composite beams at mezzanine floor +Tubular truss	Foundations – RCC Column Pedestals – RCC Plinth Beams – RCC
Description of the foundation for the building	Isolated/Combined foundation
Expansion/Separation joints provided around the building	Yes

2.4 Description of Superstructure

No. of Floors	Basement, Mezzanine and steel tubular truss
Plan Elevation, Whether Symmetric in Elevation	Symmetric on both axes.
Type of floor slab	Composite steel structure with metal deck Mezzanine floor, & roof sheeting with trusses at roof level.
Columns, beams and slabs	Columns– tubular steel Beams – composite beams with metal deck mezzanine floor

2.5 Building use and function

- **Ground Floor**: This area is used as storage godown
- **Terrace floor:** Non accessible terrace in steel structure

- **Shed**

Shed is divided into 2 blocks by expansion joint:

1. Left block
2. Right block

3. **REFERENCE CODES & STANDARDS**

The documents and Code of practices that would be considered in carrying out analysis and the design of the structure are as follows: -

Following Indian Standard codes, unless otherwise specified, would be used for analysis, design and construction of various structures.

IS: 456 – 2000	Code of practice for Plain & Reinforced concrete
IS: 800 –2007	Code of practice for General Construction in steel
IS: 875	Code of practice for design loads for Building Structure (Part I to V)
IS: 1893 - 2016	Criteria for earthquake resistant design of Structures
IS: 1786 - 2008	High Strength deformed bars & wires
IS: 1161 - 1998	Steel tubes for structural purposes
IS: 3370 - 2009	Code of practice for concrete structures for the Storage (Part I to IV) of liquids
IS: 13920 -2016	Ductile Detailing of Reinforced Concrete Structure subjected to Seismic Forces
IS: 2062 - 2011	Steel for general structural purposes
IS: 4326 – 1993	Code of practice Earthquake Resistant Design and Construction of Buildings
IS: 2911-1998	Code of Practice for Design and Construction of Pile Foundation
IS: 2950-1973	Code of Practice for Design and Construction of Raft Foundation
IS: 8009	Code of Practice for Calculation of Settlement of Foundation
IS: 6403-1981	Code of Practice for Determination of bearing Capacity of Shallow Foundation on Rock
SP: 16 -1997	Design Aids For Reinforced Concrete to IS: 456
SP: 20 -1981	Explanatory Handbook on Masonry Code.
SP: 22 -1982	Explanatory Handbook on Codes for Earthquake Engineering
SP: 34 -1987	Handbook on concrete reinforcement detailing
IS: 15988: 2013	Seismic Evaluations and Strengthening of Existing Reinforced Concrete Buildings — Guidelines
IS: 11384–1985	Code of practice for Composite construction in Structural steel and Concrete
IRC: 6-2017	Standard Specifications & Code of Practice for Road Bridges. Section II - Loads and Stresses
NBC: 2016	National Building code of India.

Wherever in addition to IS CODES other international codes/ literature will be referred, the same shall be marked in respective design notes.

4. Units

SI units shall be used in the entire analysis and design.

5. MATERIALS

The following materials shall be used for construction:

5.1 Structural Steel

Mild steel conforming to IS2062 as applicable M.S. tubular section ERW type (round, square or rectangular hollow tube sections) of Yst 310Grade conforming to IS 1161 / IS 4923. EPC designer can modify the grade of steel to Yst 355 if required.

M.S. rolled built up sections and plates of E250 BR Grade conforming to IS 2062

Fire protection shall be provided for Structural steel, wherever applicable as per provisions given in NBC 2016.

5.2 Reinforced Concrete

Minimum grade of concrete recommended as per moderate exposure condition is M 25, however considering the strength and durability issue it is proposed to go with M30 minimum grade wherever applicable & maximum grade M40 is proposed for structural purpose, which may increase depending on Structural requirement as found after detailed analysis and Design. For non- structural purposes M15 Lean concrete adopted. The specific Grade of concrete for various structural elements will be mentioned in respective drawing. Minimum cement content and water cement ratio of various structural elements shall be as per Table 5 of IS 456:2000. Design mix shall be done from IIT/NIT/CRRI only.

In general grade of concrete for various components are proposed as following and may need to be modified depending on Structural requirement as found after detailed analysis and Design:

- Columns
  From foundation to mezzanine floor level –M30/M35/M40
  Beam & Slab (For tie level and all floors) –M30

* At the junction of beams & columns, concrete grade of column for respective floor to be adopted.

5.3 Reinforcing Steel

High Yield Strength Deformed Bars (HYSD) Fe500D or more needs to be adopted.

- For Foundations, Columns and Beams
  Main reinforcement - dia. of bars greater than or equal to12mm. Stirrups & links-dia. of bars8mm, 10mm will be adopted.

- For Slab
  Main and Secondary reinforcement will be for dia. greater than or equal to 8 mm.

5.4 Material Properties

Young's Modulus of Elasticity:
For Structural Steel, $Es=2x10^5$ Mpa
For Concrete, $Ec=5000\sqrt{f}ck$ Mpa (IS456:2000)
Where, fck =28 days characteristic compressive strength of concrete in Mpa.

6. FIRE PROTECTION

Required criteria for Fire resistance compliance (for RCC and Structural steel) needs to be ensured by following various relevant guidelines/ codal provisions given in the Indian standards, NBC 2016 etc.

7. DESIGN LOADS

Summary of various loading considered based on available Architectural drawings and the functional areas mentioned in the same is mentioned below, However, the

magnitude / parameters mentioned are minimum / indicative and need to be re confirmed with respect to the relevant Indian standard provisions / guidelines.

7.1 Dead Load (hereinafter referred to as DL)

Dead load shall mean the total weight of structures and/or foundations, and all materials permanently attached there to or supported thereby. The unit weight of materials shall conform to IS 875 – Part - I.

The self weight of structure is automatically calculated by the analysis software depending upon the cross-sectional area and density of each member as follows.

Density of R.C.C Members = 25.0 kN/m^3

Density of Structural Steel = 78.5 kN/m^3

7.2 Super imposed dead load i.e. SIDL (Minimum)

- Floor Finish = 2.0 kN/m^2 (For 100mm of finish)

7.3 Live Loads (hereinafter referred to as LL)

Live loads shall mean the moving or movable external loads on structures, foundations and buildings produced by people, tools and furnishings of buildings etc. which are not permanently fixed thereto. These are applied as per IS 875 (Part II). Live load to be considered for all the structures is as follows.

- Floors = 6.0 kN/ m^2
- Staircase = 4.0 kN/ m2
- Roof Live load (Non-Accessible) = 0.75 kN/ m^2

7.4 Earthquake loads (hereinafter referred to as EQ)

As per IS 1893-2016 the structure is considered to be located in Zone iV (0.24 g Acceleration) of the seismic map of India.
The separate seismic analysis report (SAR) would be shared highlighting the findings based on the dynamic analysis carried out considering latest IS 1893:2016.

The following parameters are used for seismic design in all structures:

Zone factor Z	= 0.24
Importance factor, I	= 1.0
Response Reduction factor, R	= 5.0
Soil type	= II

The category of a building as per the IS 1893-2016 comes under SMRF i.e. Special R.C moment resisting frame.

The horizontal earthquake forces have been calculated for the full dead load & 50% of live load as applicable as per IS: 1893-2016.

The average response acceleration co-efficient taken is considering Hard soil with 5% damping. The design and detailing will be done as per the norms specified in the relevant codes applicable.i.e.IS 13920-2016.

All the above parameters need to be reconfirmed based on the framing system that is going tobe adopted and the geotechnical investigation to be conducted before execution.

7.5 Wind loads (here in after referred to as WL)

The wind loading will be as per IS 875(Part–3):2015 and the Basic wind pressure (Pz) shall be determined based on the following formulae:

$$Pz=0.6*(Vz)^2 \ N/m^2$$

Where,

V_z - Design wind speed at height z in m/s

$$Vz = (V_b \times k1 \times k2 \times k3 \times k4) \quad N/m^2$$

Where,

V_b- Basic wind speed m/sec – 50m/s (For haryana)

k1 - Risk Co-efficient factor for mean probable design life of structure (i.e.100 years) as minimum 1.06

k2 -Terrain, height and structure size factor depending on the terrain category (Terrain Category 2) (to be reconfirmed with height of structure at execution stage)

k3 - Topography factor i.e 1.0

k4 - Importance factor for cyclonic region i.e 1.0

The design wind pressure shall be determined by the following formulae:

$$P_d= K_d * K_a* K_c * P_z$$

Where,

K_d - Wind directionality factor

K_a - Area averaging factor

K_c - Combination factor

Considering the building elevation and configuration of roof, external coefficient & other parameters would be workout as per criteria given in IS 875 (part 3):2015, clause 7.3.3.2 and 7.3.3.3

In addition to the above, following guidelines needs to be followed:

Pressure coefficient for the local effects should be used for calculation of forces on local areas affecting roof sheeting, glass panels and individual claddings including their fixtures as per clause 7.3 of IS 875 (Part3)

8. LOADING COMBINATIONS

8.1 Types of loads

Unless otherwise specified as per the IS code guideline in the relevant IS codes, at least all the loads mentioned here, shall be considered in design:

DL	-	Dead load
LL	-	Live load
WL	-	Wind load
EQ	-	Earthquake load
TP	-	Temperature load
SHL	-	Shrinkage Load

8.2 Loading Combinations

Building, structure, foundations and all structural components are generally designed for the following load combinations and checked for the most critical combinations.

Load factors for concrete limit state design are specified in the following table and needs to be modified suitably for other load combinations for strength and serviceability criteria based on the relevant IS code guidelines:

Table 1.0

LOADS	ITEM		LIMIT LOAD FACTOR		
		Normal	Wind	EQ	Stability
Dead Load	DL	1.5	1.2	1.2	0.9 *1 5
Live Load	LL	***1.5	**1.2	**1.2	
Wind Load	WL		1.2		1.5
Seismic Load	EQ			1.2	1.5

* Value of 0.9 to be considered when stability against overturning or stress reversal is critical.

** For combination of gravity load with EQ / wind load appropriate reduction in live load is considered as per relevant code and no further reduction in live load is done while designing individual members.

***For gravity load design, criteria as per IS 875 part III for reduction in Live load are adopted.

9. APPROACH FOR STRUCTURAL ANALYSIS

Commercially available Software staad. prov8i shall be used for static and dynamic analysis.

10. FOUNDATION DESIGN

Soil Investigation report provided as part of bidding document shall be used as reference only and it is mandatory for the Contractor to conduct the Soil investigation for detailed design.