

# NATIONAL AWARD COMPETITION FOR STUDENTS 2022



**Civil/Structural Engineering Students  
For Best Innovative Structural Steel Design**

*Competition Theme :*

***Steel Intensive Archery Academy with Hostel***



**Institute for Steel Development & Growth**

## BRIEF OF NACS (C) 2022

### INTRODUCTION

Archery is one of India's most high-profile Olympic disciplines. Department of Sports under Ministry of Youth Affairs and Sports has identified 10 Olympic sports disciplines in which India has greater potential for excellence and winning medals. Promising young archers have made sure to leave no stone unturned in coming through the ranks in India to excel in the sport. Efforts for excelling in this event has become even more focused after India's recent success in Javelin throw during last Olympic. For the past two decades, the country has produced the finest archers for the world to see like Deepika Kumari, Lakshmi Rani Manjhi, Rimil Buriuli, Sanjeeva Singh, Limba Ram. On the whole, Archery is one of the disciplines shortlisted by Government of India in which there are fairly large number of events thereby increasing the potential number of medals that can be won by Indian sportspersons.

### APPOINTMENT AS CONSULTANT

Department of Sports, Government of Jharkhand intends to establish an international standard Archery range at Jamshedpur. The proposed archery range shall be made operational well before the ensuing 39th National Games to be held in Meghalaya so that promising archers from the state can practice and get acclimatized with the globally defined standards. The proposed shooting archery will have following facilities: Range for Indian round Archery, 50 bedded Sports hostel and a Gymnasium.

INSDAG wishes to provide the most economical and aesthetically pleasing schemes and all relevant design and detail drawings thereof, to Department of Sports, Government of Jharkhand. Considering that you have been appointed as a structural consultant for this project and have been asked to furnish a structural solution for "Steel Intensive Archery Academy with Hostel", the task is to prepare a report that should have the following scope:

1. Development of an Economical and Aesthetic structural scheme within the specified requirement.
2. Structural design engineering and Detail drawings for the developed structural scheme.
3. Bill of materials.

### FACILITIES

The client has specified the following requirements for the proposed project:

1.	Site Location	:	Jamshedpur
2.	Total Length of the Hostel Building	:	50.0m
3.	Total Length of Archery Shed		50.0m
4.	Width of Hostel Building		12.6 m
5.	Width of Archery Shed		7.50m
6.	Type of Archery Shed		<b>Cantilever, Open on 3 Sides (Front and two sides)</b>
7.	Hostel Building		Three (3) Storeyed
8.	Floor to floor height (Hostel Block)		3.0 m
9.	Clear Height of Archery Shed		2.5 m from PL
10.	Columns	:	Allowed only along LONGER SIDE periphery of the building
11.	Column Spacings		As per economical layout
12.	Floor Beams		<b>Steel Beams / Latticed Girders</b>
13.	Flooring		RCC / Profile Deck Sheet
14.	False Ceiling		At Archery Shed – 10 kg/sqm
15.	Walls of Hostel Building		Brickwalls / Lightweight Gypsum Board Panels/AAC Block
16.	Roof covering of Archery Shed	:	Colour Coated Steel Sheet
17.	Bracing		As per design, allowed at two ends only

Total Depth (including sheeting) of Cantilever Archery Shed along the LENGTH of the building shall not be more than 1.40 m

## DESIGN SCOPE

For designing the building, the following scope of work needs to be undertaken:

1. Layout Plan, Elevation and Sectional views should show the arrangement facilities provided.
  - d. Beams & Columns: Sections, such as MB/MC [refer IS 808, built-up sections or parallel flange sections ], Tubular Sections [refer IS 1161 and IS 4923 will be preferred.- latest versions to be used
  - e. Truss members: IS 808, IS 1161 and IS 4923 - latest versions to be used
2. Connections: All connections shall be either welded connection or bolted connection using mild steel or high tensile black bolts, turned bolts or HSFG bolts.
3. The design and detailing of the following items shall be done:
  - a. Analysis of the structure in 2D or 3D as applicable.
  - b. Foundation System
  - c. All Columns / trestles and Girders / Beams
  - d. All Truss members, Posts, Purlins and Girts
  - e. All Bracings, Struts and cables / steel ropes.
  - f. Connection designs for Critical joints
  - g. Any other members conceived in the scheme.
4. Bill of Materials: A bill of materials (in A4 sheet) should be prepared for all items under design scope to determine the quantity of materials required.

## EXCLUSIONS

Structural bearings for supports and all allied services like electrical fittings.

## DESIGN STANDARDS

### 1. Design

- Steel design - As per IS: 800 -2007 & NBC 2016 ( for latest revision)
- Concrete design - As per IS: 456 -2000
- Live load - As per IS: 875 Part 2 -1987
- Wind load - As per IS: 875 Part 3-2015
- Seismic load - As per IS: 1893 -2016

### 2. Material

- Rolled sections and plates - As per IS: 2062 – 2011
- SHS/RHS - As per IS: 4923 – 2017
- CHS - As per IS: 1161 – 2014

### 3. Welding

- Symbols for welding - As per IS: 813(Part 1) – 2018
- Weld joint details - As per IS: 9595 – 1996

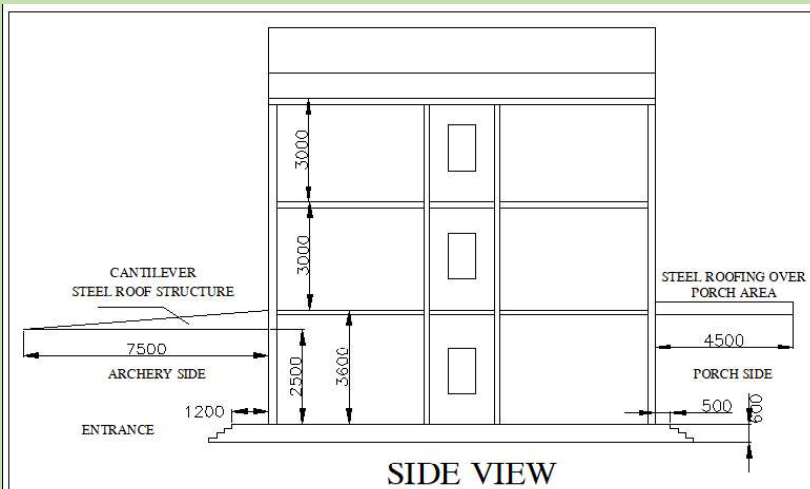
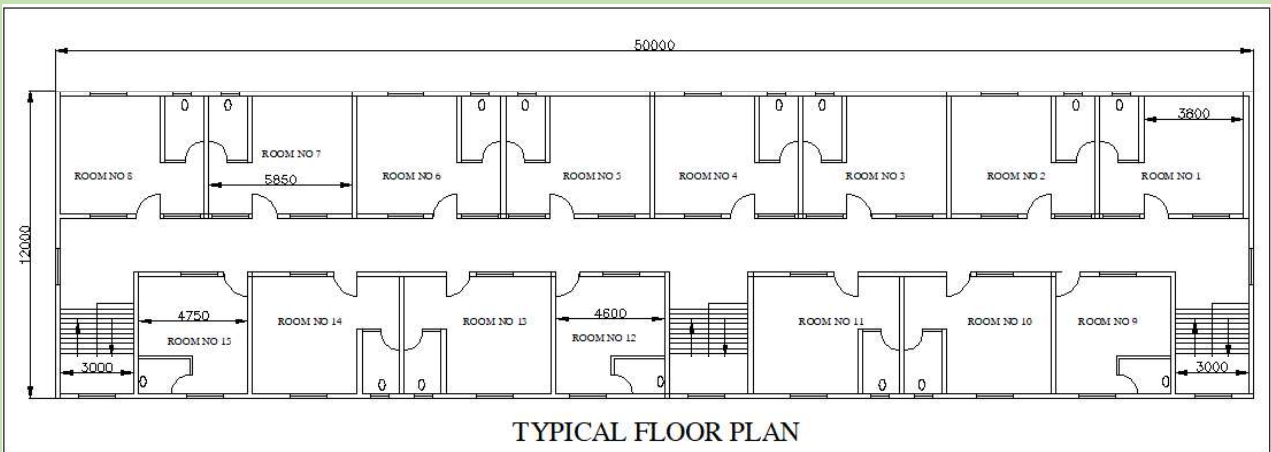
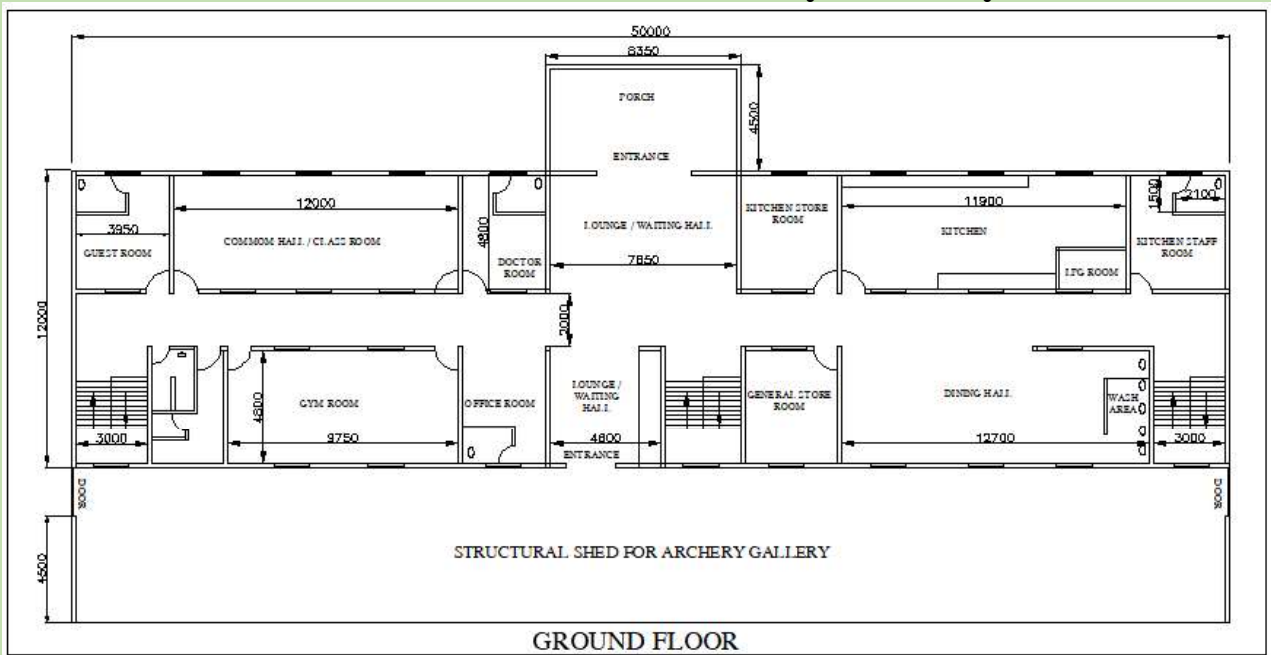
### 4. Fasteners

- High strength structural bolts - As per IS: 3757 – 1985 (Reaffirmed 2019) & IS: 4000 – 1992 (Reaffirmed 2017)
- Hexagon Head Bolt -As per IS: 1363 (Part 1)– 2019
- Foundation bolts - As per IS: 5624 – 1993

Visit us at [www.steel-insdag.org](http://www.steel-insdag.org)

The Announcement and the Brief of this year's Competition is also available at INSDAG website for free downloading.

# Schematic Plan for Steel Intensive Archery Academy with Hostel



## Checklist for Submission

Sl No	Description
1	Content page for report and all submissions
2	All pages and drawings are to be numbered
3	All soft copies are submitted on a CD (i.e., drawings, input and output files of analysis, excel spreadsheets for design checks etc.)
4	Hard copy report along with all required drawings.
5	Bonafide certificate in hard copy
6	Student details along with photos in soft copy.

**YEAR – 2022**

**COMPETITION TOPIC:**

**STEEL INTENSIVE ARCHERY ACADEMY WITH HOSTEL**

**DESIGN OPTION**

**BY**

**1ST Prize Winner – Team W-04**

**from**

**L.D. College of Engineering, Ahmedabad, Gujarat**



# INSDAG

INSTITUTE FOR STEEL  
DEVELOPMENT AND GROWTH



## STEEL INTENSIVE ARCHERY ACADEMY WITH HOSTEL

PREPARED BY:- W-04

CHINTAN MAKWANA (2<sup>ND</sup> YEAR, ME-SE)  
SUSHIL PATEL (4<sup>TH</sup> YEAR, BE-CE)  
ARVI PRAJAPATI (4<sup>TH</sup> YEAR, BE-CE)  
CHANDRESH NAINA (2<sup>TH</sup> YEAR, ME-CE)

GUIDED BY:-

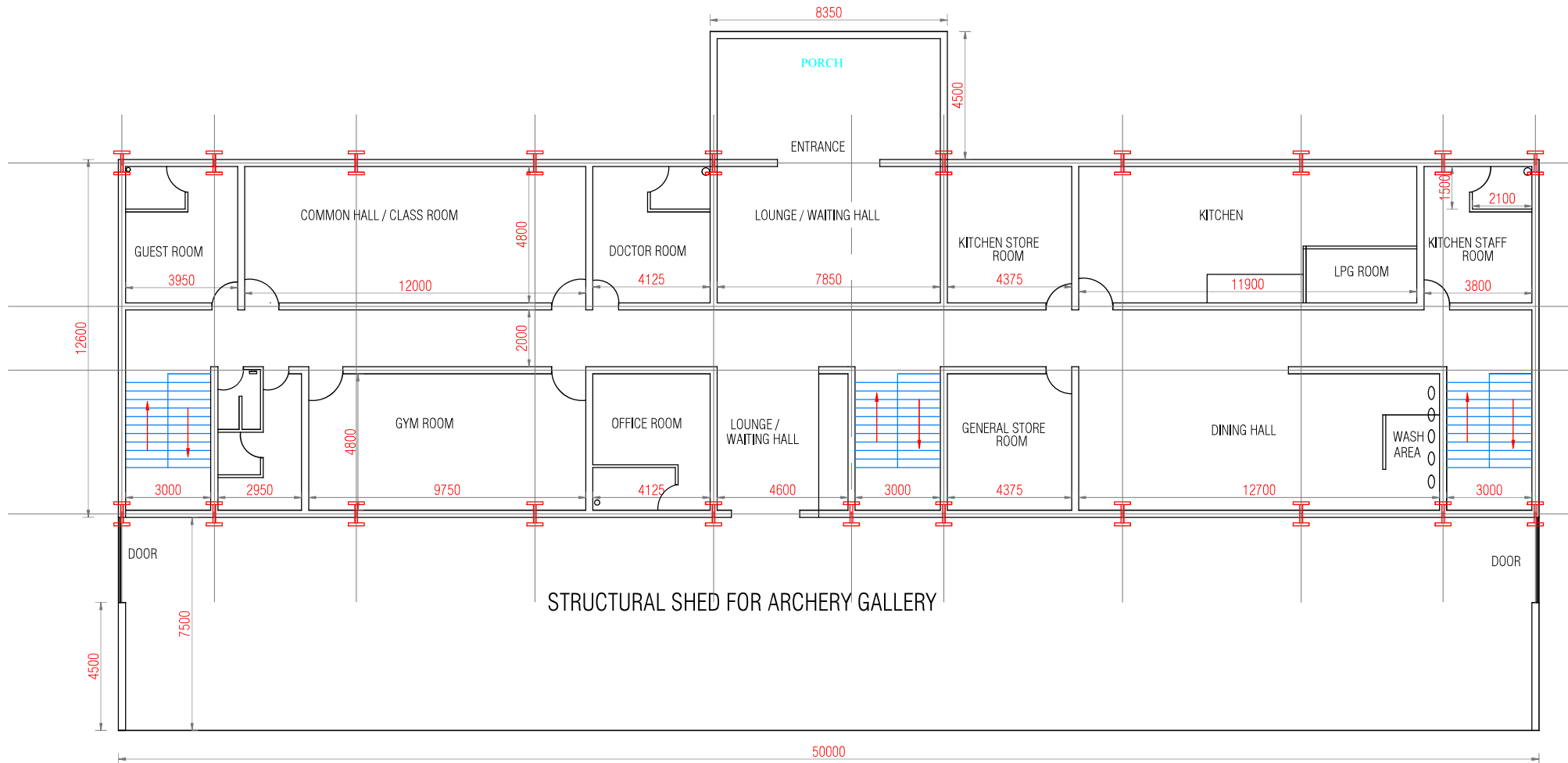
PROF. CHINTAN D. PATEL  
Assistant Professor  
Applied Mechanics Department,  
L.D. College of Engineering,  
Ahmedabad, Gujarat

L. D. COLLEGE OF ENGINEERING, AHMEDABAD, GUJARAT



## PARAMETERS GIVEN

SR NO.	DISCRIPTION	SPECIFIED
1	Site Location	Jamshedpur, Jharkhand
2	Total Length of the Hostel Building & Archery Shed	50.0m
3	Width of Hostel Building	12.6 m
4	Width of Archery Shed	7.50m
5	Type of Archery Shed	Cantilever, Open on 3 Sides (Front and two sides)
6	Floor-to-floor height (Hostel Block)	3.0 m
7	Clear Height of Archery Shed	2.5 m from PL
8	Columns	Allowed only along LONGER SIDE periphery of the building
9	Column Spacings	As per economical layout
10	Floor Beams	Steel Beams / Latticed Girders
11	Flooring	RCC / Profile Deck Sheet
12	False Ceiling	At Archery Shed — 10 kg/sqm
13	Walls of Hostel Building	Brick walls / Lightweight Gypsum Board Panels/AAC Block
14	Roof covering of Archery Shed	Colour Coated Steel Sheet
15	Bracing	As per the design, allowed at two ends only
16	Depth of the Cantilever Archery Shed	Not be more than 1.40 m

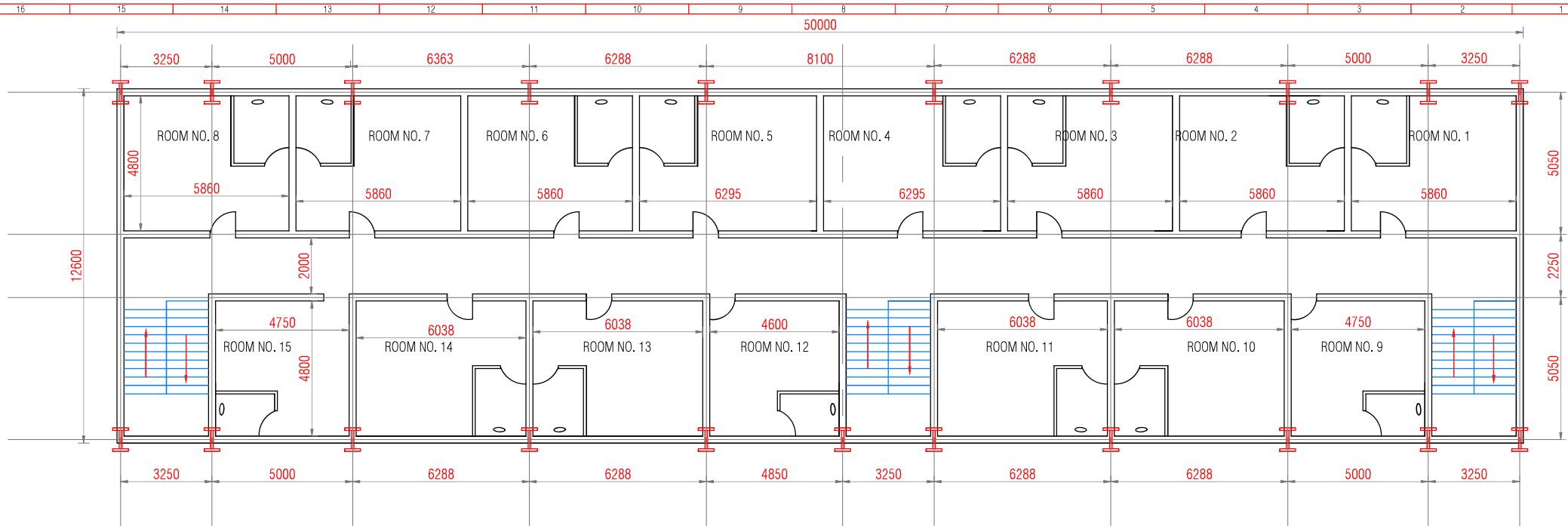


STRUCTURAL SHED FOR ARCHERY GALLERY

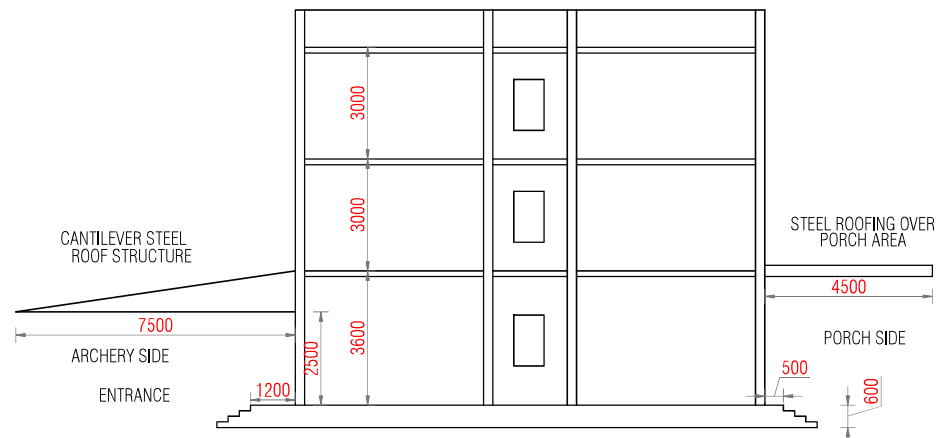
GROUND FLOOR PLAN

DWG NO:- 1	DATE:- 20/12/2022
INSTITUTE:- L. D. COLLEGE OF ENGINEERING	
PROJECT:- STEEL INTENSIVE ARCHERY ACADEMY WITH HOSTEL	
TEAM NO:- W04	YEAR:- 2022
CLIENT:- INSDAG, KOLKATA	
GUIDED BY:- PROF. C. D. PATEL	
PREPARED BY: CHINTAN MAKWANA SUSHIL PATEL ARVI PRAJAPATI CHANDRESH NAINA	TITLE:- GROUND FLOOR PLAN



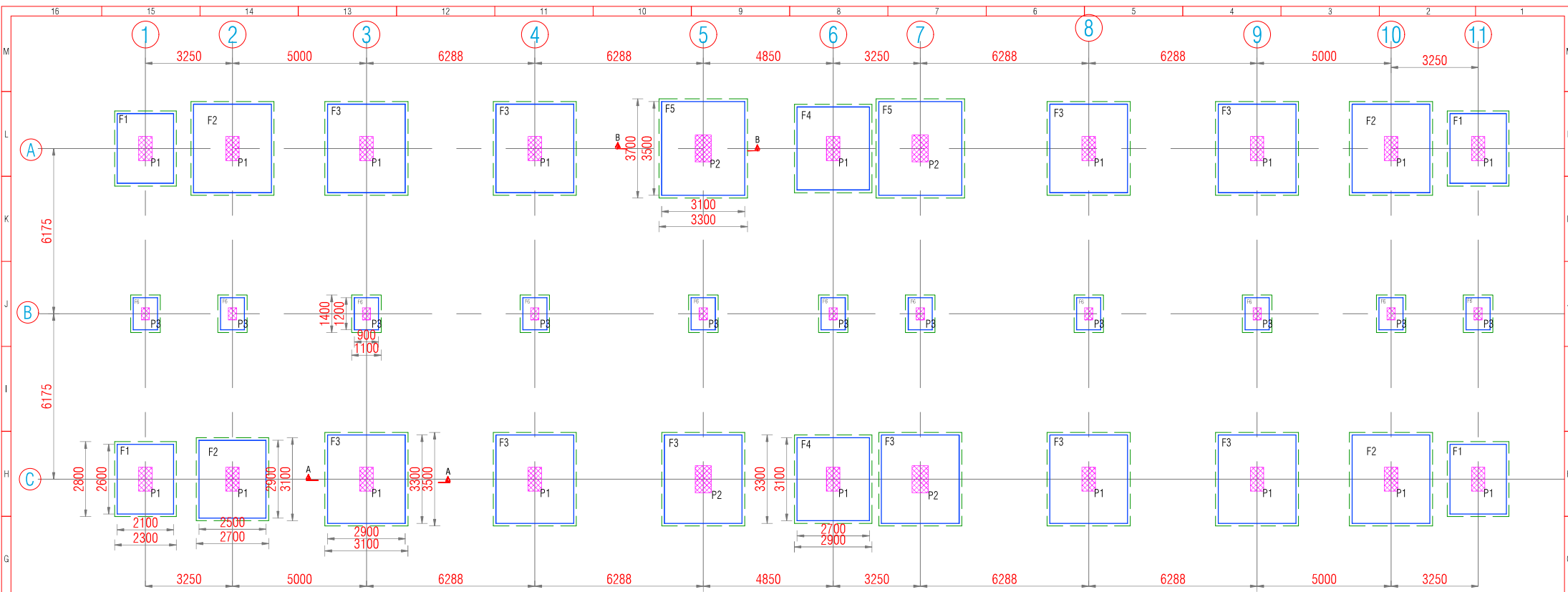


TYPICAL FLOOR PLAN & PROPOSED COLUMN LOCATION

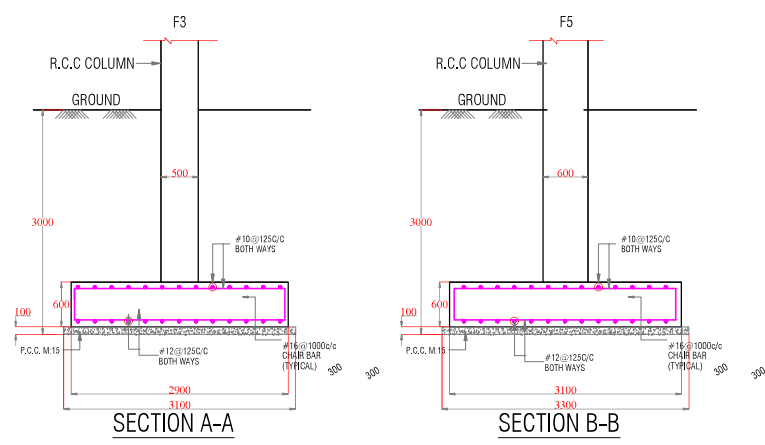


SIDE VIEW

DWG NO:- 2	DATE:- 20/12/2022
INSTITUTE:- L. D. COLLEGE OF ENGINEERING	
PROJECT:- STEEL INTENSIVE ARCHERY ACADEMY WITH HOSTEL	
TEAM NO:- W04	YEAR:- 2022
CLIENT:- INSDAG, KOLKATA	
GUIDED BY:- PROF. C. D. PATEL	
PREPARED BY: CHINTAN MAKWANA SUSHIL PATEL ARVI PRAJAPATI CHANDRESH NAINA	TITLE:- TYPICAL FLOOR PLAN, PROPOSED COLUMN LOCATION AND SIDE VIEW

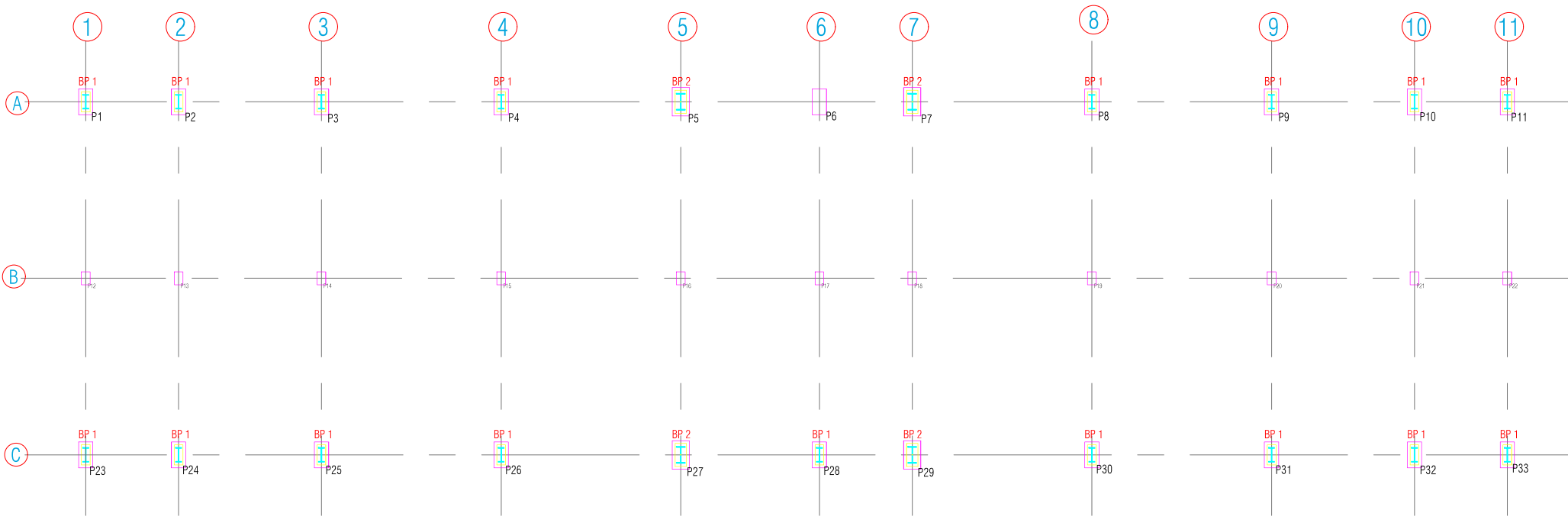


### LAYOUT OF FOUNDATION

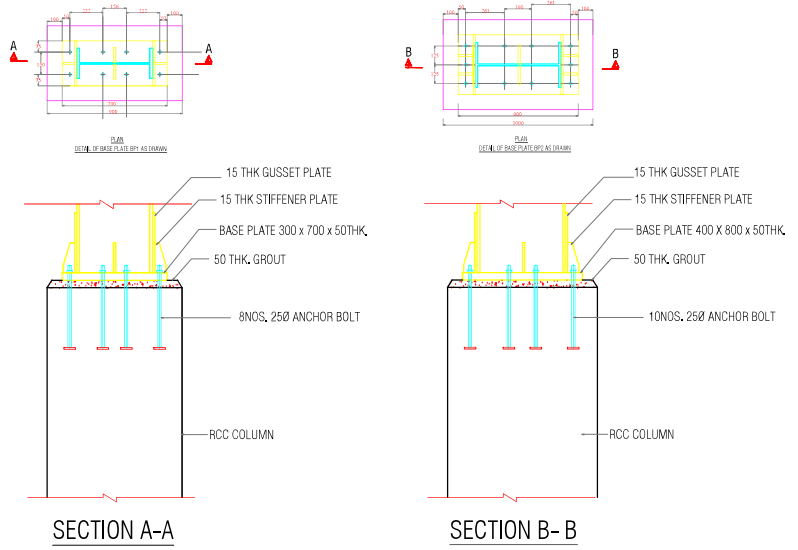


FOUNDATION SCHEDULE							
TYPE OF FOOTING	FOOTING SIZE B x L	d	PEDESTAL DEPTH D	DEPTH OF FOUNDATION (Df)	REINFORCEMENT PARALLEL TO "L"	REINFORCEMENT PARALLEL TO "B"	REMARKS
F2	2500 X 2900	600	3000	3000	10T 200 C/C 12T 140 C/C	10T 200 C/C 12T 140C/C	TOP REINF. BOTTOM REINF.
F3	2900 x 3300	600	3000	3000	10T 200 C/C 12T 140 C/C	10T 200 C/C 12T 140 C/C	TOP REINF. BOTTOM REINF.
F4	2700 X 3100	600	3000	3000	10T 200 C/C 12T 140 C/C	10T 200 C/C 12T 150 C/C	TOP REINF. BOTTOM REINF.
F5	3100 x 3500	600	3000	3000	10T 200 C/C 12T 150 C/C	10T 200 C/C 12T 150 C/C	TOP REINF. BOTTOM REINF.
F6	900 X 1200	300	2700	3000	8T 200 C/C 10T 130 C/C	8T 200 C/C 10T 180 C/C	TOP REINF. BOTTOM REINF.

DWG NO:- 3	DATE:- 20/12/2022
INSTITUTE:- L. D. COLLEGE OF ENGINEERING	
PROJECT:- STEEL INTENSIVE ARCHERY ACADEMY WITH HOSTEL	
TEAM NO:- W04	YEAR:- 2022
CLIENT:- INSDAG, KOLKATA	
GUIDED BY:- PROF. C. D. PATEL	
PREPARED BY: CHINTAN MAKWANA SUSHIL PATEL ARVI PRAJAPATI CHANDRESH NAINA	TITLE:- LAYOUT OF FOUNDATION AND ITS SCHEDULE

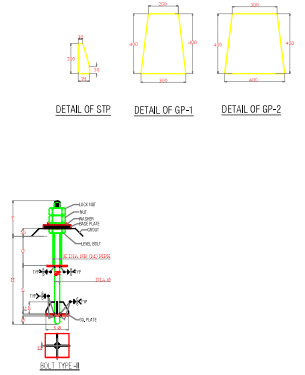


LAYOUT OF BASE PLATE



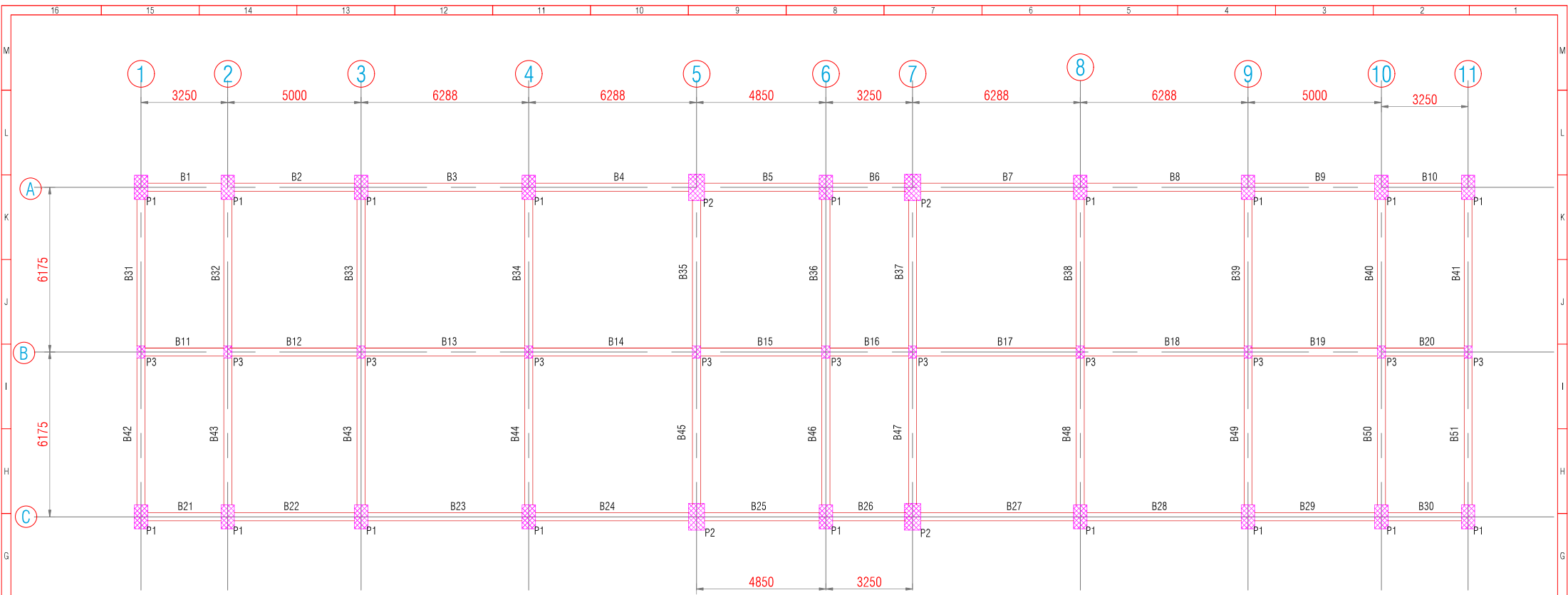
DETAIL OF BASE PLATE BP1

DETAIL OF BASE PLATE BP2



DETAIL OF ANCHOR BOLTS										
BOLT DIA Ø (mm)	L (mm)	H (mm)	T (mm)	G (mm)	K (mm)	t1 (mm)	t2 (mm)	h (mm)	NOS. REQD.	REMARKS
	25	300	$G+L+t1+d$	175	400	50	12	8	100	8 - BP1 10 - BP2

DWG NO:- 4	DATE:- 20/12/2022
INSTITUTE:- L. D. COLLEGE OF ENGINEERING	
PROJECT:- STEEL INTENSIVE ARCHERY ACADEMY WITH HOSTEL	
TEAM NO:- W04	YEAR:- 2022
CLIENT:- INSDAG, KOLKATA	
GUIDED BY:- PROF. C. D. PATEL	
PREPARED BY: CHINTAN MAKWANA SUSHIL PATEL ARVI PRAJAPATI CHANDRESH NAINA	TITLE:- LAYOUT AND DETAILS OF BASE PLATE AND DETAILS OF ANCHOR BOLTS



LAYOUT OF TIE BEAM & COLUMN

SCHEDULE OF PEDESTAL/COLUMN

PEDESTAL	COLUMNS FROM FOOTING TOP LEVEL TO TIE BEAM TOP LEVEL	SIZE	500 X 900	600 X 1000	300 X 450
	STEEL	6-20T + 10-16T	600 X 1000	4-16T + 6-12 T	300 X 450
	CONF. LENGTH	1000 MM	1000 MM	1000 MM	1000 MM
	CONF. STEEL	8 T @ 100 C/C	8 T @ 100 C/C	8 T @ 100 C/C	8 T @ 100 C/C
	REST STEEL	8 T @ 180 C/C	8 T @ 180 C/C	8 T @ 180 C/C	8 T @ 180 C/C
	CONC. GRADE	M : 25	M : 25	M : 25	M : 25

PEDESTAL/COLUMN SIZE	500 X 900	600 X 1000	300 X 450
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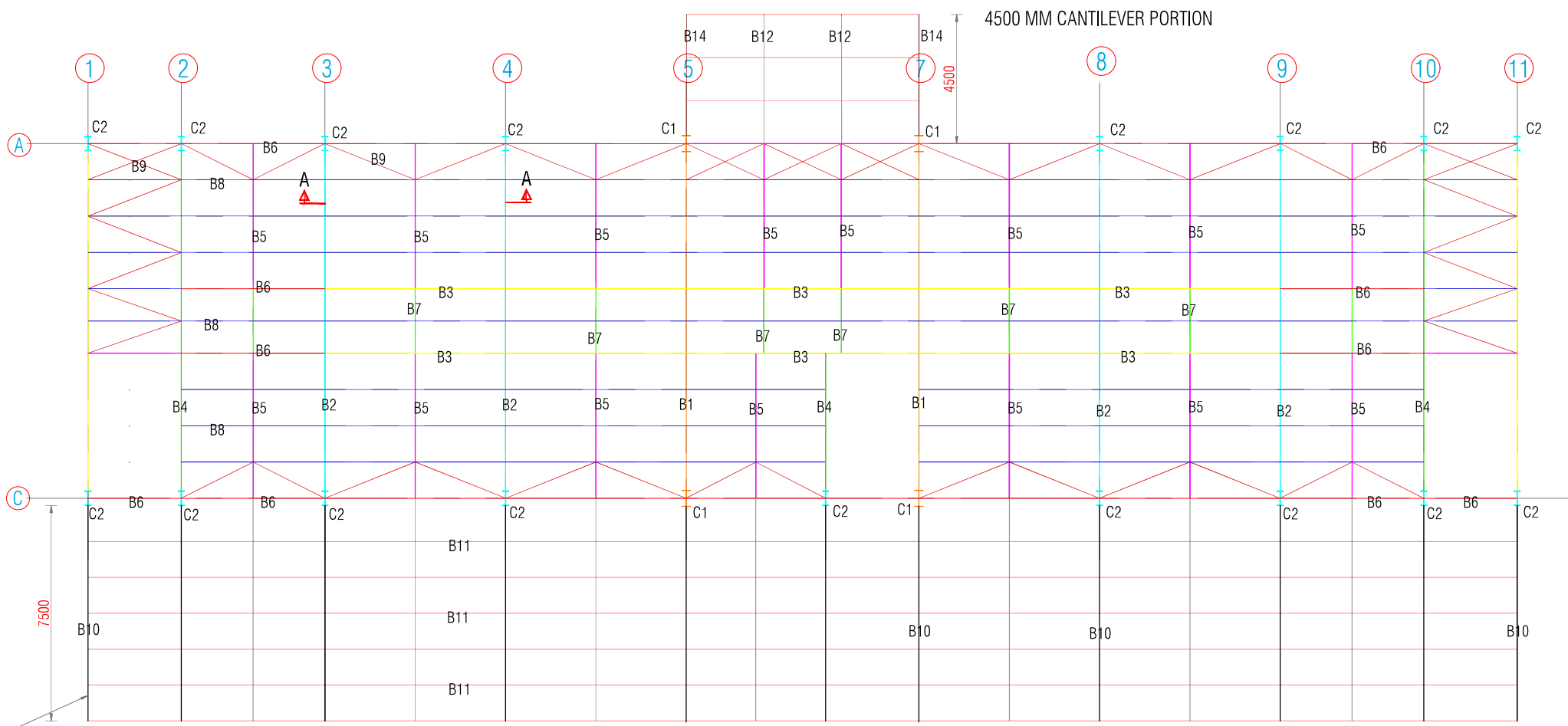
PEDESTAL MARK	P1	P2	P3
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NOTE : PROVIDE ONE FULL RING EXTRA AFTER EACH FIVE RINGS

SCHEDULE OF GROUND BEAM

BEAM NO.	SIZE OF BEAM		REINFORCEMENT						REMARKS	
	BREADTH	DEPTH	BOTTOM BARS		TOP BARS		STIRRUPS 2 legged			SIDE FACE REINF. ON EACH FACE
			THROUGHOUT	EXTRA BAR AT MIDDLE	THROUGHOUT	EXTRA BAR AT SUPPORT	AT SUPPORT (FOR LENGTH 2d)	BALANCE PORTION (AT MIDDLE)		
ALL BEAM HAVE NEARLY SAME REINFORCEMENT SO HIGHEST Ast PROVIDED										
B1-B51	300	450	3-#10	-	2-#12 + 1-#10	#8 @ 90 c/c	#8 @ 160 c/c	-	#25	

DWG NO:- 5	DATE:- 20/12/2022
INSTITUTE:- L. D. COLLEGE OF ENGINEERING	
PROJECT:- STEEL INTENSIVE ARCHERY ACADEMY WITH HOSTEL	
TEAM NO:- W04	YEAR:- 2022
CLIENT:- INSDAG, KOLKATA	
GUIDED BY:- PROF. C. D. PATEL	
PREPARED BY: CHINTAN MAKWANA SUSHIL PATEL ARVI PRAJAPATI CHANDRESH NAINA	TITLE:- LAYOUT OF TIE BEAM & COLUMN AND SCHEDULE OF PEDESTAL/ COLUMN AND GROUND BEAM

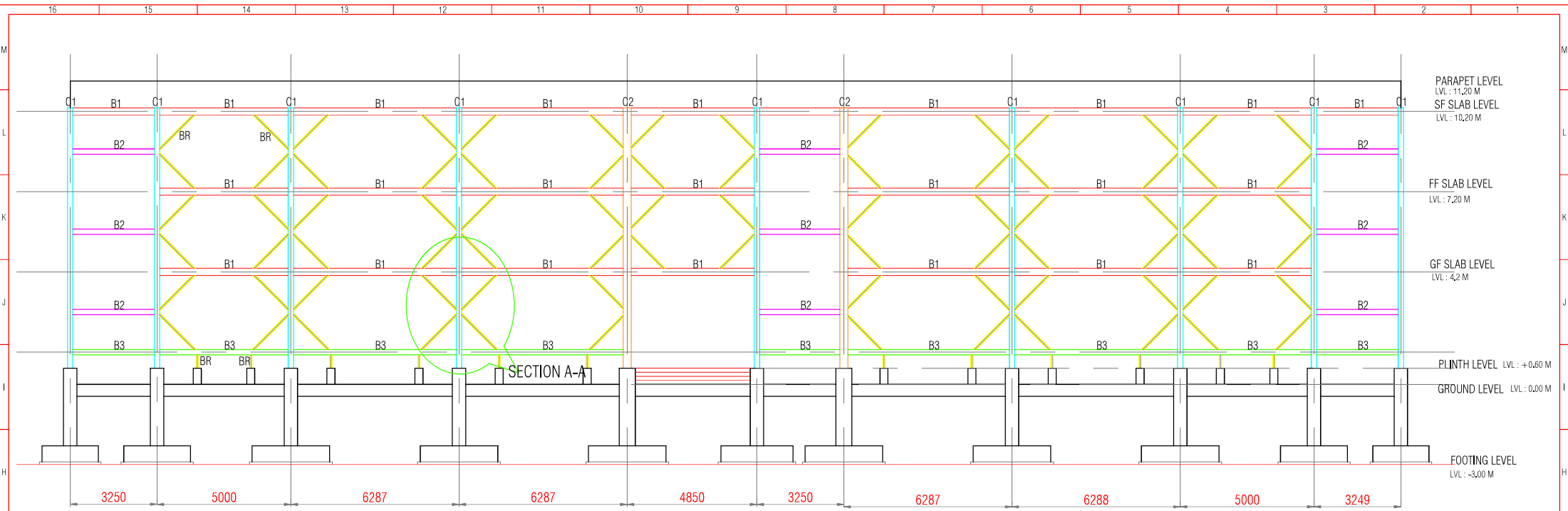


7500 MM CANTILEVER TRUSS

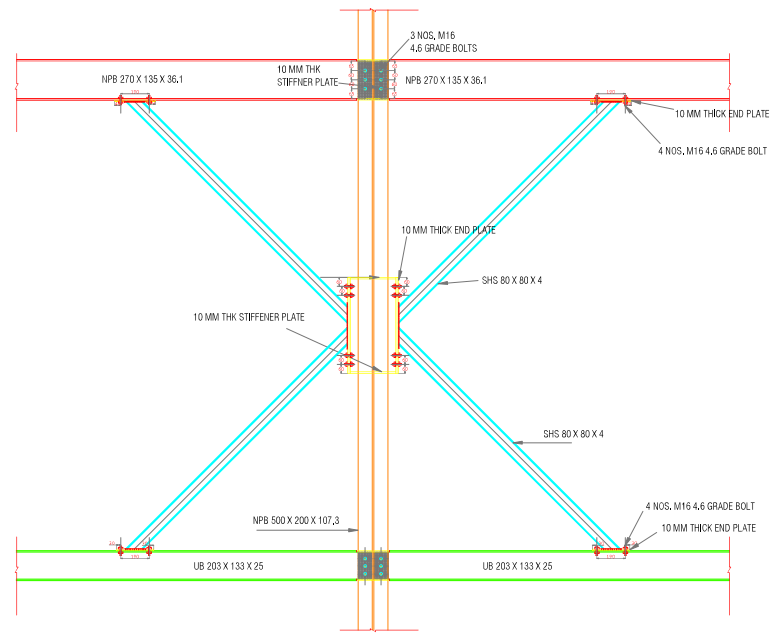
LAYOUT OF PLAN OF STEEL MEMBER FRAMING AT 1ST FLOOR

B1	WPB 600 X 300 X 128.8	B10	RHS 145 X 82 X 4.8
B2	UB 533 X 210 X 122	B11	RHS 200 X 100 X 5
B3	UB 406 X 178 X 60	B12	RHS 96 X 48 X 3.2
B4	UB 457 X 191 X 98	B13	SHS 80 X 80 X 4
B5	UB 254 X 146 X 31	B14	RHS 300 X 200 X 8
B6	NPB 270 X 135 X 36.1		
B7	UB 203 X 133 X 25		
B8	RHS 145 X 82 X 4.8		
B9	CHS 60.3 X 4.5		
C1	WPB 600 X 300 X 128.8		
C2	NPB 500 X 200 X 107.3		

DWG NO:- 6	DATE:- 20/12/2022
INSTITUTE:- L. D. COLLEGE OF ENGINEERING	
PROJECT:- STEEL INTENSIVE ARCHERY ACADEMY WITH HOSTEL	
TEAM NO:- W04	YEAR:- 2022
CLIENT:- INSDAG, KOLKATA	
GUIDED BY:- PROF. C. D. PATEL	
PREPARED BY: CHINTAN MAKWANA SUSHIL PATEL ARVI PRAJAPATI CHANDRESH NAINA	TITLE:- LAYOUT OF PLAN OF STEEL MEMBER FRAMING AT 1ST FLOOR

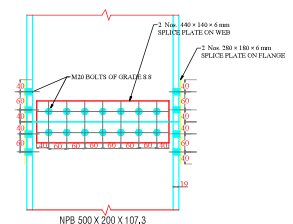
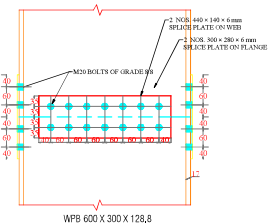


- B1 NPB 270 X 135 X 36.1
- B2 UB 203 X 133 X 25
- B3 UB 203 X 133 X 25
- BR - BRACING SHS 80 X 80 X 4
- RCC RCC MEMBER

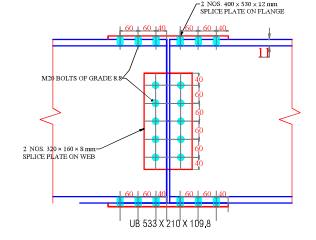
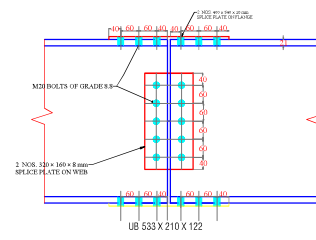
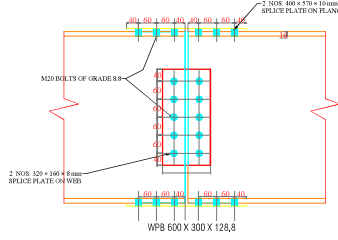


**SECTION A-A**  
LAYOUT OF SECTION OF STEEL MEMBER FRAMING BUILDING AT ALL LEVELS

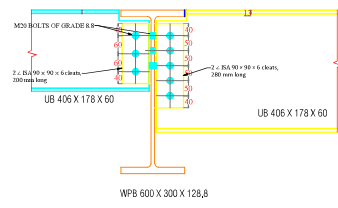
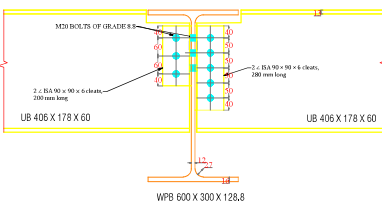
DWG NO:- 7	DATE:- 20/12/2022
INSTITUTE:- L. D. COLLEGE OF ENGINEERING	
PROJECT:- STEEL INTENSIVE ARCHERY ACADEMY WITH HOSTEL	
TEAM NO:- W04	YEAR:- 2022
CLIENT:- INSDAG, KOLKATA	
GUIDED BY:- PROF. C. D. PATEL	
PREPARED BY: CHINTAN MAKWANA SUSHIL PATEL ARVI PRAJAPATI CHANDRESH NAINA	TITLE:- LAYOUT OF SECTION OF STEEL MEMBER FRAMING BUILDING AT ALL LEVELS



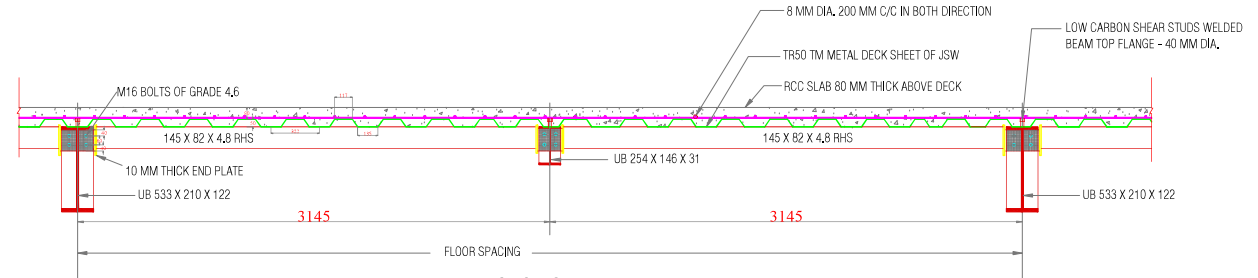
DETAILS OF COLUMN SPLICE CONNECTION



DETAILS OF BEAM SPLICE CONNECTION

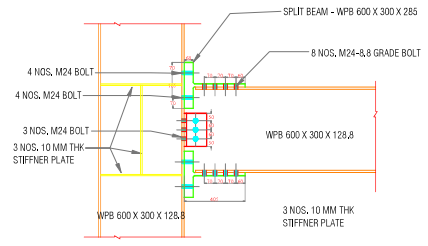


DETAILS OF BEAM TO BEAM SHEAR CONNECTION

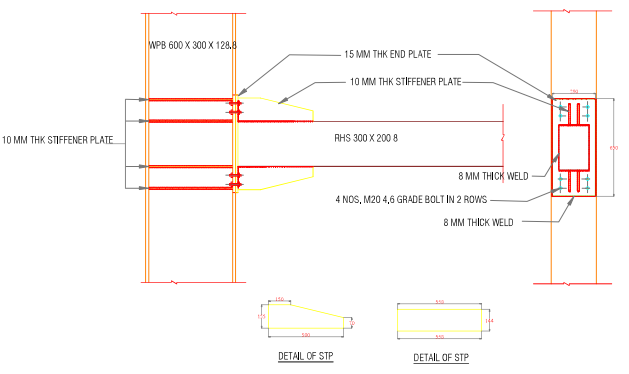


SECTION A-A

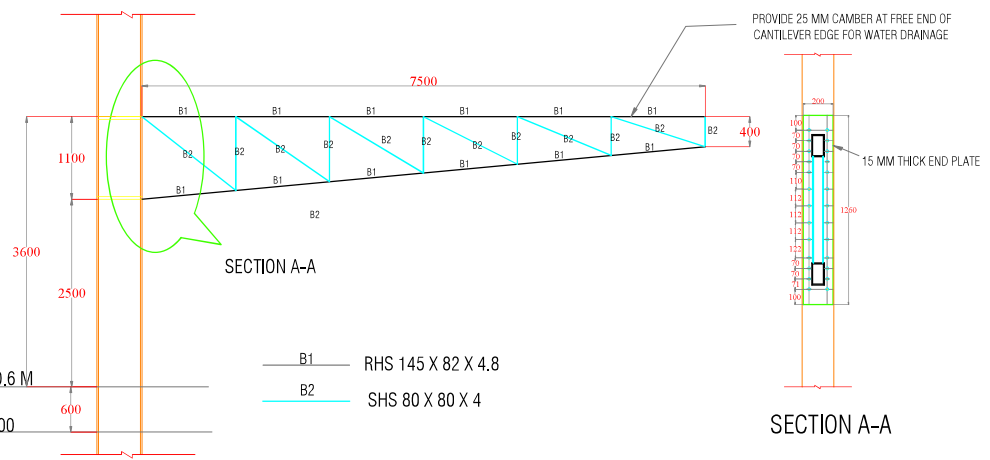
DETAILS OF COMPOSITE FLOOR & RHS BEAM TO I-BEAM SHEAR CONNECTION



DETAILS OF BEAM TO COLUMN MOMENT CONNECTION (T-STUB CONNECTION)



DETAILS OF CANTILEVER RHS BEAM TO COLUMN CONNECTION (4.5 M)



SECTION A-A

SECTION A-A

PLINTH LEVEL 0.6 M  
NGL LVL 0.00

B1 RHS 145 X 82 X 4,8  
B2 SHS 80 X 80 X 4

DETAILS OF CANTILEVER ROOF TRUSS TO COLUMN CONNECTION

DWG NO:- 8	DATE:- 20/12/2022
INSTITUTE:- L. D. COLLEGE OF ENGINEERING	
PROJECT:- STEEL INTENSIVE ARCHERY ACADEMY WITH HOSTEL	
TEAM NO:- W04	YEAR:- 2022
CLIENT:- INSDAG, KOLKATA	
GUIDED BY:- PROF. C. D. PATEL	
PREPARED BY:- CHINTAN MAKWANA SUSHIL PATEL ARVI PRAJAPATI CHANDRESH NAINA	TITLE:- CONNECTIONS AND SECTION OF COMPOSITE SLAB

## 6. ESTIMATION



TOTAL EARTHWORK = 688  
CUM.  
1,92,640/-



TOTAL CONCRETE WORK =  
340 CUM  
13,60,000/-



TOTAL REINFORCEMENT =  
29.800 TONNE  
22,35,000/-



TOTAL TONNAGE OF STEEL  
SECTION = 133.024 TONNE  
1,13,07,040/-

Total – 1.66 Cr.

TONNAGE PER SQ. METER AREA = 58.72 Kg/m<sup>2</sup>



**YEAR – 2022**

**COMPETITION TOPIC:**

**STEEL INTENSIVE ARCHERY ACADEMY WITH HOSTEL**

**DESIGN OPTION**

**BY**

**2<sup>nd</sup>- B Prize Winner – Team N-01**

**from  
IIT Roorkee Uttarakhand**



# STEEL INTENSIVE ARCHERY ACADEMY WITH HOSTEL

Anubhav Chaudhary

Prathamesh Kulkarni

Project Guide: Prof. P C Ashwin Kumar

**IIT Roorkee**



N-01, INSDAG 2022

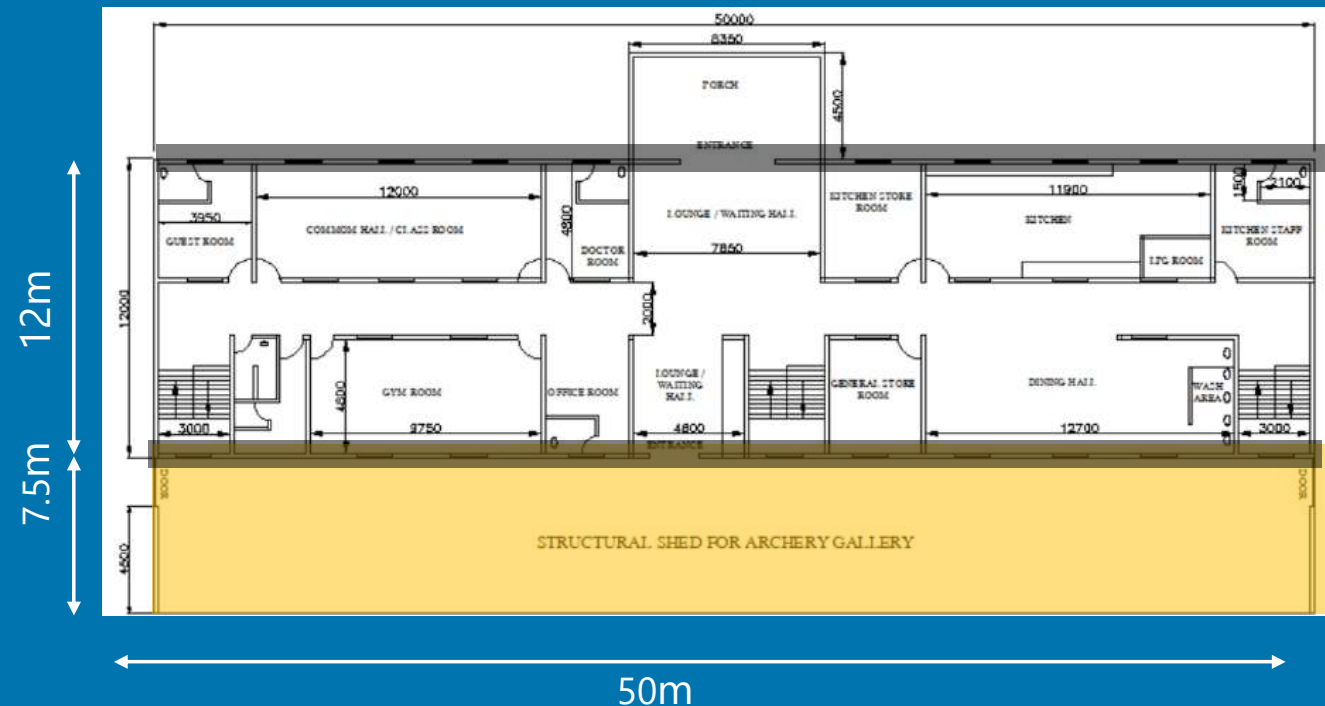
## **FACILITIES**

The client has specified the following requirements for the proposed project:

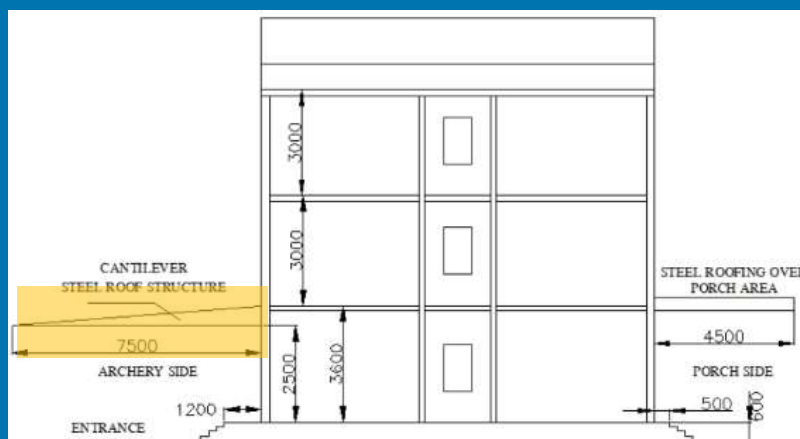
1.	Site Location	:	Jamshedpur
2.	Total Length of the Hostel Building	:	50.0m
3.	Total Length of Archery Shed		50.0m
4.	Width of Hostel Building		12.6 m
5.	Width of Archery Shed		7.50m
6.	Type of Archery Shed		<b>Cantilever, Open on 3 Sides (Front and two sides)</b>
7.	Hostel Building		Three (3) Storeyed
8.	Floor to floor height (Hostel Block)		3.0 m
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13.	Flooring		RCC / Profile Deck Sheet
14.	False Ceiling		At Archery Shed – 10 kg/sqm
15.	Walls of Hostel Building		Brickwalls / Lightweight Gypsum Board Panels/AAC Block
16.	Roof covering of Archery Shed	:	Colour Coated Steel Sheet
17.	Bracing		As per design, allowed at two ends only

Total Depth (including sheeting) of Cantilever Archery Shed along the LENGTH of the building shall not be more than 1.40 m

## MAIN PARAMETERS

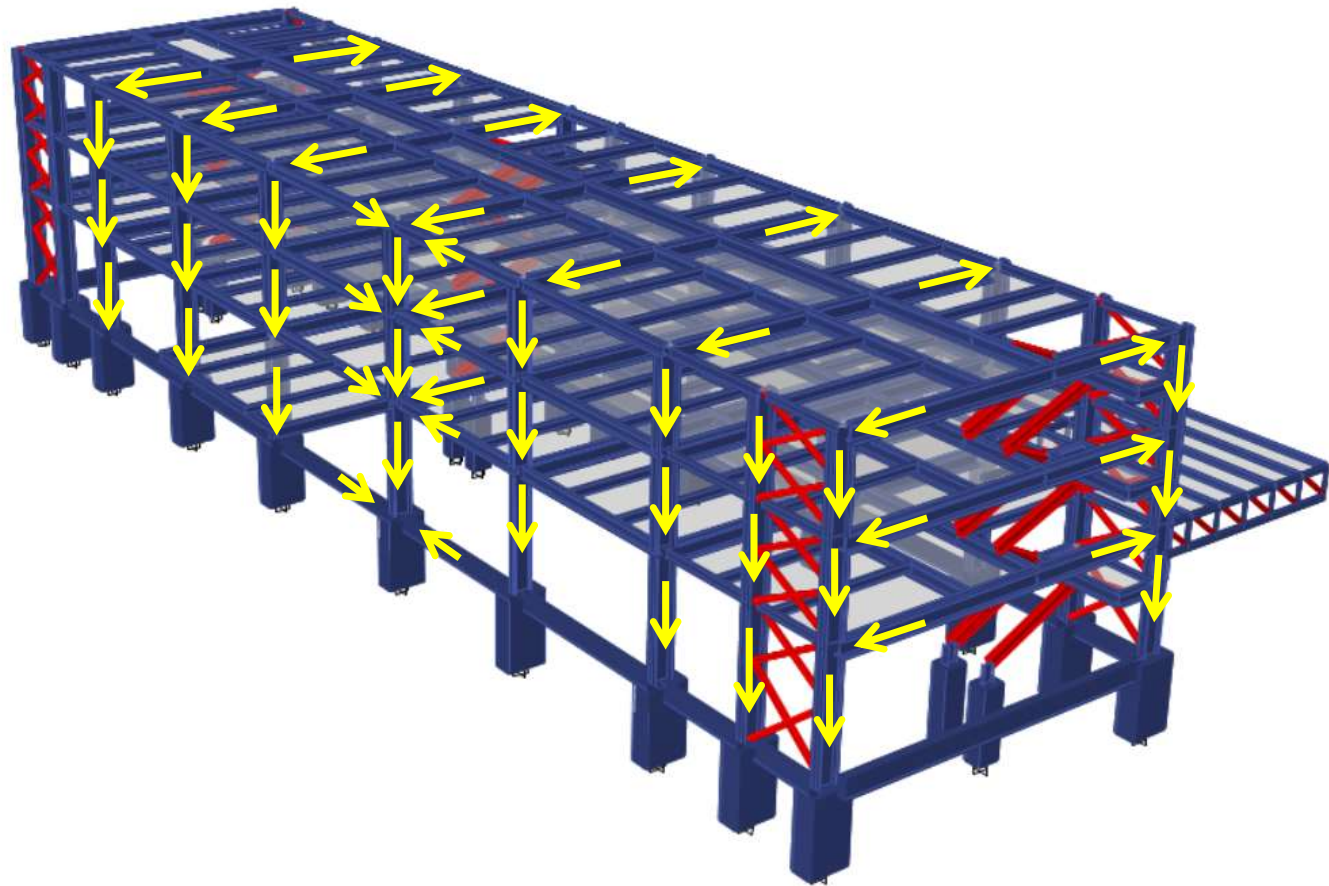


- **Columns** – Periphery of building (longer side only)
- **Beams** – Steel Beams/Latticed Girder
- **Walls** – Brickwalls/ LW Gypsum Board panels/ AAC Block
- **Flooring** - RCC/ Profile Deck
- **Cantilever Roof** – Colour coated steel sheet (CCSS)



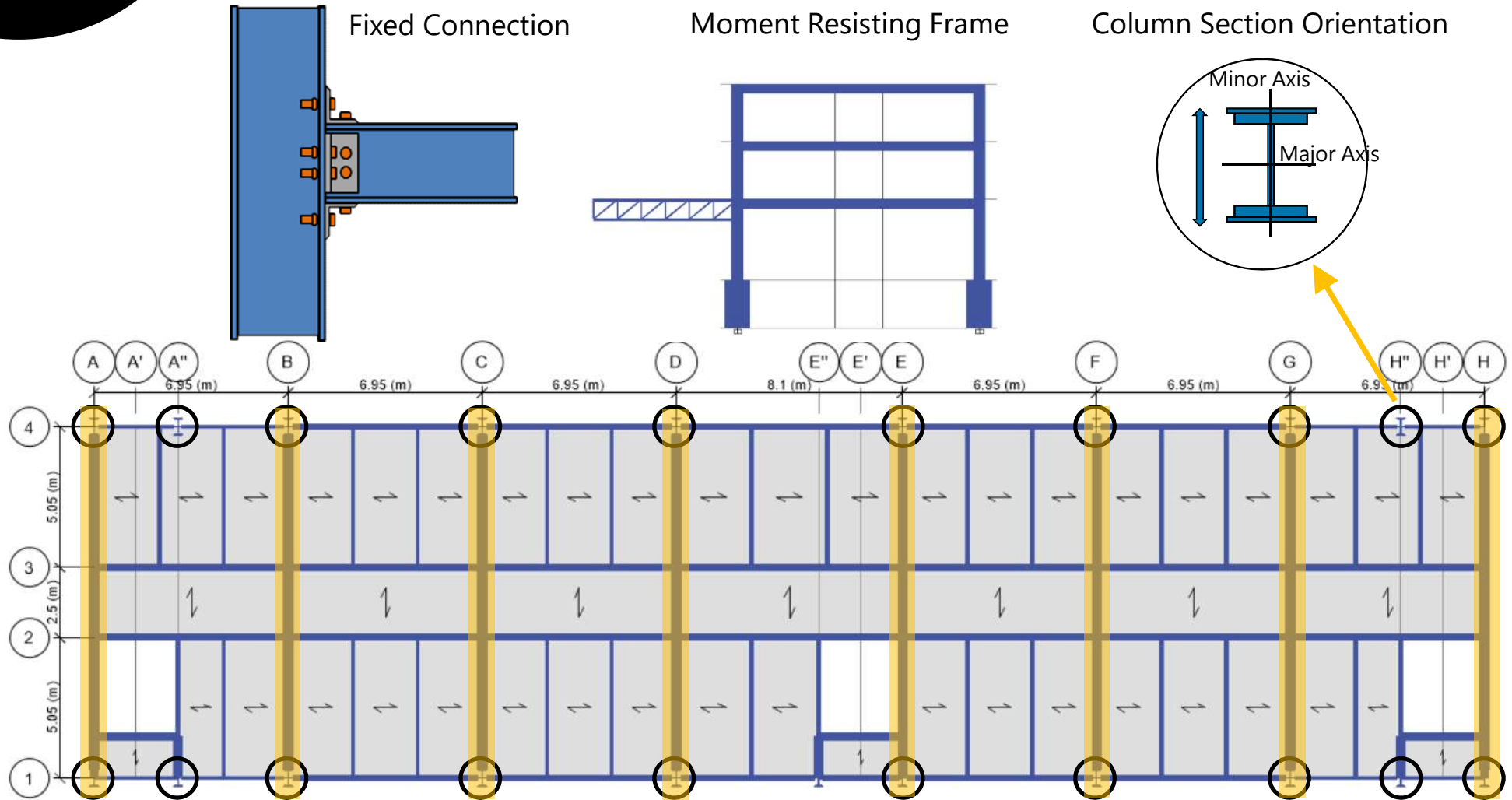
# ANALYSIS

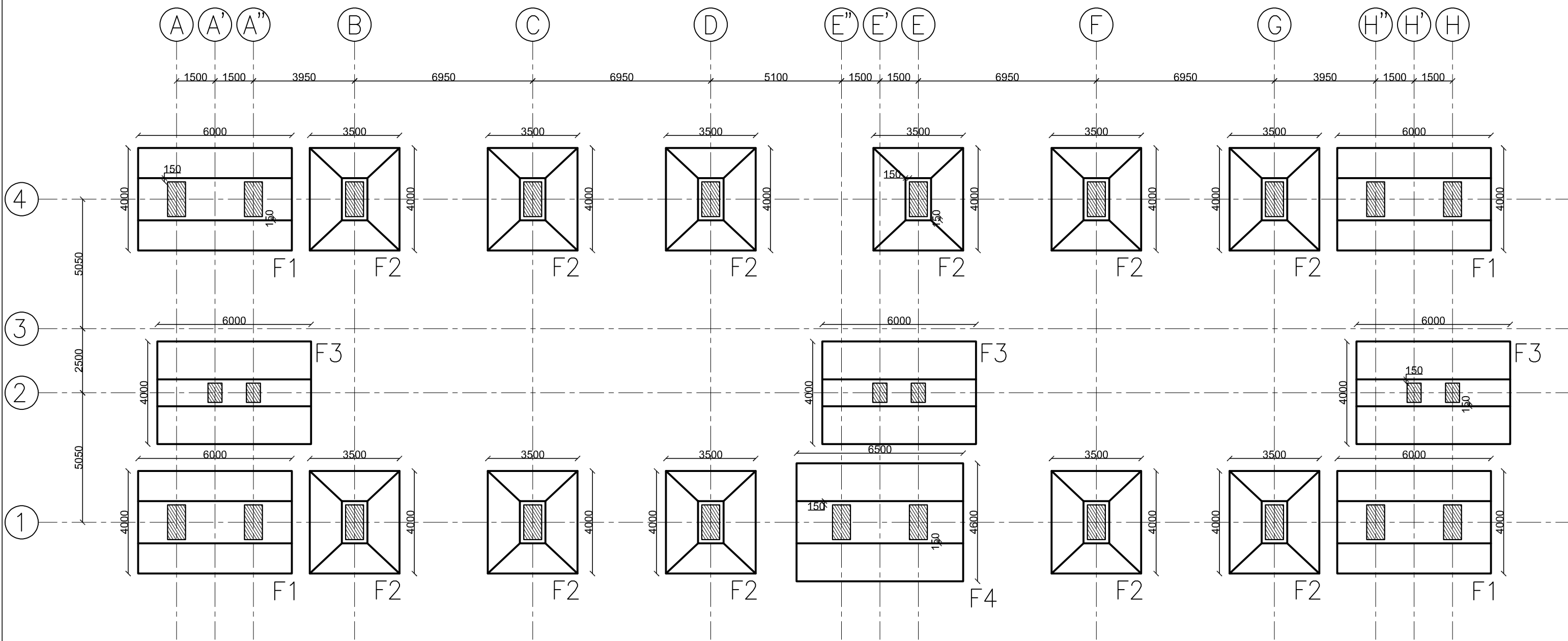
## GRAVITY LOAD RESISTING SYSTEM




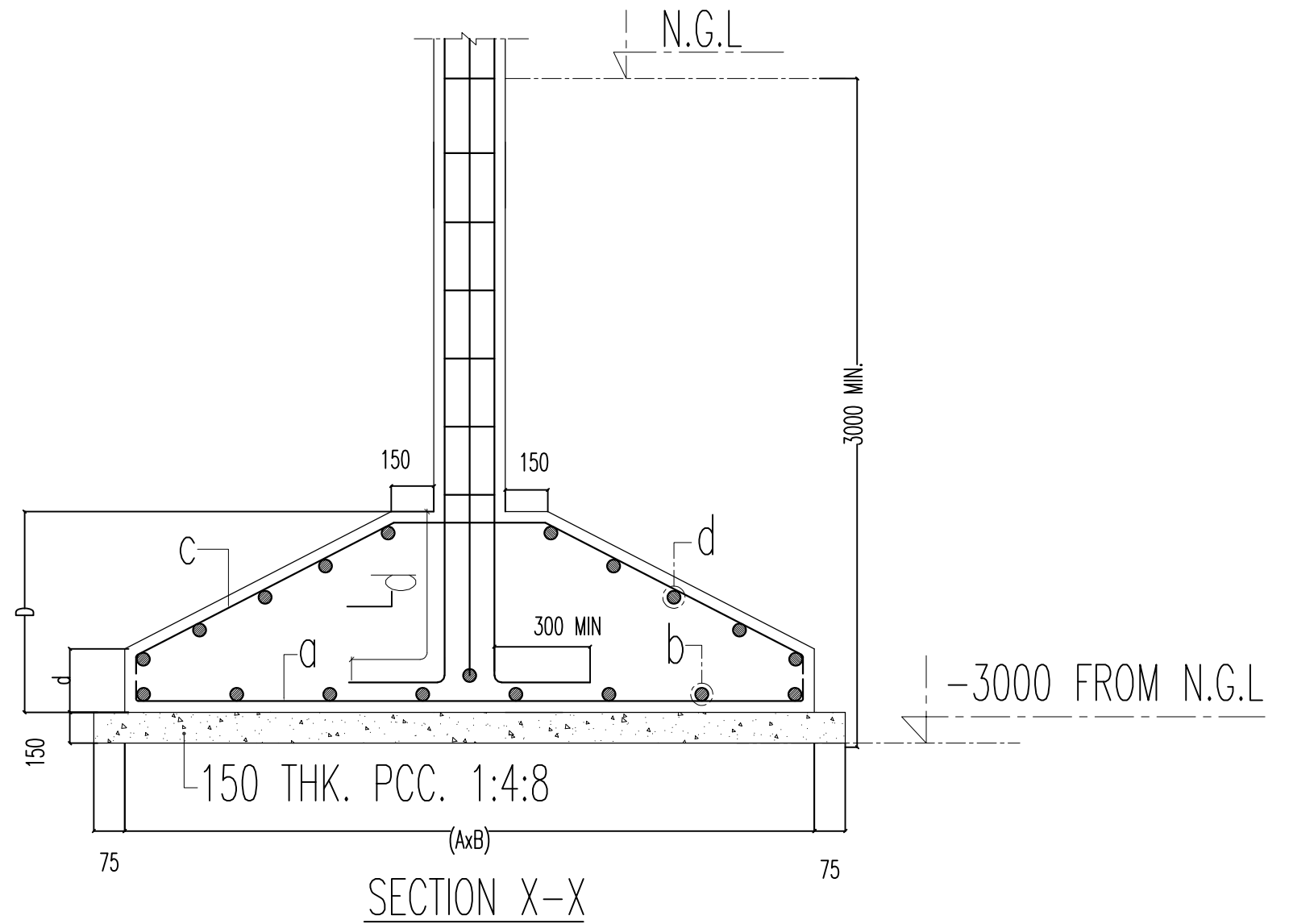
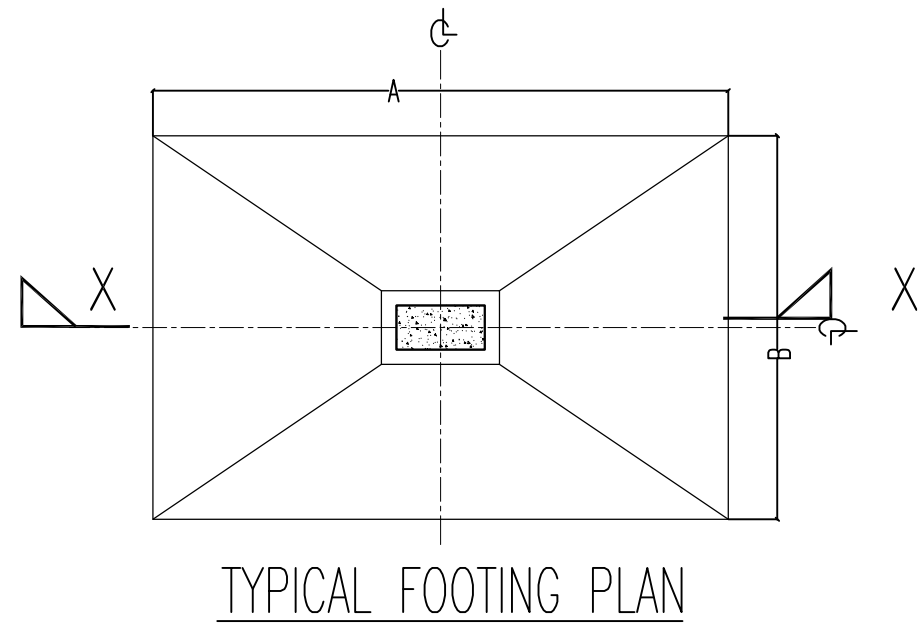
# ANALYSIS

## LATERAL LOAD RESISTING SYSTEM (Y-Direction)






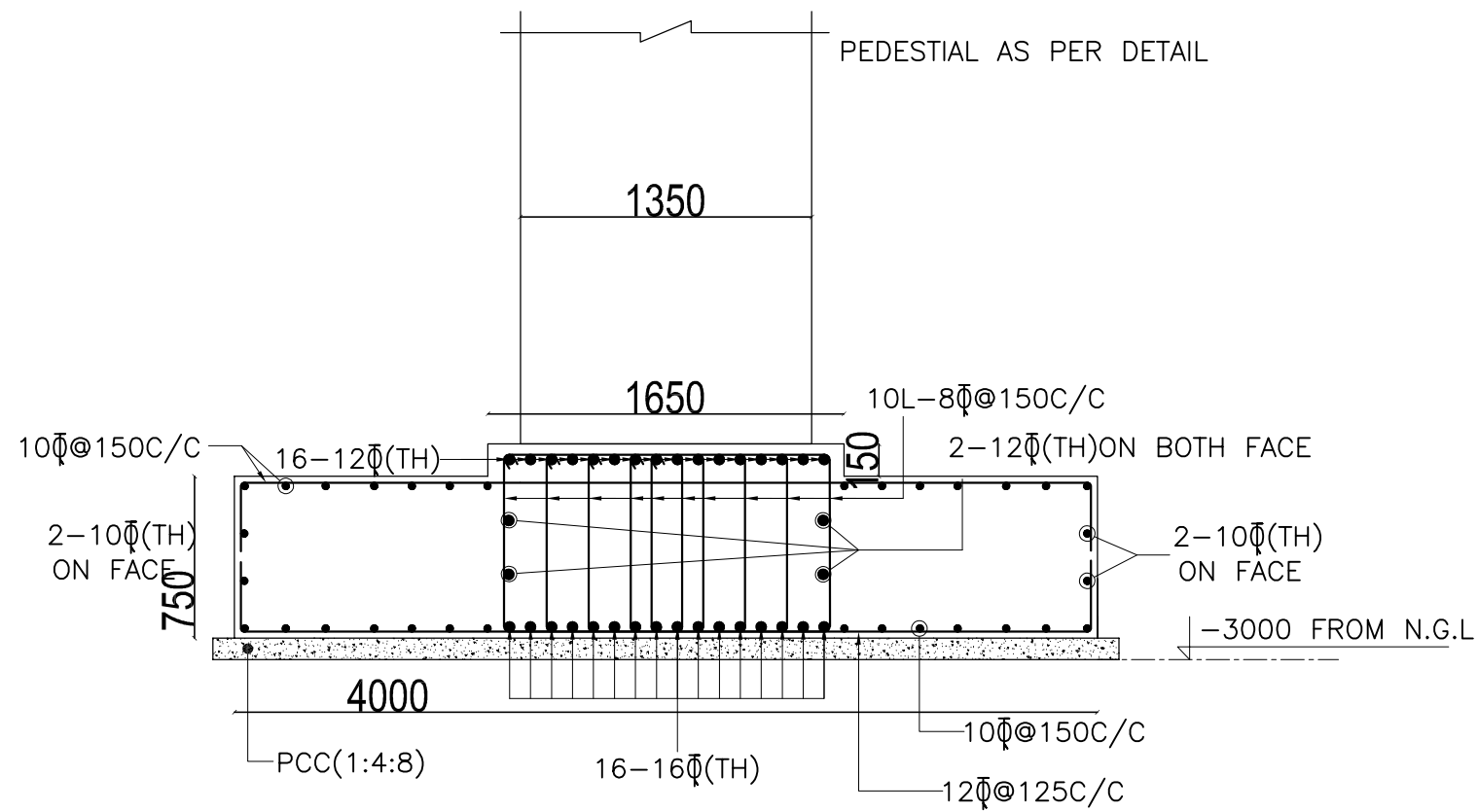
SHEET NO <b>02</b>	PROJECT NAME <b>STEEL INTENSIVE ARCHERY ACADEMY WITH HOSTEL</b>	DRAWING TITLE FOUNDATION LAYOUT <b>FOUNDATION</b>	GROUP <b>N - 01</b> ANUBHAV CHAUDHARY PRATHAMESH KULKARNI		<b>Competition Entry</b> Final Submission
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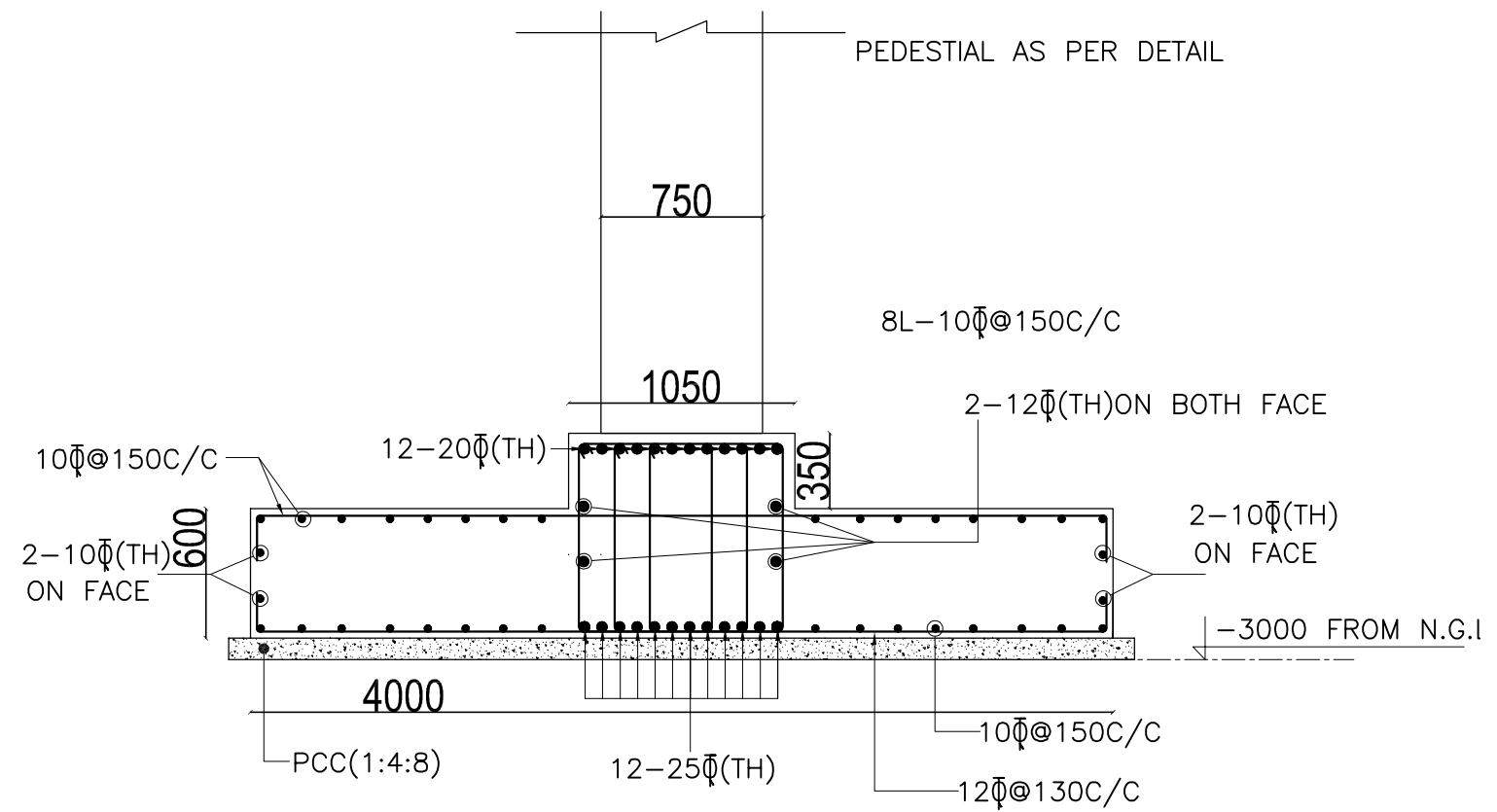
		DETAIL OF FOOTINGS				REINFORCEMENT			
S NO	FOOTING	B	A	D	d	a	b	c	d
1.	F1	4000	6000	750	—	—	—	—	—
2.	F2	4000	3500	700	450	16mm@175c/c	16mm@175c/c	10mm@200c/c	10mm@200c/c
3.	F3	4000	6000	600	—	—	—	—	—
4.	F4	4600	6500	850	—	—	—	—	—

SHEET NO	PROJECT NAME	DRAWING TITLE	GROUP		<b>Competition Entry</b> Final Submission
<b>03</b>	<b>STEEL INTENSIVE ARCHERY ACADEMY WITH HOSTEL</b>	FOOTING DETAILS	<b>N - 01</b>		
		<b>FOUNDATION</b>	ANUBHAV CHAUDHARY PRATHAMESH KULKARNI		

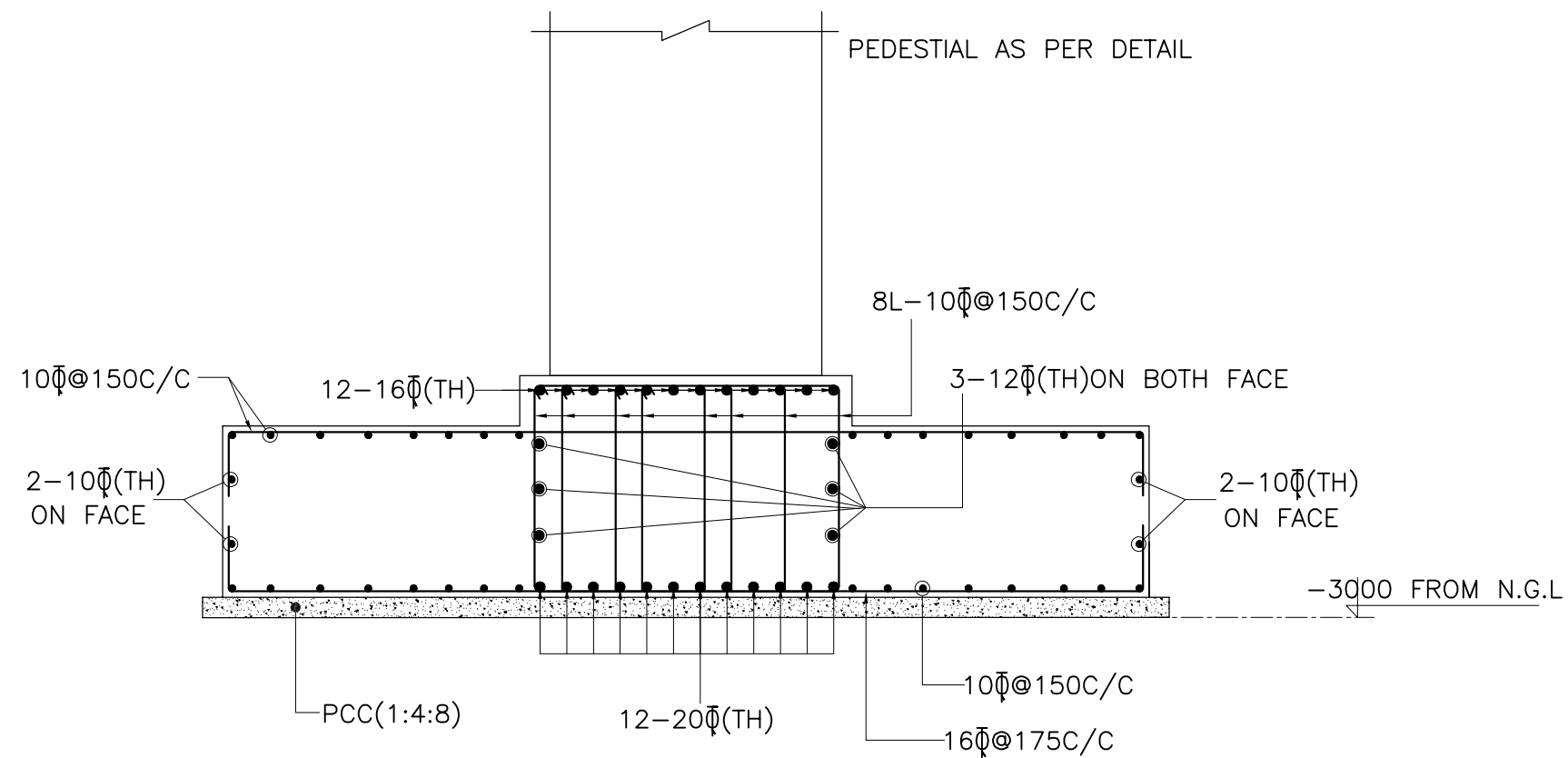





CROSS-SECTION OF F1

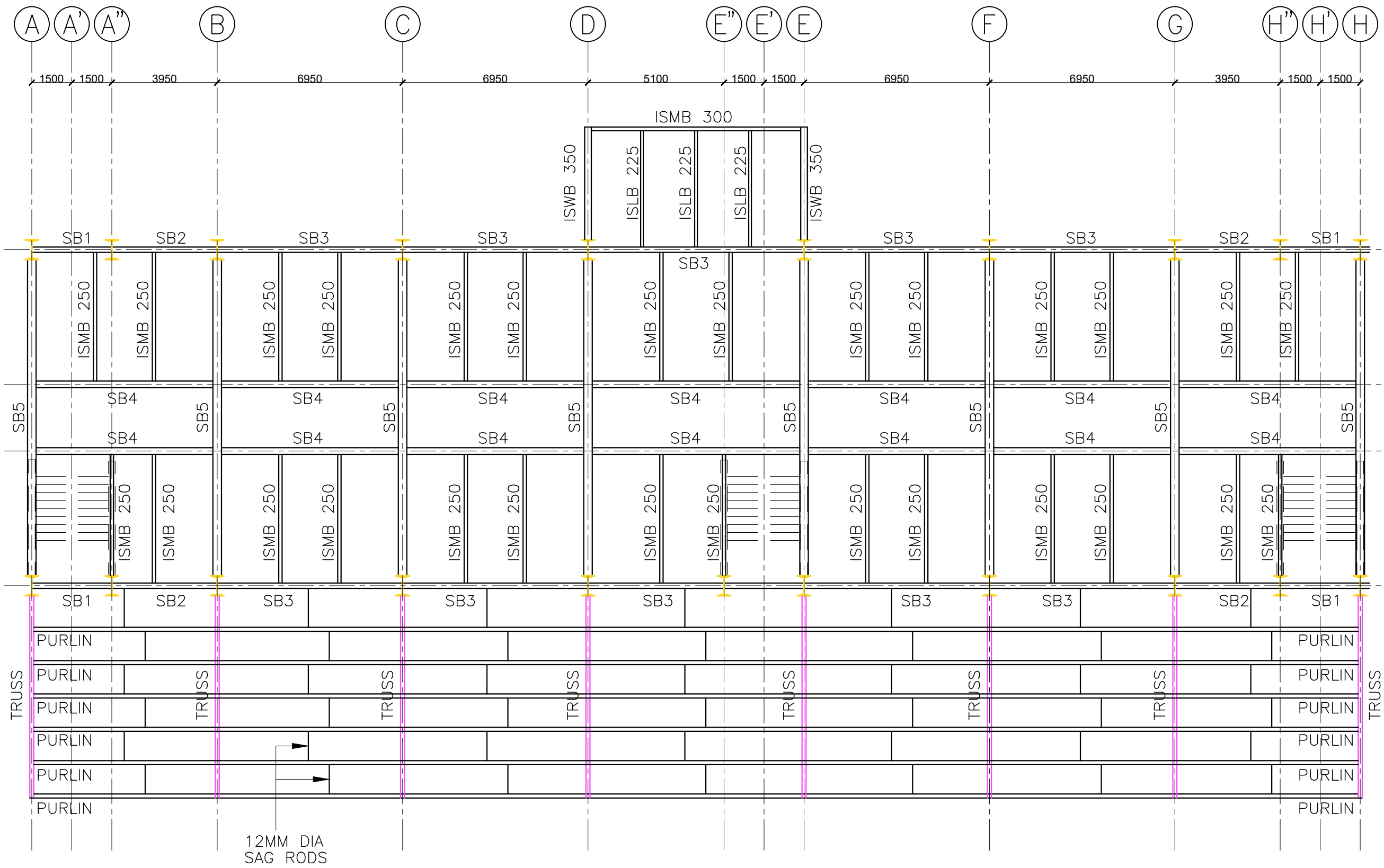



CROSS-SECTION OF F3



CROSS-SECTION OF F4

SHEET NO	PROJECT NAME	DRAWING TITLE	GROUP		<b>Competition Entry</b> Final Submission
<b>04</b>	<b>STEEL INTENSIVE ARCHERY ACADEMY WITH HOSTEL</b>	FOOTING SECTION DETAIL	<b>N - 01</b>		
		<b>FOUNDATION</b>	ANUBHAV CHAUDHARY PRATHAMESH KULKARNI		




SHEET NO <h1 style="font-size: 2em; margin: 0;">09</h1>	PROJECT NAME <h2 style="font-size: 1.2em; margin: 0;">STEEL INTENSIVE ARCHERY ACADEMY WITH HOSTEL</h2>	DRAWING TITLE <h3 style="font-size: 1.1em; margin: 0;">BEAM LAYOUT</h3> <h3 style="font-size: 1.1em; margin: 0;">FIRST FLOOR PLAN</h3>	GROUP <h2 style="font-size: 1.5em; margin: 0;">N - 01</h2> <p style="font-size: 0.8em; margin: 0;">ANUBHAV CHAUDHARY PRATHAMESH KULKARNI</p>		<h2 style="font-size: 1.5em; margin: 0;">Competition Entry</h2> <p style="font-size: 1.2em; margin: 0;">Final Submission</p>
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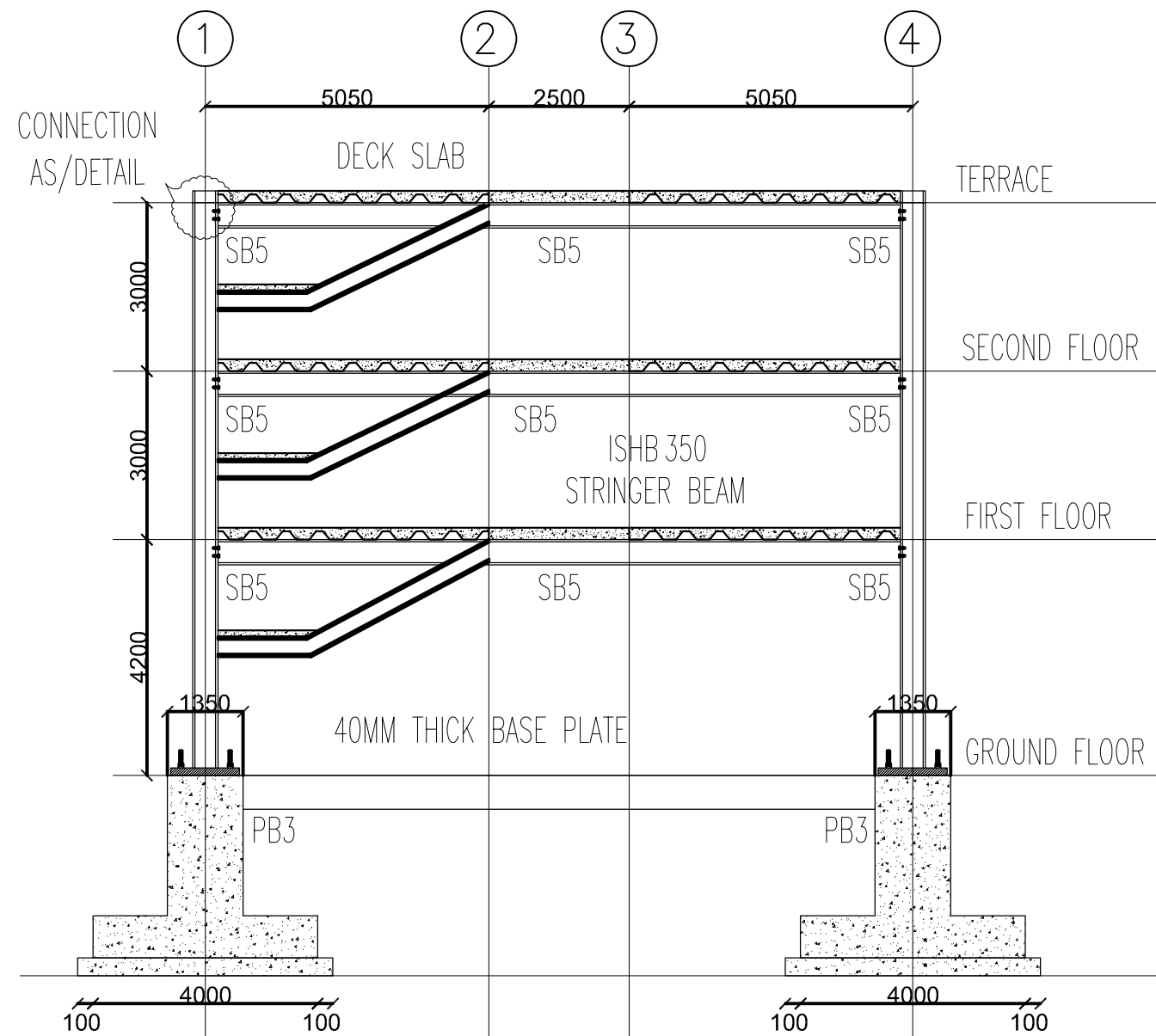


STEEL DETAIL

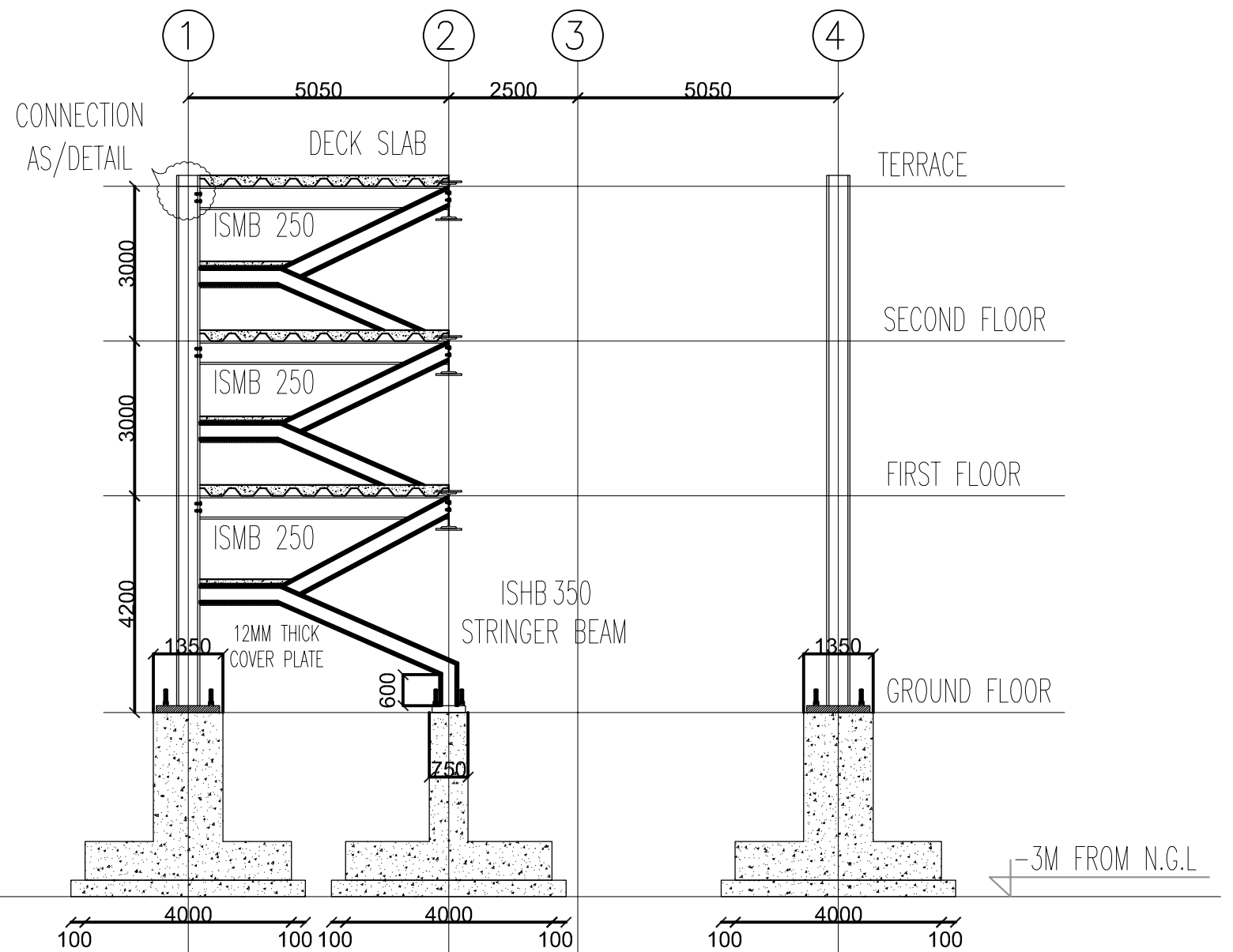
BEAM	TYPE	DETAILS	DOUBLE COVER PLATE		GRADE	
			WIDTH (MM)	THICKNESS (MM)		
SB1	I-Section	ISMB 200 ● 25.40 Kg/m	-	-	Fe410	
SB2	I-Section	ISMB 225 ● 31.20 Kg/m	-	-	Fe410	
SB3	I-Section	ISWB 300 ● 78.70 Kg/m	200	10	Fe410	
SB4	I-Section	ISWB 350 ● 130.9 Kg/m	200	25	Fe410	
SB5	I-Section	ISWB 450 ● 205.0 Kg/m	320	25	Fe350	
SB6	I-Section	ISLB 150 ● 14.20 Kg/m	-	-	Fe410	
ALL COLUMNS ARE			ISWB 600 ● 225.5 Kg/m	320	16	Fe350

NOTE: 1. All other structural steel members have Fe350 grade, if not specified otherwise  
 2. DECK SLAB - JSW TR60™ 130mm thick slab & 1mm deck sheet


SHEET NO	PROJECT NAME	DRAWING TITLE	GROUP		<h2 style="margin: 0;">Competition Entry</h2> <p style="margin: 0;">Final Submission</p>
10	<i>STEEL INTENSIVE ARCHERY ACADEMY WITH HOSTEL</i>	BEAM LAYOUT	N - 01		
		SECOND FLOOR PLAN	ANUBHAV CHAUDHARY PRATHAMESH KULKARNI		

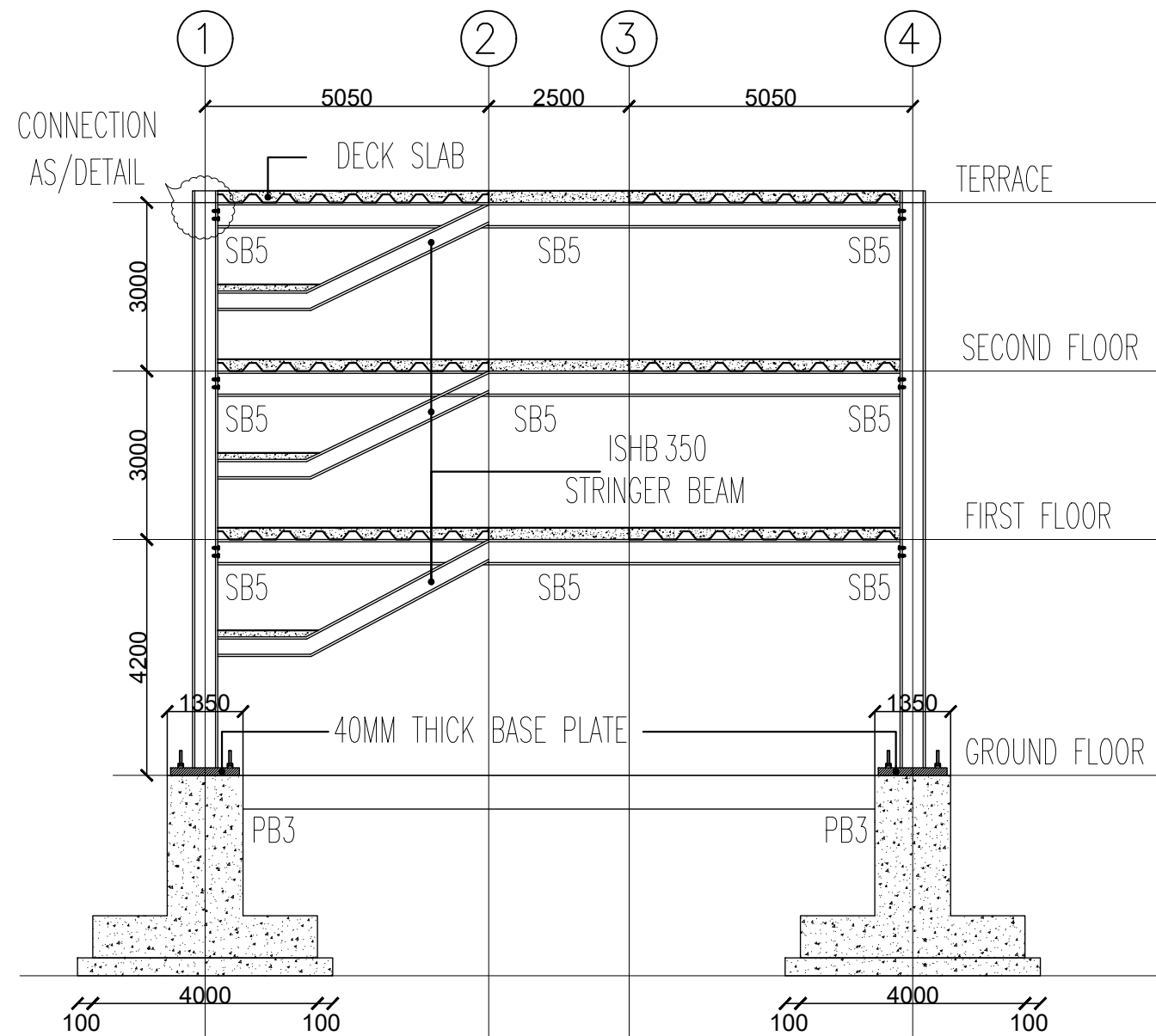


ELEVATION GRID-A

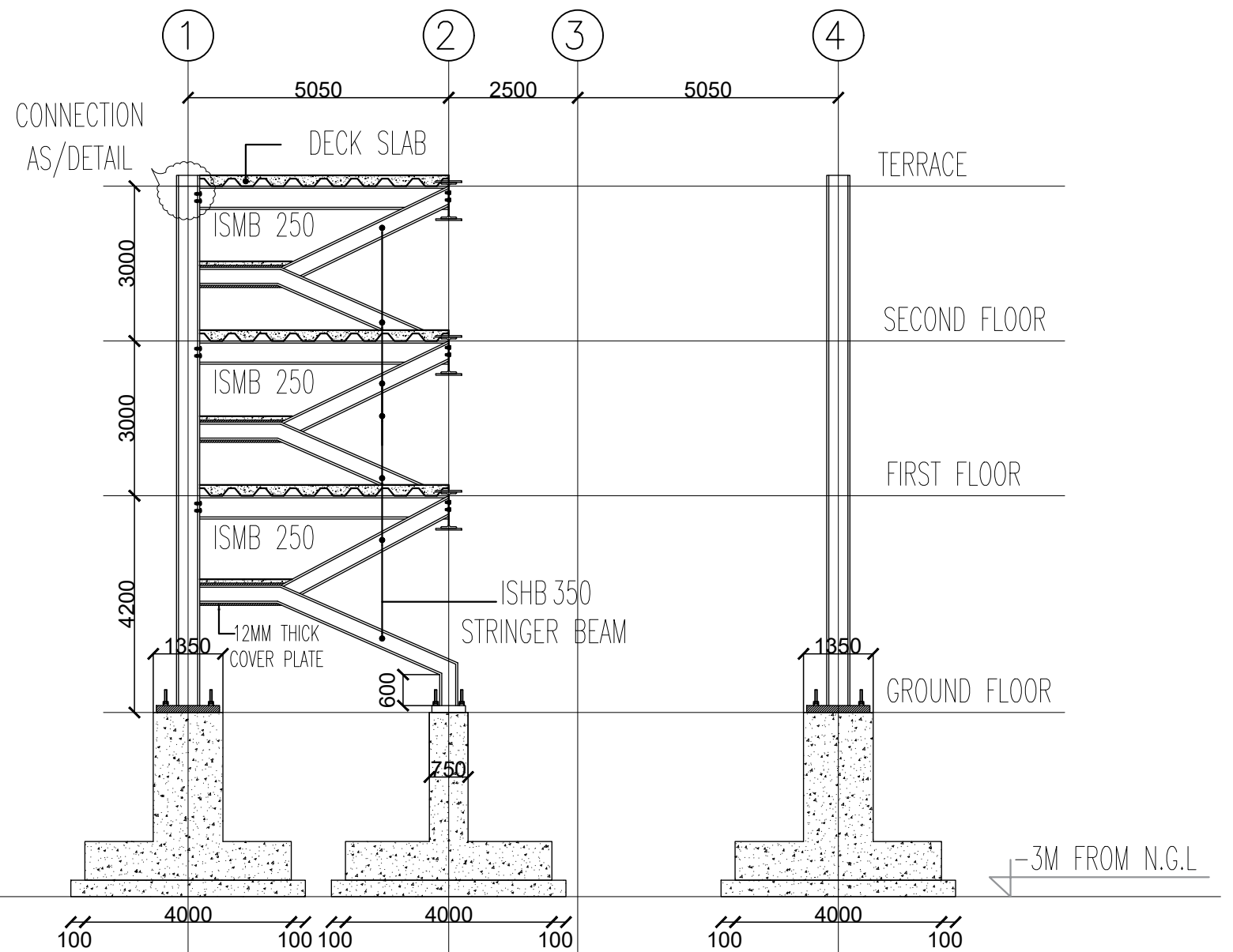


ELEVATION GRID-A'


SHEET NO <b>12</b>	PROJECT NAME <b>STEEL INTENSIVE ARCHERY ACADEMY WITH HOSTEL</b>	DRAWING TITLE DETAIL ELEVATION	GROUP <b>N - 01</b> ANUBHAV CHAUDHARY PRATHAMESH KULKARNI		<b>Competition Entry</b> Final Submission
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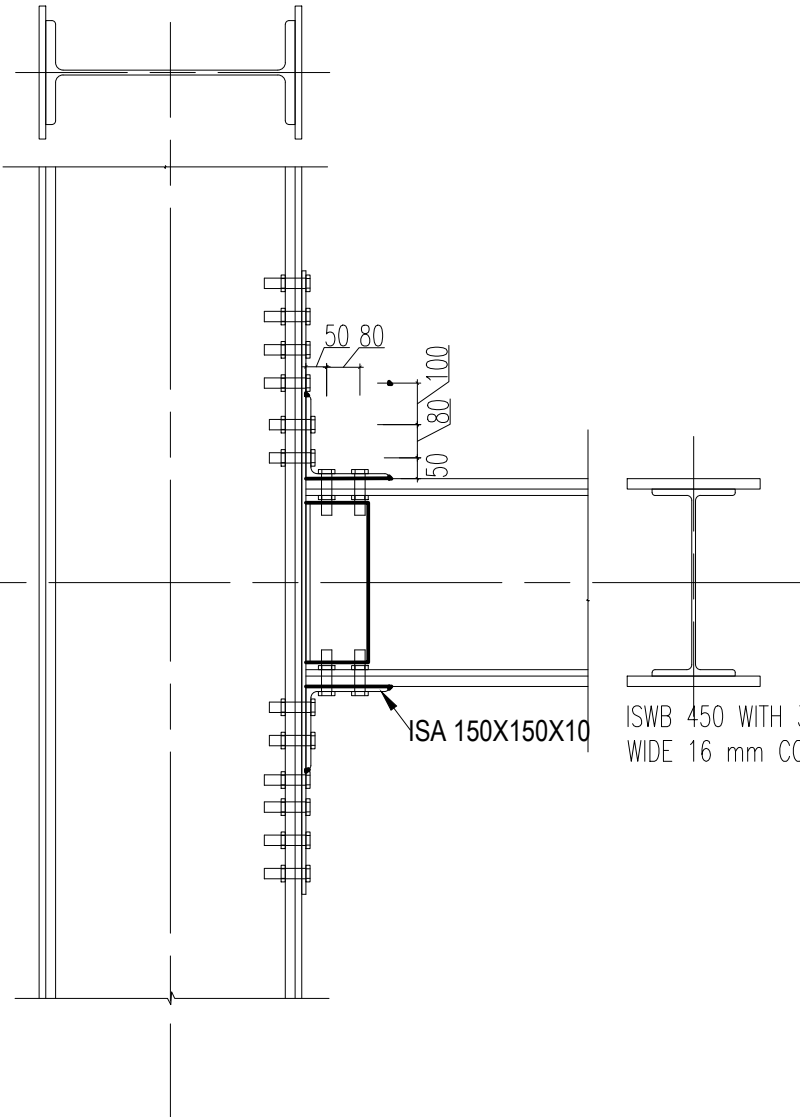
ELEVATION GRID-A



ELEVATION GRID-A'

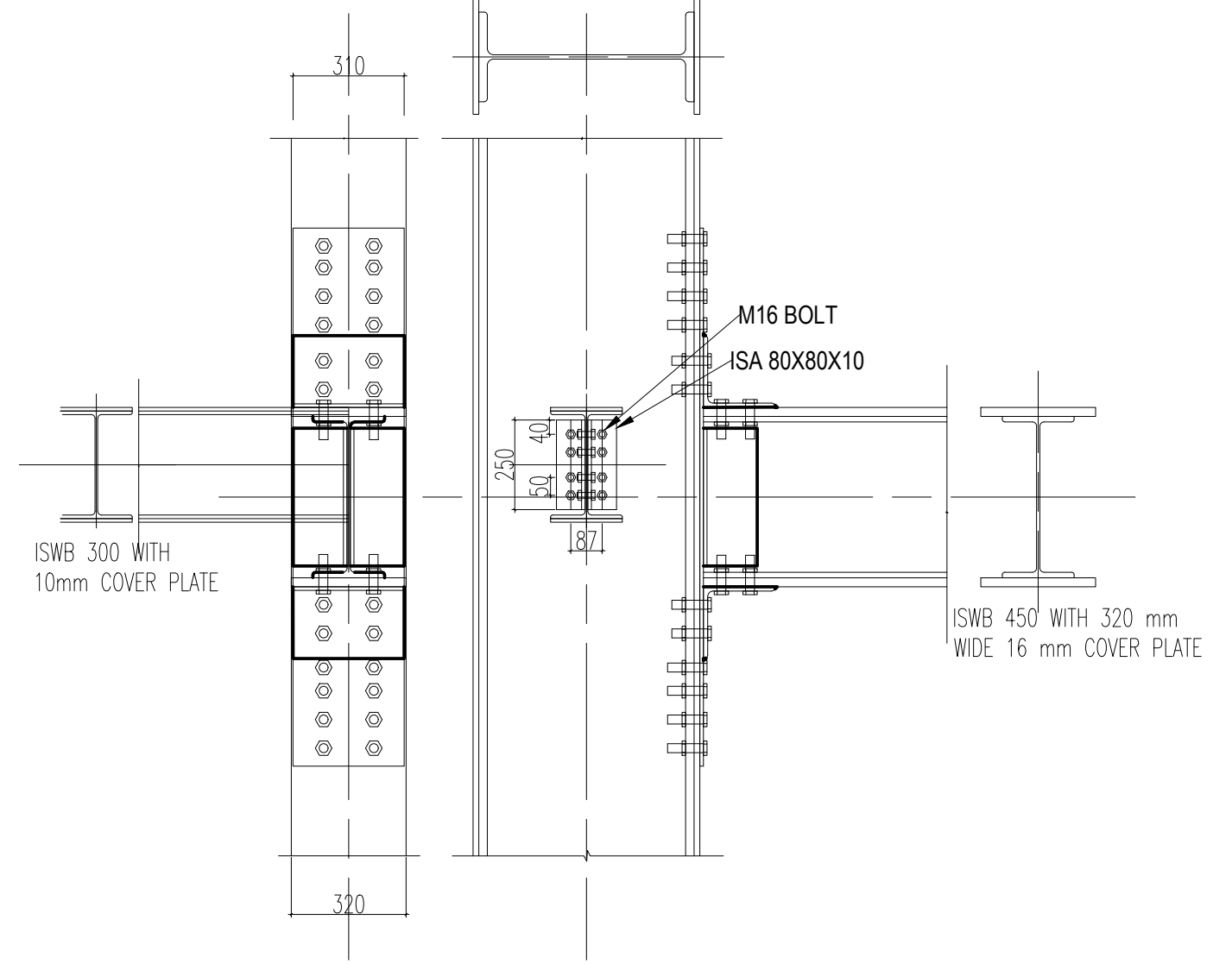
SHEET NO <b>12</b>	PROJECT NAME <b>STEEL INTENSIVE ARCHERY ACADEMY WITH HOSTEL</b>	DRAWING TITLE <b>DETAIL ELEVATION</b>	GROUP <b>N - 01</b> ANUBHAV CHAUDHARY PRATHAMESH KULKARNI		<b>Competition Entry</b> Final Submission
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ISWB 600 WITH 320 mm WIDE 16 mm THICK PLATE




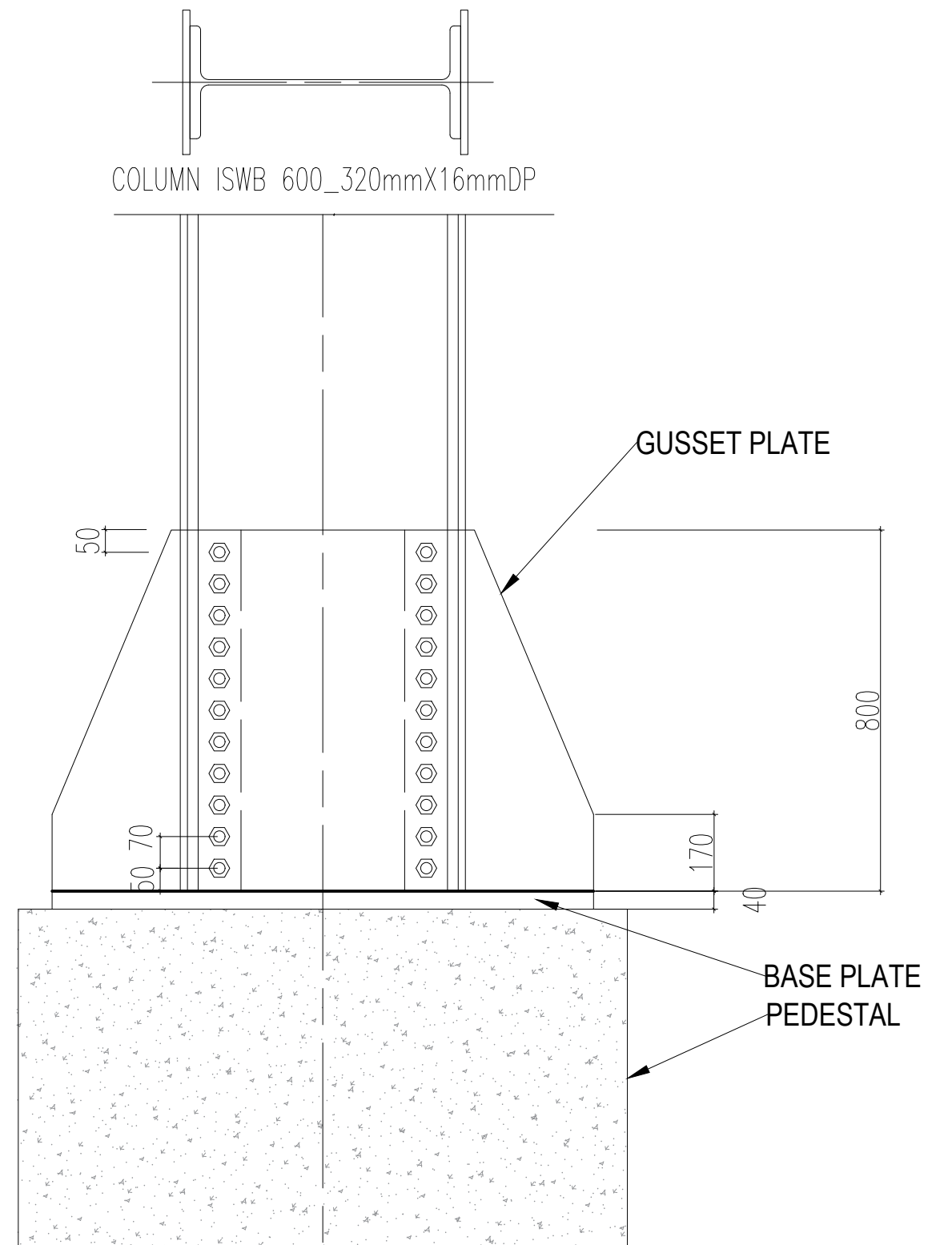
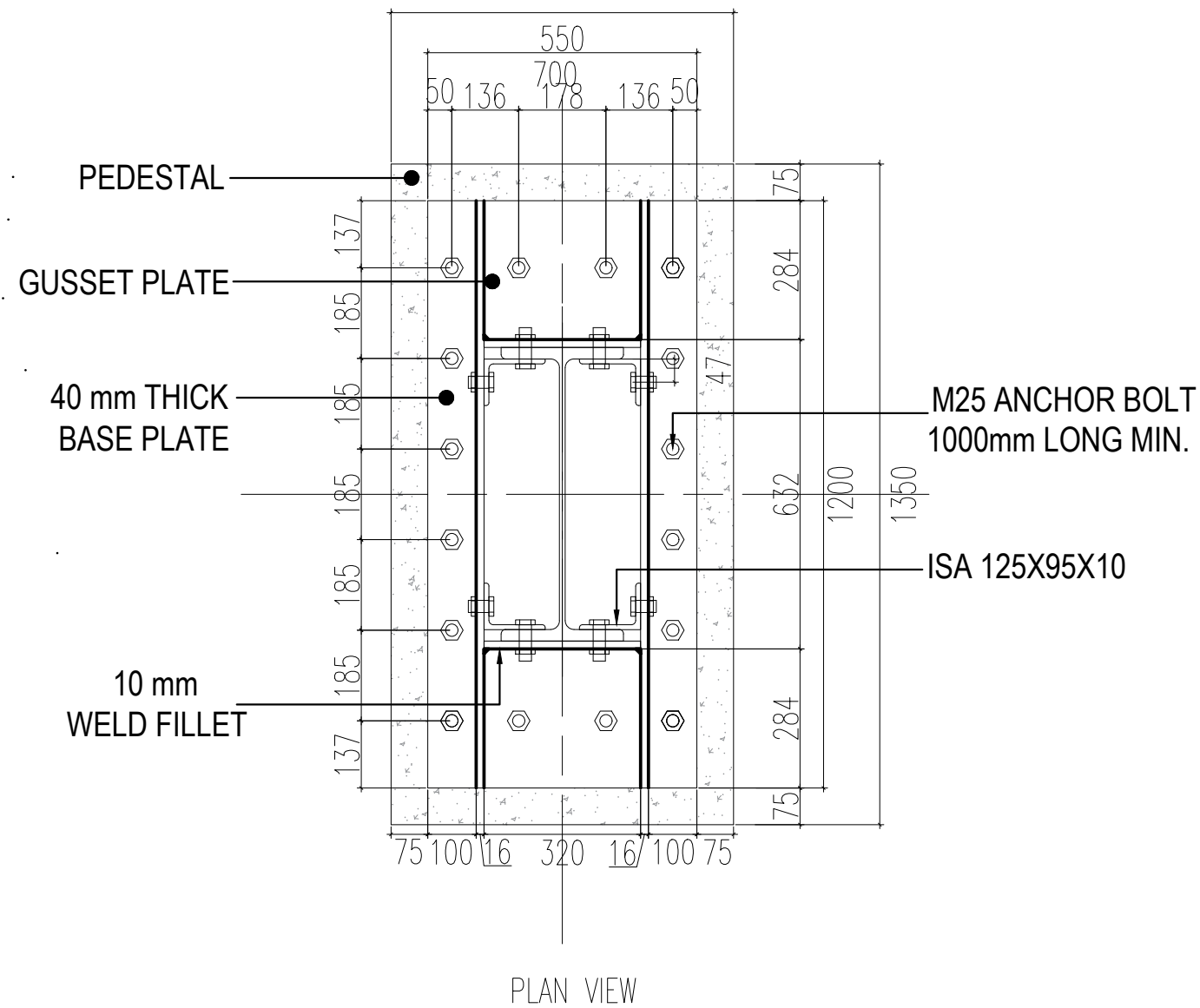
COLUMN TO MAIN BEAM RIGID CONNECTION

ISWB 600 WITH 320 mm WIDE 16 mm THICK PLATE




COLUMN TO SECONDARY BEAM SHEAR CONNECTION

SHEET NO	PROJECT NAME	DRAWING TITLE	GROUP		<p><b>Competition Entry</b> Final Submission</p>
<p><b>17</b></p>	<p><b>STEEL INTENSIVE ARCHERY ACADEMY WITH HOSTEL</b></p>	<p>CONNECTION DETAIL</p>	<p><b>N - 01</b> ANUBHAV CHAUDHARY PRATHAMESH KULKARNI</p>		



BASE PLATE TO COLUMN CONNECTION DETAIL

SHEET NO	PROJECT NAME	DRAWING TITLE	GROUP		<b>Competition Entry</b> Final Submission
<b>18</b>	<b>STEEL INTENSIVE ARCHERY ACADEMY WITH HOSTEL</b>	BASE PLATE DETAIL	<b>N - 01</b>		
		PLINTH LEVEL	ANUBHAV CHAUDHARY PRATHAMESH KULKARNI		

**YEAR – 2022**

**COMPETITION TOPIC:**

**STEEL INTENSIVE ARCHERY ACADEMY WITH HOSTEL**

**DESIGN OPTION**

**BY**

**3<sup>RD</sup>- B Prize Winner – Team E-04**

**from  
Kalinga Institute of Industrial Technology, Bhubaneswar,  
Odisha**





# INS DAG

CIVIL AWARD COMPETITION 2022



## STEEL INTENSIVE ARCHERY ACADEMY WITH HOSTEL

**GUIDED BY:**

**PROF. (DR.) PURNACHANDRA SAHA  
KIIT DEEMED TO BE UNIVERSITY, BHUBANESWAR**

**PRESENTED BY :  
GROUP E-04**

**SOHAM DE ( M. Tech, 1st YEAR, C.E(SE))  
JYOTI SAHOO(B.TECH,4th YEAR, C.E)  
SURAJ KUMAR GOUDA(B.TECH,4th YEAR, C.E)**

# PARAMETERS GIVEN

1. Site location	Jamshedpur
2. Total Length of the hostel building	50.0m
3. Total Length of Archery shed	50.0m
4. Width of Hostel Building	12.6m
5. Width of Archery Shed	7.50m
6. Types of Archery Shed	Cantilever, open on 3 sides (Front and Two Sides)
7. Hostel Building	Three(3) Storeyed
8. Floor to floor height(Hostel Block)	3.0m
9. Clear Height of Archery Shed	2.5 m from PL
10. Columns	Allowed only along LONGER SIDE periphery of the Building
11. Column Spacings	As per economical layout
12. Floor Beams	Steel/Latticed Girders
13. Flooring	RCC/ Profile Deck Sheet
14. False Ceiling	At Archery Shed - 10 kg/sqm
15. Walls of Hostel Building	Brickwalls/ Lightweight Gypsum Board panels / AAC Block
16. Roof Covering of Archery shed	Colour Coated Steel Sheet
17. Bracing	As per design allowed at two ends only

# MATERIALS FOR CONSTRUCTION

1. Foundation System	R.C.C. of minimum grade M25
2. Structural members like columns, beams members and bracing systems	Structural steel of mild (grade E250BR or higher grade as required and applicable)
3. Roof and Cladding	Standard Colour Coated Steel Sheets (Galvalume)

## **FACILITIES**

The client has specified the following requirements for the proposed project:

1.	Site Location	: Jamshedpur
2.	Total Length of the Hostel Building	: 50.0m
3.	Total Length of Archery Shed	: 50.0m
4.	Width of Hostel Building	: 12.6 m
5.	Width of Archery Shed	: 7.50m
6.	Type of Archery Shed	: Cantilever, Open on 3 Sides (Front and two sides)
7.	Hostel Building	: Three (3) Storeyed
8.	Floor to floor height (Hostel Block)	: 3.0 m
9.	Clear Height of Archery Shed	: 2.5 m from PL
10.	Columns	: Allowed only along LONGER SIDE periphery of the building
11.	Column Spacings	: As per economical layout
12.	Floor Beams	: Steel Beams / Latticed Girders
13.	Flooring	: RCC / Profile Deck Sheet
14.	False Ceiling	: At Archery Shed – 10 kg/sqm
15.	Walls of Hostel Building	: Brickwalls / Lightweight Gypsum Board Panels/AAC Block
16.	Roof covering of Archery Shed	: Colour Coated Steel Sheet
17.	Bracing	: As per design, allowed at two ends only

## **MATERIALS FOR CONSTRUCTION**

1. Foundation system	: R.C.C. of minimum grade M25
2. Structural members like columns, beams, members and bracing systems	: Structural steel of mild steel (grade E250BR or higher grade as required and applicable)
4. Roof & Cladding	: Standard Colour Coated Steel Sheet (Galvalume)

## **STANDARD SHAPE OF THE STRUCTURE**

While considering the shape and arrangement of the Structure, aesthetics, economy as well as structural integrity of the entire system has to be considered.

## **DESIGN LOADS**

### 1. Dead Load:

Dead load will be the weight of the structure itself along with all permanent weight carried by it.

### 2. Live Load:

- |                      |                                        |
|----------------------|----------------------------------------|
| a. Live load on Roof | - as per IS: 875 Part 2 latest version |
| b. Live Load on Deck | - as per IS: 875 Part 2 latest version |
| c.                   |                                        |

### 3. Wind Load:

- a. Basic wind speed to be considered for the specified location as per IS: 875 Part 3 latest version

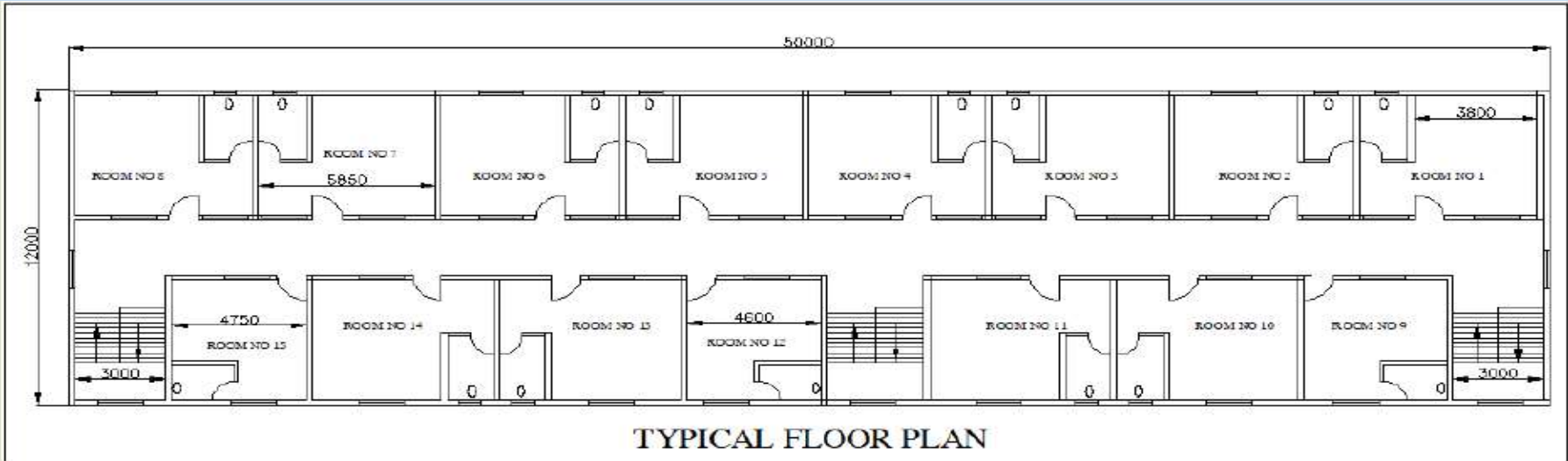
### 4. Seismic Load:

- a. Seismic Zone for the mentioned location as per IS: 1893 latest version

### 5. Other Loads:

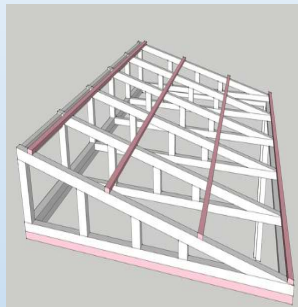
Temperature variation of 15°C has to be considered. Please consult relevant specification for other specific loads and action points.

# SCHEMATIC PLAN



## UNIQUENESS OF DESIGN

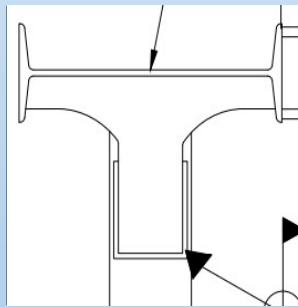
Used mono pitch-truss(with vertical members)



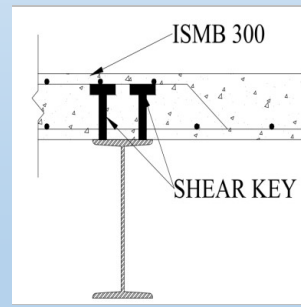
Hollow Section is used for design



Use of stiffener plate at beam column junction



Use of shear key at the junction beam and slab

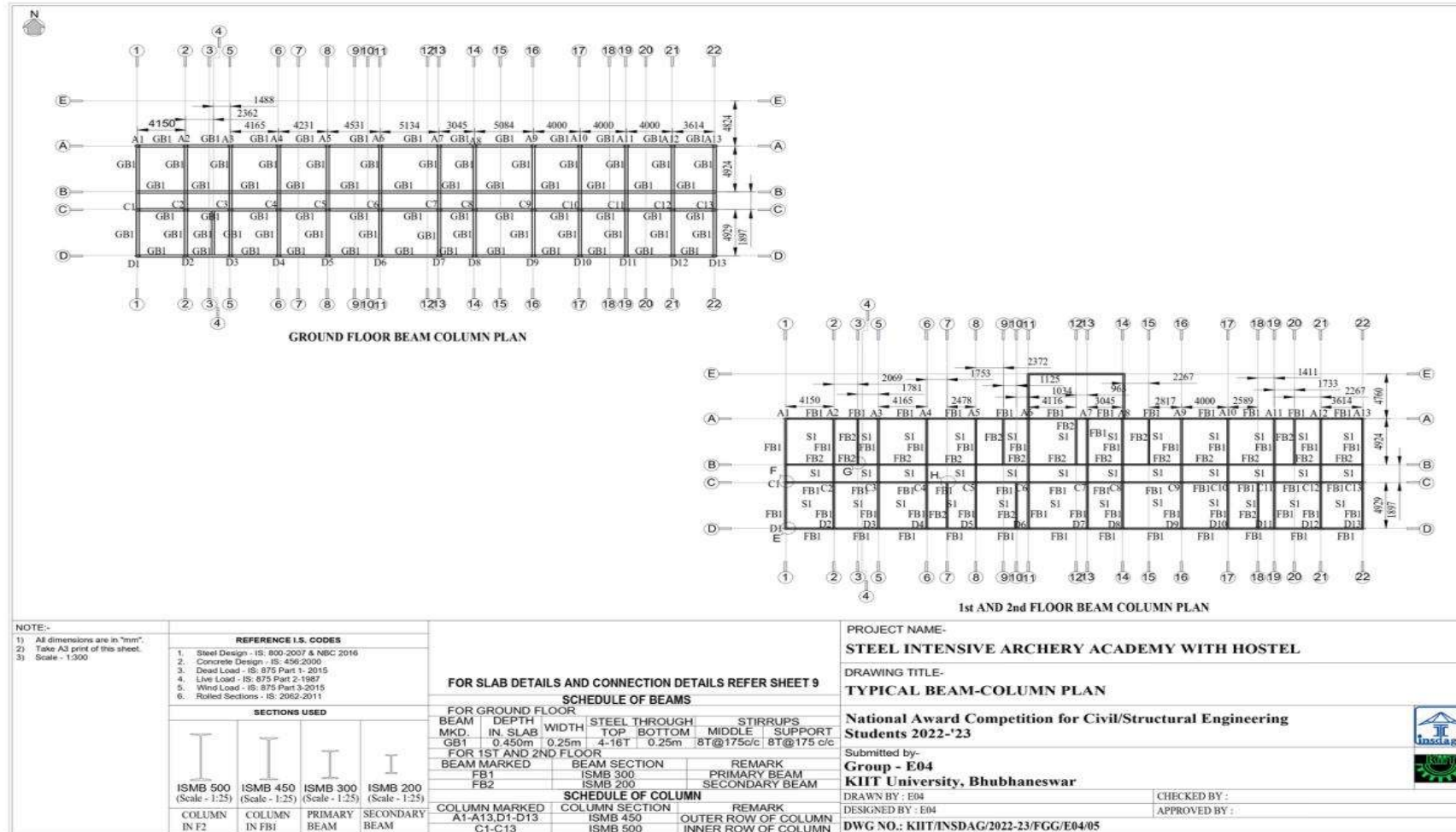


## STRUCTURAL DESIGN-

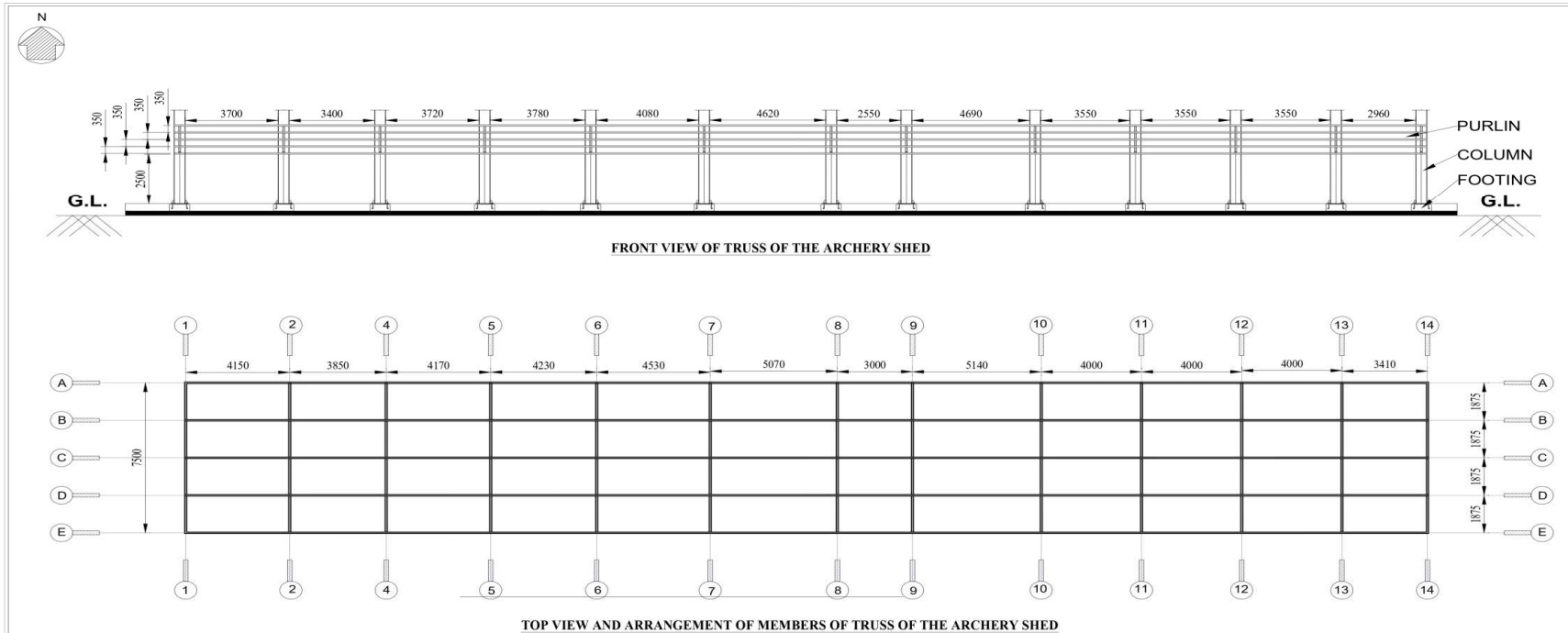
Structural design of each and every member was done manually. For the design we followed the latest IS codes.

- Steel Design - As per IS: 800-2007
- Concrete Design - As per IS: 456-2000
- Dead Load - As per IS: 875 part 1-1987
- Live Load - As per IS: 875 part 2-1987
- Wind Load - As per IS: 875 part 3-2015
- Seismic load - As per IS: 1893 part 1-2016
- Composite - As per EN1994-2005`
- Rolled sections and plates - As per IS: 2062-2011
- SHS/RHS - As per IS: 4923-1997
- CHS – As per IS: 1161-2014
- Symbols for welding - As per IS: 813(part 1 )-2018
- Weld joint details - As per IS: 9595-1996
- High strength structural bolts - As per IS: 3757-1985(Reaffirmed 2019) & IS: 4000-1992(Reaffirmed 2017)
- Hexagon Head Bolt - As per IS: 1363(part 1)-2019
- Foundation - As per IS: 5624-1993

# BEAM COLUMN LAYOUT-



# FRONT AND TOP VIEW OF TRUSS SHED-



**NOTE:-**

- 1) All dimensions are in "mm".
- 2) Take A3 print of this sheet.
- 3) Scale - 1:150

**REFERENCE I.S. CODES**

1. Steel Design - IS: 800-2007 & NBC 2016
2. Concrete Design - IS: 456:2000
3. Rolled Sections - IS: 2062-2011
4. SHS - IS: 4923-2017
5. Symbols for Welding - IS: 813(Part 1) - 2018
6. Weld Joint Details - IS: 9595 - 1996
7. Foundation Bolts - IS: 5624-1993
8. High strength structural bolts - IS:3757-1985 & IS:4000-1992

**PROJECT NAME-**

**STEEL INTENSIVE ARCHERY ACADEMY WITH HOSTEL**

**DRAWING TITLE-**

**FRONT AND TOP VIEW OF TRUSS SHED**

**National Award Competition for Civil/Structural Engineering Students 2022-'23**

**Submitted by-**

**Group - E04  
KIIT University, Bhubhaneswar**

DRAWN BY : E04

DESIGNED BY : E04

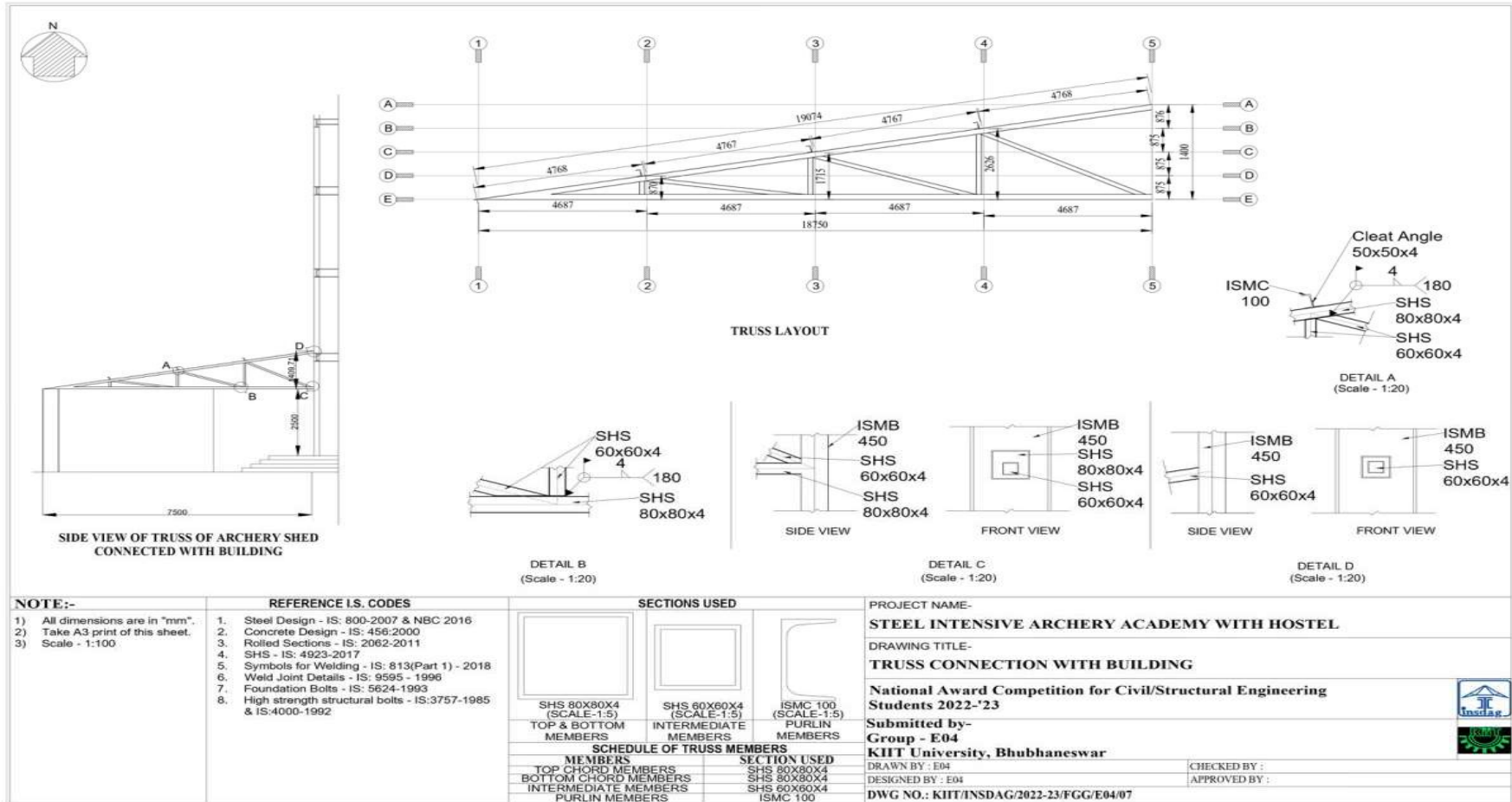
DWG NO.: KIIT/INSDAG/2022-23/FGG/E04/06

CHECKED BY :

APPROVED BY :

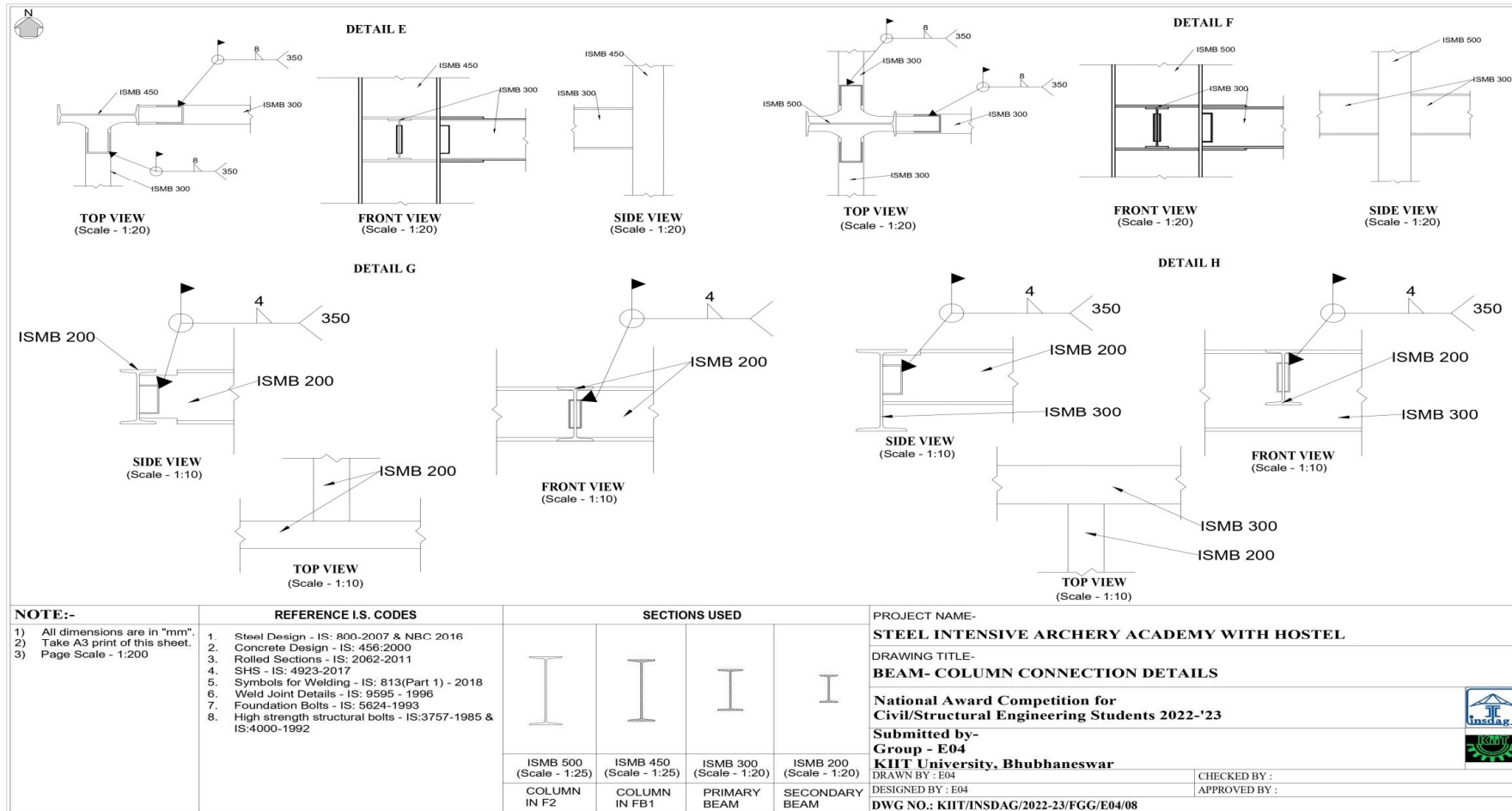


# TRUSS CONNECTION WITH BUILDING-

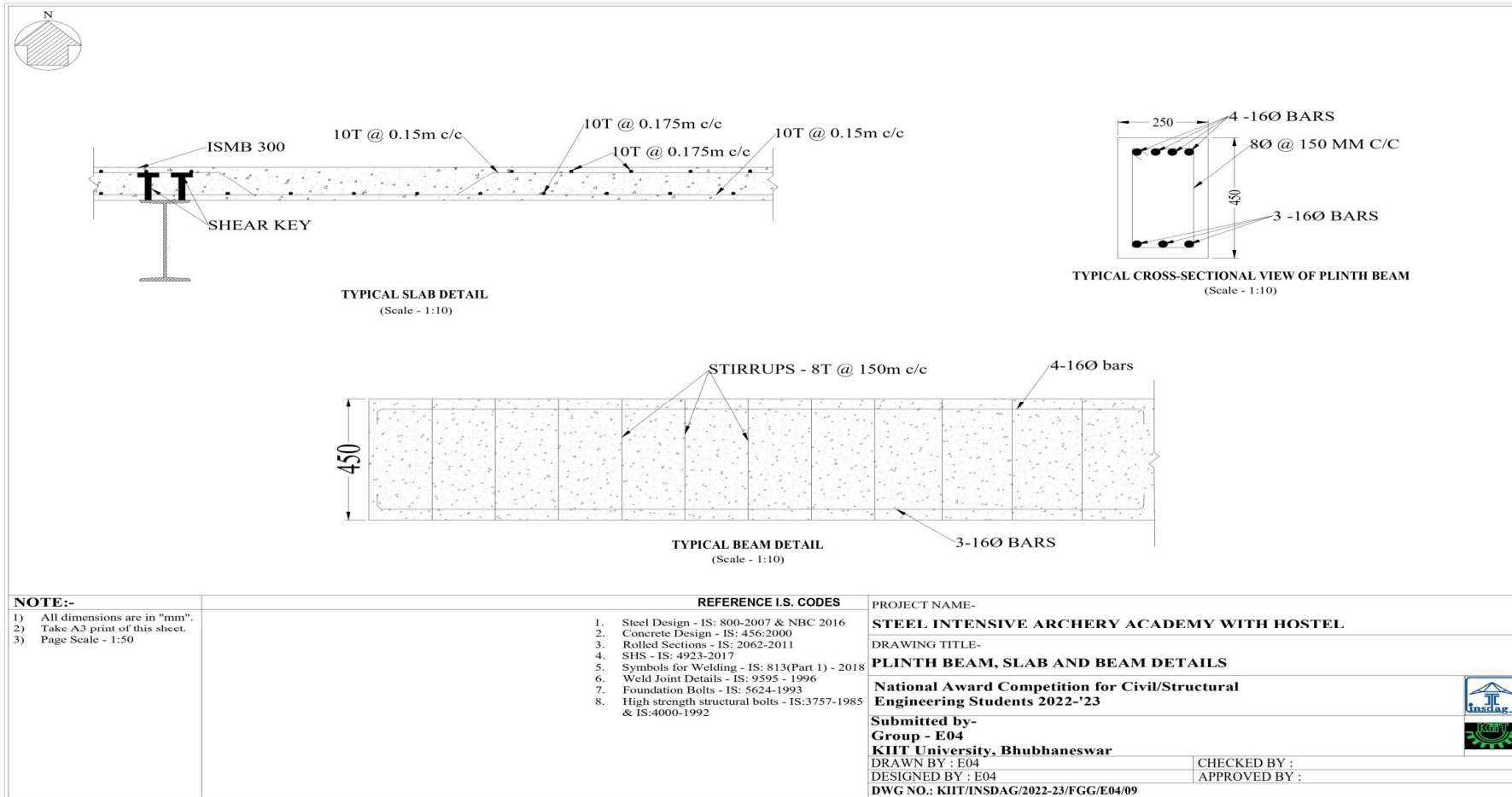




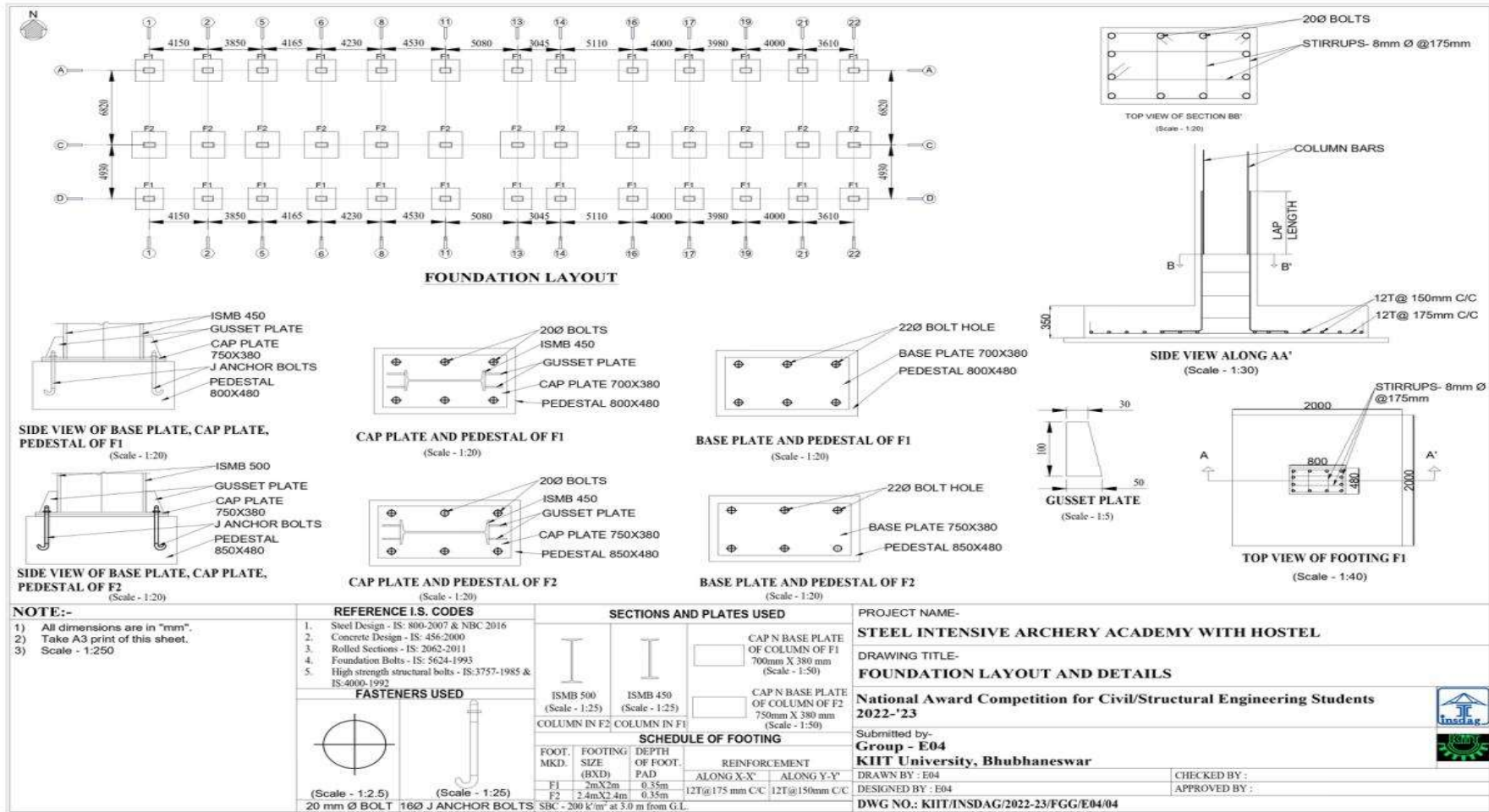
# BEAM-COLUMN CONNECTION DETAILS-



# PLINTH BEAM, SLAB AND BEAM DETAILS-



# FOUNDATION LAYOUT AND CONNECTION DETAILS-



## BILL OF QUANTITIES-

- Sections used in Design (grade E250BR),
  - For Beam- ISMB 200, ISMB 300,
  - For Column- ISMB 450, ISMB 500
  - For Truss(Top Chord Members)- SHS 80X80X4
  - For Truss(Rafters)- SHS 80X80X4
  - For Truss(Internal Members)- SHS 60X60X4
  - For Purlin- ISMC 100
- GI Sheet
- Grade of Concrete used in Design : M20 for PCC Work and for structural member M25
- Reinforcement used in Design,
  - 8mm, 10mm, 12mm, 16mm and 20mm dia bar of Fe 500 grade
- Welding : Fillet Weld of thickness 4mm, 6mm and 8mm

## BILL OF QUANTITIES-

- Detailed estimation was carried out to find the quantities of different materials being used in the structure.
- The market rate for high tensile steel of grade E250BR is in the range of ₹ 80.00/kg. We considered the upper range to estimate the total price.
- Quantity of total structural steel consumed :500.349 Tons with a cost of around ₹ 32,523,090.24
- After Adding a 3% extra to the total material cost, considering the wastage the total cost would be ₹ 3,83,08,267.85

## SUMMERIZED BILL OF QUANTITIES-

TOTAL STEEL				
Member	Total Weight (kg)	Rate/kg (INR)	Total Cost (INR)	Extra 3%
Floor Beam	51326.073	65	3336194.745	3436280.587
Column	36044.532	65	2342894.58	2413181.417
Truss (rafter)	968.1	65	62926.5	64814.295
Truss (top chord)	955.192	65	62087.48	63950.1044
Truss (internal members)	2782.71	65	180876.15	186302.4345
Purlin	2300	65	149500	153985
Gusset Plate	3790.540176	65	246385.1114	253776.6648
Base plate	2792.088	65	181485.72	186930.2916
Tie beam steel	2413.831574	65	156899.0523	161606.0239
Tie beam stirrups	1060.774645	65	68950.35191	71018.86247
Pedestral steel	1956.84957	65	127195.2221	131011.0787
Pedestral Tie	1305.973447	65	84888.27408	87434.9223
slab Steel	392658.57	65	25522807.05	26288491.26
<b>GRAND TOTAL</b>			<b>32523090.24</b>	<b>33498782.94</b>

## SUMMERIZED BILL OF QUANTITIES-

<b>TOTAL CONCRETE</b>				
Member	Total Weight (m <sup>3</sup> )	Rate/m <sup>3</sup> (INR)	Total Cost (INR)	Extra 3%
PCC	69.2652	5850	405201.42	417357.4626
Pedastal Concrete	42.1668	6250	263542.5	271448.775
Concrete Foundation	70.616	5500	388388	400039.64
Tie Beam Concrete	40.6022625	5500	223312.4438	230011.8171
Slab Concrete	205.0948125	5500	1128021.469	1161862.113
<b>GRAND TOTAL</b>			2408465.833	2480719.807

<b>TOTAL GI SHEET</b>				
Member	Total Weight (kg)	Rate/kg (INR)	Total Cost (INR)	Extra 3%
Sheet 1	1422.518125	110	156476.9938	161171.3036
<b>GRAND TOTAL</b>			156476.9938	161171.3036

## SUMMERIZED BILL OF QUANTITIES-

BRICKWORK				
Member	Total no.of brick	Rate/brick	Total Cost (INR)	Extra 3%
ALL WALL	210446	10	2104460	2167593.8

GRAND TOTAL (Rs)	38308267.85
	Three Crore Eight Three Lakhs Eight Thousand Two Hundred Sixty Seven and Eight Five Paisa