Unit House of 350 sq. ft. Floor Area



Steel Intensive Rural Structures - INSDAG Initiative

To achieve the goal of ensuing sustainable construction and for its mission of steel promotion INSDAG has developed few design models of rural buildings using structural steel.

4 building plans collected from municipalities of West Bengal have been used for building design.

- 1. One Unit house if Area 350 Sq Ft
- 2. One Anganwadi -cum- Health Centre of area 400 Sq ft
- 3. A meeting / Panchayat hall of area 1500sq.ft
- 4. A school building of area 2600sq.ft

A. Salient Features / Building Components of in Building Models with Steel Framing

i) Roofing

Roof sheeting is done with 0.5 mm thick Corrugated Galvanized/ Galvalume/ colour coated Steel Sheets spanning over purlins supported on steel portals or trusses made from Square Hollow Section/ Rectangular Hollow Section. Lighter weight Galvalume sheet and FC panel can also be used.

ii) Structural Framework

Structural steel Column and Trusses / Portal Frames using SHS/RHS

The entire framework for the building has been conceptualized using Square Hollow Section with idealized panels approximately 1.0mx1.0 m. The members are connected with the SHS or RHS sections by insert plates.

iii) Ferro-Cement Wall panels/Cladding

A typical panel size of 1m x 1m for the cladding materials has been chosen. Each panel is made of a 15 mm thick Cement-Sand mortar (1:1) skin with 1 layer of 0.265 mm diameter galvanized chicken mesh under a layer of 2.65 mm diameter reinforcement @ 25 mm c/c both ways as welded mesh placed centrally. The typical details of the connection of these panels are in the corresponding drawing sheets of each building . The gaps (approx. 2 mm) between the panels and SHS sections will be sealed with waterproof grouting using SIKA / Accoproof or equivalent, to make the connections leak proof.

iv) RCC Foundation System

The foundation type and pattern for all of the housing modules has been conceived as a frame work of RCC peripheral beam at plinth level supported over RCC pedestals and RCC isolated footings. For partition walls, intermediate supports have been considered supported over tie beams.

v) Flooring

Brick on-edge flooring placed over rammed earth at locations of rooms. For water-tightness flooring is placed over 50 mm thick 1:2:4 Plain Cement Concrete.

vi) Doors and Windows

Steel framed doors and windows are assumed to be used. Depending on the local site condition other material can be used also to make it cost-effective.



Structural Frame & Ferro cement panels while Installation

Prototype Buildings Installed by INSDAG



Connection of SHS with Ferro cement panel



Picture 1



Picture 2

Model Rural House Installed at Rural Technology Park at the Campus of National Institute of Rural Development & Panchayat Raj, Hyderabad, (Installed in 2017, still in good condition in 2023)

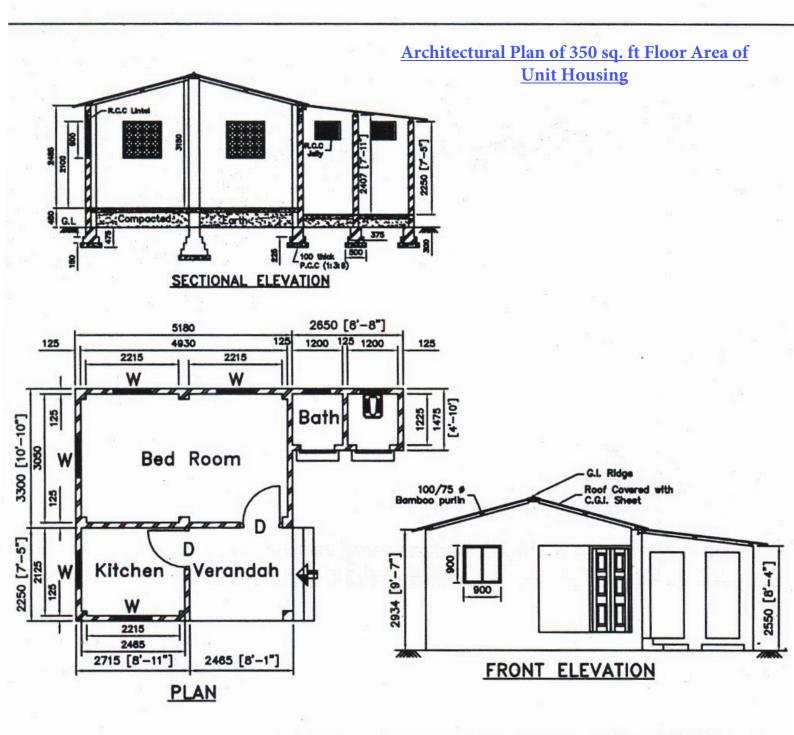
Many more prototypes have been installed by INSDAG in many places like in Burdwarn in West Bengal (2013), Tripura, Talegaon in Maharashtra (2017) with FC Panels.

B. Cost Aspects

Steel framed building module by INSDAG would cost around Rs. 1100 to 1300/- per sq. ft of area (as estimated with DSR 2023) with steel usage of 4.0 to 5.3 kg steel per sq. ft. of construction area (structural steel & TMT bars) which is competitive and sometimes lower if constructed in mass scale.

| Building Type | Area | Cost | Steel usage |
|---------------------|---------|-------------|--|
| | Sq. Ft. | per sq. ft. | (Structural Steel & TMT) |
| Unit House | 350 | Rs. 1295 /- | 5.3 kg / sq. ft. (only structural steel- 4.54) |
| Health / Aanganwadi | 400 | Rs. 1125 /- | 4.9 kg / sq. ft. (only structural steel- 4.00) |
| Centre | | | |
| Meeting Hall | 1500 | Rs. 1276/- | 4.7 kg / sq. ft. (only structural steel- 4.0) |
| School Building | 2600 | Rs. 1050 /- | 4.0 kg / sq. ft. (only structural steel- 2.7) |

Cost & Steel Usage – 4 Building Modules



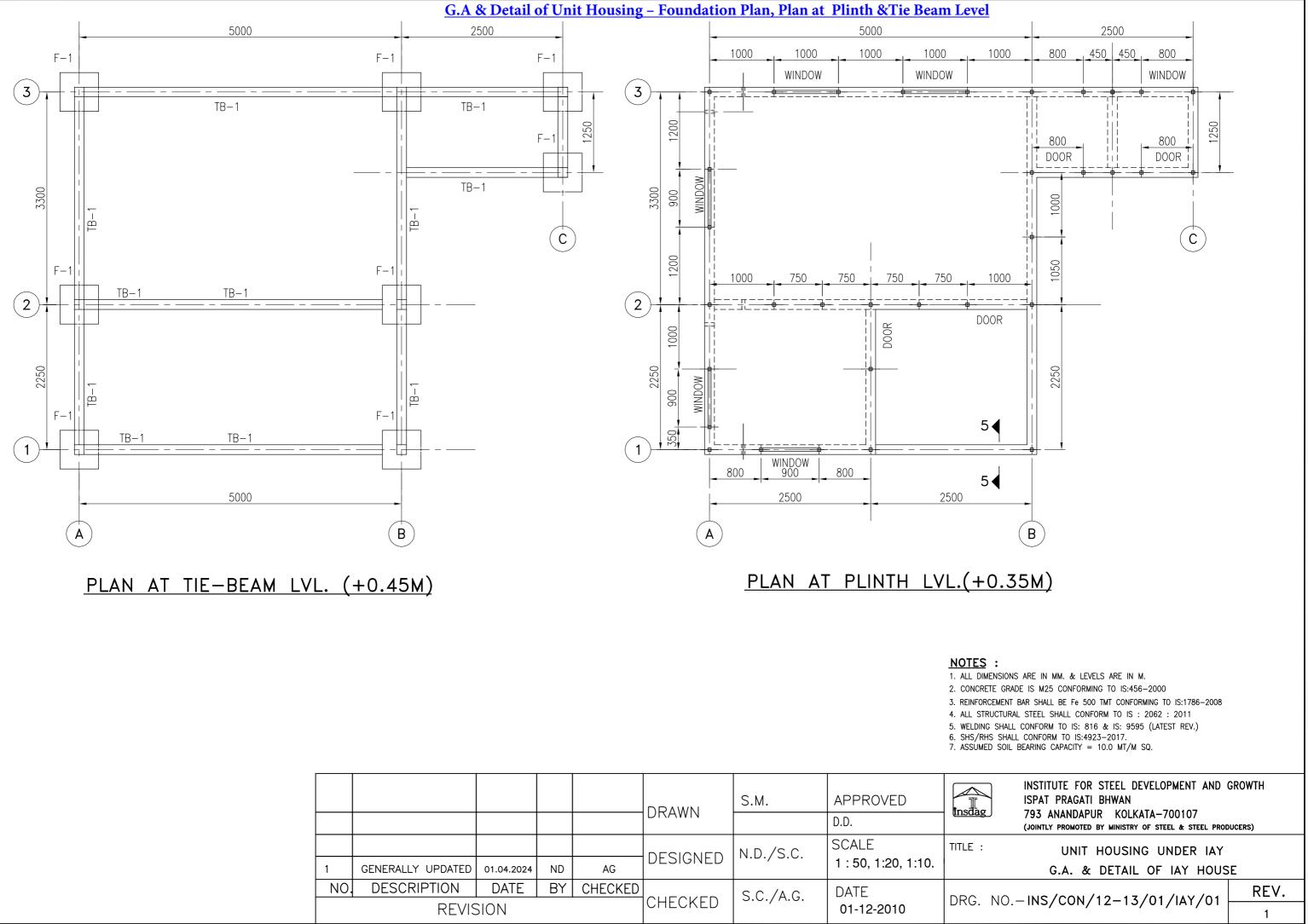
PLAN AND ELEVATION SHOWING UNIT HOUSE 350 SQ. FT. FLOOR AREA

NOTES :

1. ALL DIMENSIONS ARE IN MM. & LEVELS ARE IN M.

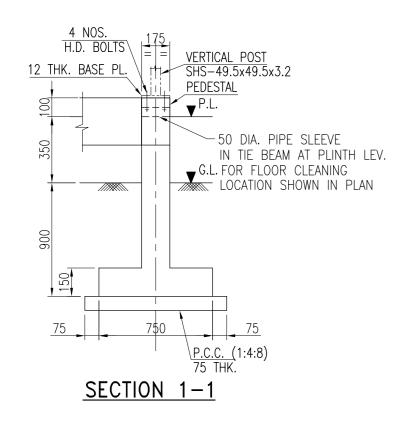
2. DRAWING COLLECTED FROM S.A.E. OFFICE RANAGHAT BLOCK, WEST BENGAL

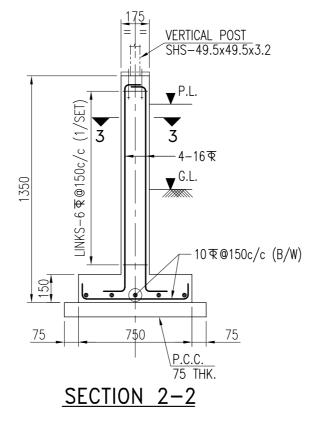
| INSTITUTE FOR STEEL DEVELOPMENT & GROWTH (JOINTLY PROMOTED BY MINISTRY OF STEEL & STEEL PRODUCERS) 52/1A, BALLYGUNGE CIRCULAR ROAD, KOLKATA-700 019 | | | | | | | | | ж. 1 | | |
|---|----|------|----------|-------|-------|--------------------------------|------|------|----------|------|---|
| TITLE : | OF | | CTURAL P | | | DRG. NO. HNS/CON/12-13/01/IAY/ | | | | | С |
| DRAWN | SM | СНКД | ND/SC | SCALE | 1:50, | 1:20, | 1:10 | DATE | 10/12/13 | REV. | |

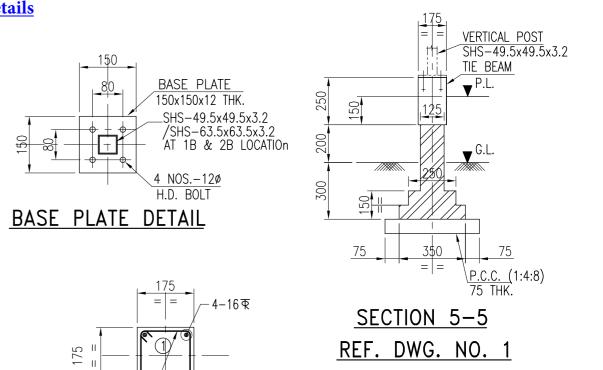


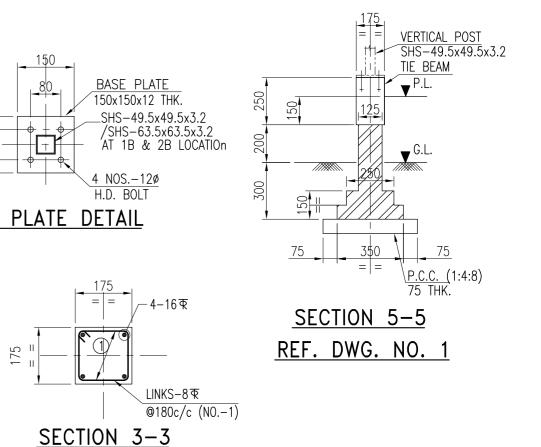
| | | | | | | DRAWN | S.M. | APPROVED | | |
|---|----------|-------------------|------------|----|---------|----------|-------------|---------------------|---------|--|
| | | | | | | | | D.D. | | |
| | | | | | | DESIGNED | N.D./S.C. | SCALE | TITLE : | |
| 1 | 1 | GENERALLY UPDATED | 01.04.2024 | ND | AG | DESIGNED | 11.2.7 0.0. | 1 : 50, 1:20, 1:10. | | |
| | NO. | DESCRIPTION | DATE | ΒY | CHECKED | | S.C./A.G. | DATE | | |
| | REVISION | | | | | CHECKED | 0.0.7 A.O. | 01-12-2010 | DRG. N | |

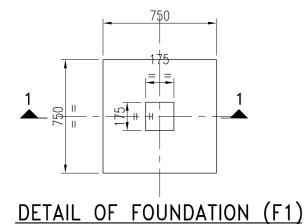
G.A & Detail of Unit Housing - Foundation Details

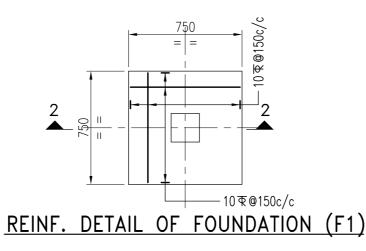


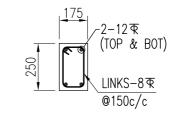










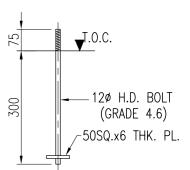


| <u>REINF. DET</u> | _• |
|-------------------|----------------|
| OF TIE-BEAM | (<u>TB1</u>) |

NOTES :

- 1. ALL DIMENSIONS ARE IN MM. & LEVELS ARE IN M.
- 2. CONCRETE GRADE IS M25 CONFORMING TO IS:456-2000
- 3. REINFORCEMENT BAR SHALL BE Fe 500 TMT CONFORMING TO IS:1786-2008
- 4. ALL STRUCTURAL STEEL SHALL CONFORM TO IS : 2062 : 2011
- 5. WELDING SHALL CONFORM TO IS: 816 & IS: 9595 (LATEST REV.)
- 6. SHS/RHS SHALL CONFORM TO IS:4923-2017.
- 7. ASSUMED SOIL BEARING CAPACITY = 10.0 MT/M SQ.

| | | | | | DRAWN | S.M. | APPROVED | | |
|-----|-------------------|------------|----|---------|-----------|------------|---------------------|-----------|--|
| | | | | | DRAWN | | D.D. | (IIISUAg) | |
| | | | | | DESIGNED | N.D./S.C. | SCALE | TITLE : | |
| 1 | GENERALLY UPDATED | 01.04.2024 | ND | AG | DESIGNED | | 1 : 50, 1:20, 1:10. | | |
| NO. | DESCRIPTION | DATE | ΒY | CHECKED | | S.C./A.G. | DATE | | |
| | REVISION | | | CHECKED | 0.0.77.0. | 01-12-2010 | DRG. N | | |



DETAIL OF ANCHOR BOLT



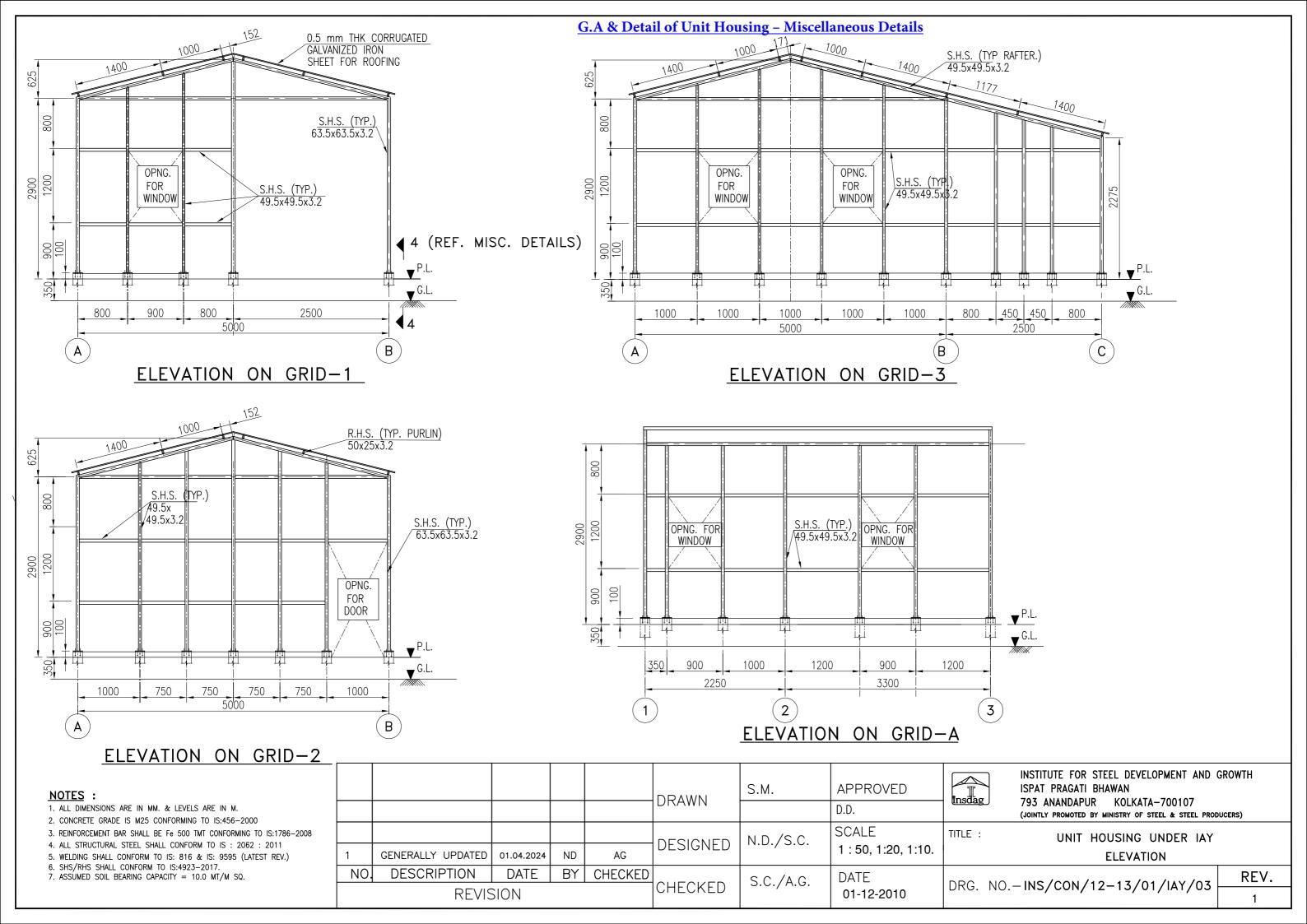
INSTITUTE FOR STEEL DEVELOPMENT AND GROWTH ISPAT PRAGATI BHWAN 793 ANANDAPUR KOLKATA-700107 (JOINTLY PROMOTED BY MINISTRY OF STEEL & STEEL PRODUCERS)

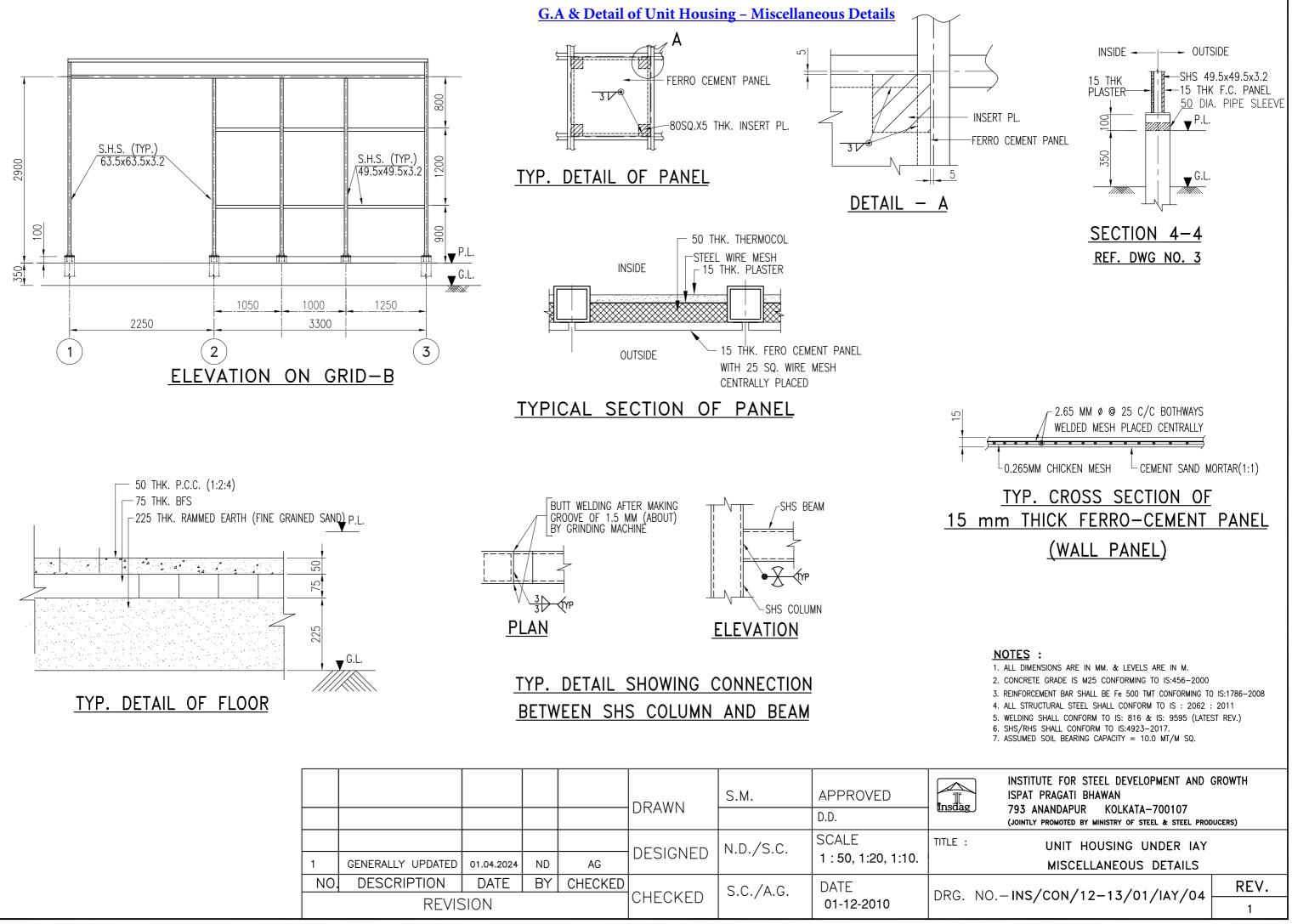
UNIT HOUSING UNDER IAY

FOUNDATION DETAILS

NO.-INS/CON/12-13/01/IAY/02

REV. 1





| | | | | | DRAWN | S.M. | APPROVED | | |
|-----|-------------------|------------|----|---------|----------|------------|---------------------|---------|--|
| | | | | | | | D.D. | | |
| | | | | | DESIGNED | N.D./S.C. | SCALE | TITLE : | |
| 1 | GENERALLY UPDATED | 01.04.2024 | ND | AG | DESIGNED | | 1 : 50, 1:20, 1:10. | | |
| NO. | DESCRIPTION | DATE | BY | CHECKED | | S.C./A.G. | DATE | | |
| | REVIS | REVISION | | | CHECKED | 3.0.7 A.0. | 01-12-2010 | DRG. NO | |

Bill of Materials & Estimated Cost

Summary for the construction materials required for

Cost Rs. 1295 per Sq ft

| | ΙΑΥ | 350 | Sq Ft. | | Steel | 5.3 | KG/ Sq ft |
|-------|---|----------|----------------|-----------|-----------|-----|-----------|
| SI No | Description | Quantity | Unit | Rate (Rs) | Total | | |
| 1 | Excavation in Foundations and trenches | 11.08 | m ³ | 260 | 2880.1013 | | |
| 2 | 75 mm thk PCC below Foundation (1:4:8) | 1.75 | m3 | 5205 | 9087.93 | | |
| 3 | Volume of RCC (M25 Grade) | 2.44 | m³ | 9045 | 22060.755 | | |
| 4 | Brickwork | 2.98 | m ³ | 7132 | 21267.624 | | |
| 5 | Earthwork in filling. | 7.95 | m³ | 308 | 2447.2487 | | |
| 6 | Reinforcement bar TMT Fe 500 | 330 | kg | 89.65 | 29584.5 | | |
| 7 | Structural steel SHS, Plates etc | 1.54 | MT | 100000 | 154000 | | |
| 8 | 50 thk PCC (1:2:4) for Floor | 1.54 | m ³ | 9257 | 14290.494 | | |
| 9 | 75 thk BFS for Floor | 30.9 | m² | 450 | 13893.75 | | |
| 10 | 225 thk Rammed Earth (Fine Grained Soil) | 6.95 | m ³ | 186 | 1292.1188 | | |
| 11 | 15mm thick Ferrocement panels | 95.00 | m² | 350 | 33250 | | |
| 12 | 50 mm thk Thermocol | 95.00 | m² | 10 | 950 | | |
| 13 | Steel Wire Mesh (2.65Ø @ 25 mm c/c) | 190.00 | m² | 250 | 47500 | | |
| 14 | 15mm thk Plaster (1:5) | 190.00 | m² | 175 | 33250 | | |
| 15 | Roof Sheeting | 0.16 | МТ | 100000 | 16000 | | |
| 16 | PVC Pipe Sleeves 150 mm long x 50 mm dia | 12.0 | Nos | 50 | 600 | | |
| 17 | Centering and Shuttering | 39.0 | m² | 307.95 | 12010.05 | | |
| 18 | Doors and windows | | LS | 5000*D+20 | 35000 | | |
| 19 | White washing and paint | 187.51 | m² | 20 | 3750.1 | | |

Total Rs. **453114.7**

Note: RATE as per DSR 2023