DESIGN LAYOUT AND CONSTRUCTION DETAILS FOR DIFFERENT TYPOLoGIES OF BUILDINGS IN MOUNTAINOUS REGIONS (UTTARAKHAND)

Design Compendium
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DIFFERENT TYPOLOGIES OF BUILDINGS IN MOUNTAINOUS REGIONS (UTTARAKHAND)
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Disclaimer
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Suggested Citation
# TABLE OF CONTENTS

1. **Introduction** ................................................................. 4

2. **Building 1: Community Building** .................................................. 5
   2.1 Construction and Structural Drawings ........................................... 6
   2.2 Specifications and Bill of Quantities .............................................. 29

3. **Building 2: Rural Home Stay** ..................................................... 31
   3.1 Construction and Structural Drawings ........................................... 32
   3.2 Specifications and Bill of Quantities .............................................. 51

4. **Building 3: Residence** .......................................................... 53
   4.1 Construction and Structural Drawings ........................................... 54
   4.2 Specifications and Bill of Quantities .............................................. 68

5. **Structural Validation Report** .................................................... 70
INTRODUCTION

Multi-hazard prone mountain states like Uttarakhand are seeing intensive construction activity. Most of this construction uses energy and resource intensive brick and RCC based technologies, forgetting the rich heritage of vernacular architecture the region has. The new systems of construction, besides being expensive and energy intensive due to non-local materials that have to be carried to remote mountain locations have also demonstrated to be hazard prone with significant damages to life and property in the earthquakes, flash floods and landslides etc. being faced by the region.

A five-pronged solution is being proposed with this project i.e. Research & Assessment, Technology Adaptation, Technology Integration& Design, Training & Capacity Building, Technology demonstration and Knowledge Dissemination.

Hence, the proposed design for the community building in Kamad village, Uttarkashi consists of typical construction details followed by the use of locally available material such as mud and stone used for walls and masonry keeping in mind the safe construction practises in the earthquake prone zone. The design incorporates multiple green building technologies used in various components of the building such as-

1. Compressed Stabilized Earth Blocks for wall construction
2. Concrete Block for construction of walls
3. Pine Shingle for roofing material for sloping roofs
4. Plank and Joist for intermediate roof slabs and flat roofs
5. RCC door-window frames

Furthermore, the community building in Kamad village has been constructed as a model for disaster resistant construction in the mountainous district of Uttarkashi. As such, structural safety of the given building technologies was essential pre-requisite for architectural design. The design of the building was based on structural guidelines which have been developed for earthquake resistant construction in the country, with focus on non-engineered construction in rural areas, such as the Kamad village in Uttarkashi. Land available in Kamad is located opposite the main mandir of the village. It is a 40’ by 28’ plot with a plinth of 2’7” and situated on an internal village lane. As per the assessment and observation, first draft of the design was developed.

Detail description of the above-mentioned features are further described in the structural validation report.
1. Community Building
Kamad village, Dunda Block, Uttarkashi

Set of Drawings

Under the project:
Delivery of Eco-friendly Multi-Hazard Resistant Construction Technologies and Habitat Solutions in Mountain States

Supported by:
Department of Science and Technology, Government of India
Programme: TIME-LEARN
Construction and Structural Drawings

- Site Plan
- Boundary Wall
- Village Road 4' Wide
- Primary School
- Mandir (Temple)

Earthquake Guidelines:
- C: 13207-1993
- B: 4326/1993 - EDBON 3.2
- D: 13628/1993
- E: 1693/1984

Reinforcement Stub Column
- Tree
- Boundary Wall
- Spill Over Area

Notes:
1. To retain and conserve all trees on site.
2. All measurements in feet & inches.
3. All levels at finish floor level unless otherwise specified.
4. All detail work is left to the attention of the architect.

DWG: SITE PLAN
REV. DATE:
BOUNDARY WALL

1. 16MM DIA VERTICAL REINFORCEMENT BARS

2. 3 NO. 8 MM BARS WITH TRIANGULAR 6MM STIRRUPS @ 200 SPACING

3. CSEB COLUMN ABOVE STONE MASONRY

4. 3 NO. 8 MM BARS WITH TRIANGULAR 6MM STIRRUPS @ 200 SPACING

5. 12 MM DIA VERTICAL REINFORCEMENT BARS

EXCAVATION LAYOUT

PLINTH LAYOUT

NOTE:
1. TO RETAIN AND CONSERVE ALL TREES ON SITE.
2. ALL MEASUREMENTS IN FEET/ INCHES.
3. ALL LEVEL AT FINISH FLOOR LEVEL, UNLESS OTHERWISE NOTED.
4. ANY RESIDENCES SHOULD SUBMIT TO THE ATTENTION OF THE ARCHITECT.

DWG: PLINTH & EXCAVATION LAYOUT
REV. DATE: 02/06/2020

VERTICAL REINFORCEMENT DETAILS
NOTE:
1. TO RETAIN AND CONSERVE ALL TREES ON SITE.
2. ALL MEASUREMENT IN FEET/ INCHES.
3. ALL LEVEL AT FINISH FLOOR LEVEL, UNLESS OTHERWISE MENTIONED.
4. ANY REFERENCES SHOULD ATTEND TO THE ATTENTION OF THE ARCHITECT.

GROUNDFLOOR PLAN
REV. DATE: 31/10/2018

GROUND FLOOR PLAN
REV. DATE: 31/10/2018

Random Rubble Masonry 16" Thick
Concrete Block Masonry 8" Thick

KITCHEN
(7'7" x 8'8")
65.06 sq ft.

COMMUNITY HALL
(17'8" x 11'10")
211.56 sq ft.

Random Rubble Masonry 16" Thick
Compresses Stabilized Earth-Block Masonry 13" Thick

CSEB COLUMN
ABove Stone Masonry 13" Thick

Earthquake Guidelines:
1. 13027:1993
2. 4326:1993 - EDITION 3.2
3. 13026:1993
4. 1893-1984
NOTE:
1- TO RETAIN AND CONSERVE ALL THE TREES ON SITE
2- ALL MEASUREMENTS IN FEET AND INCHES
3- ALL LEVEL AT FINISH FLOOR LEVEL UNLESS OTHERWISE MENTIONED
4- ANY DISCREPANCIES SHOULD BE BROUGHT TO THE ATTENTION OF AN ARCHITECT.
NOTE:
1- TO RETAIN AND CONSERVE ALL THE TREES ON SITE
2- ALL MEASUREMENTS IN FEET AND INCHES
3- ALL LEVEL AT FINISH FLOOR LEVEL UNLESS OTHERWISE MENTIONED
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SOUTH ELEVATION

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NOTE:
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3. ALL LEVEL AT FINISH FLOOR LEVEL UNLESS OTHERWISE MENTIONED
4. ANY DISCREPANCIES SHOULD BE BROUGHT TO THE ATTENTION OF AN ARCHITECT.
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1. TO RETAIN AND CONSERVE ALL THE TREES ON SITE
2. ALL MEASUREMENTS IN FEET AND INCHES
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2. ALL MEASUREMENTS IN FEET AND INCHES
3. ALL LEVEL AT FINISH FLOOR LEVEL UNLESS OTHERWISE MENTIONED
4. ANY DESCRIEPCENCIES SHOULD BE BROUGHT TO THE ATTENTION OF AN ARCHITECT.
CONSTRUCTION DETAILS- PLINTH, SILL AND LINTEL BAND

### DETAIL - A
- PLINTH BEAM 3" Thick
- 6mm stirrups @200 C/C
- 2 No. Rebar.

### DETAIL - B
- SILL BAND 3" Thick
- 6mm stirrups @200 C/C
- 2 No. Rebar.

### DETAIL - C
- SILL BAND 3" Thick
- 6mm stirrups @200 C/C
- 2 No. Rebar.

### DETAIL - C
- LINTEL BAND 3" Thick
- 6mm stirrups @200 C/C
- 2 No. Rebar.
Plank&Joist Roof (Refer sheet 14)

Refer DETAIL A (Sheet-11)

Refer DETAIL B (Sheet 11)

Refer DETAIL C (Sheet-11)

Plank&Joist Roof

COMMUNITY HALL

SILL BAND 3" TH.
1:1.5:3

CSEB Wall
13" thick

Lintel Band 3"Thick
1:1.5:3

Well compacted earth

PLINTH BEAM
3" TH. 1:1:5:3

FINISHED FLOOR
1" Thick

STONE MASONRY
16" Thick

PCC BASE
Avg.TH 1.5"

From foundation PCC to Lintel Band
From Sill band to Lintel Band
From foundation PCC to Roof Band
From foundation PCC to Lintel beam

N

A

B

C

PARAPET +13'-9" LVL
ROOF +10'-5" LVL
LINTEL +8'-5" LVL
SILL +4'-5" LVL
PLINTH +0'-12" LVL

SHEET-12

DESIGN LAYOUT AND CONSTRUCTION DETAILS FOR DIFFERENT TYPOLOGIES OF BUILDINGS IN MOUNTAINOUS REGIONS (UTTARAKHAND) | Design Compendium

NOTE:
1-TO RETAIN AND CONSERVE ALL THE TREES ON SITE
2-ALL MEASUREMENTS IN FEET AND INCHES
3-ALL LEVEL AT FINISH FLOOR LEVEL UNLESS OTHERWISE MENTIONED
4-ANY DESCREEPENCIES SHOULD BE BROUGHT TO THE ATTENTION OF AN ARCHITECT.

WALL SECTION-CC'

TABLE:

VERTICAL REINFORCEMENT DETAILS

<table>
<thead>
<tr>
<th>WINDOW</th>
<th>DETAILS</th>
<th>VERTICAL REINFORCEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-JUNCTIONS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PLINTH DETAIL

6MM STIRRUPS @ 150C/C
PLINTH BEAM
2 NO. Ø12 MM REBAR

DETAIL PB - PLINTH BEAM

8MM STIRRUPS @ 200C/C
PLINTH BEAM
4 NO. Ø10 MM REBAR

PLINTH BEAM - STRIP FOUNDATION (VERANDAH)

VERTICAL REINFORCEMENT DETAIL

3 NO. 8 MM BARS WITH TRIANGULAR 6MM STIRRUPS @ 200 SPACING

NOTE:
1. ALL CONCRETE MIX SHALL BE M20 (1:1.5:3), UNLESS OTHERWISE NOTED.
2. CLEAR COVER TO REINFORCEMENT SHALL BE AS FOLLOWS -
   - TOP AND BOTTOM - MIN. 30MM
   - SIDES - MIN. 30MM
3. LAP LENGTH FOR MAIN REINFORCEMENT BARS SHALL BE 50D (D = DIA OF BAR)
4. NOT MORE THAN 50% OF THE BARS SHALL BE LAPPED AT ONE SECTION

SHEET-13

18
8" THICK CONCRETE BLOCK WALL

2" THICK FLOOR FINISH

10MM CEMENT MORTAR

T-1

REFER DETAIL "Y"

T-1

REFER DETAIL "X"

CONCRETE BLOCK Wall 8" THK

Floor Finish 1.2" THK

Base Floor M15-In Situ Concrete

PRE-CAST RC Plank

6mm Bar 2 per plank

2 no 8mm bar

CONCRETE BED 1:1.5:3

BED FOR JOIST RCC 4 NO 10MM BAR 6 MM STIRRUPS WIDTH EQUAL TO WALL THICKNESS

NOTE:
1-TO RETAIN AND CONSERVE ALL THE TREES ON SITE
2-ALL MEASUREMENTS IN FEET AND INCHES
3-ALL LEVEL AT FINISH FLOOR LEVEL UNLESS OTHERWISE MENTIONED
4-ANY DESCEREPNCIES SHOULD BE BROUGHT TO THE ATTENTION OF AN ARCHITECT

DESIGN LAYOUT AND CONSTRUCTION DETAILS FOR DIFFERENT TYPOLOGIES OF BUILDINGS IN MOUNTAINOUS REGIONS (UTTARAKHAND) | Design Compendium
NOTE:
1. TO RETAIN AND CONSERVE ALL THINGS ON SITE.
2. ALL MEASUREMENTS IN FEET/ INCHES.
3. ALL LEVEL AT FINISH FLOOR LEVEL UNLESS OTHERWISE NOTED.
4. ANY RESERVATIONS SHOULD BE SEEN TO THE ATTENTION OF THE ARCHITECT.

DWG:
 COURSE DETAIL-Concrete Block

REV. DATE:
 02/06/2020

DETAIL A

COURSE PLAN-
CONCRETE BLOCK MASONRY

Ø75mm KEY HOLE
CAVITY TO BE FILLED WITH 1:2:4 MICRO CONCRETE USING 6MM DOWN AGGREGATE
NOTE:
1. TO RETAIN AND CONSERVE ALL TREES ON SITE.
2. ALL MEASUREMENTS IN FEET INCHES, UNLESS OTHERWISE MENTIONED.
3. ALL LEVELS AT SAME FLOOR LEVEL, UNLESS OTHERWISE MENTIONED.
4. ANY DISCREPANCIES SHOULD BE BROUGHT TO THE ATTENTION OF THE ARCHITECT.
NOTE:

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SHEET - 18

Staircase at the back (in elevation)

MS BRACING 45X45X5mm (thickness)

MS PIPE 100X100X3mm (thickness)

Refer Footing Detail - F1

Refer Step Detail - S1

Step no. 18 - Length to be adjusted as per site dimensions

4" - 7" (Adjust as per site dimensions)

2.9" - 3"

7" - 8.5"

Refer Step Detail - S2

MS PIPE (90X50X3mm)

ANCHORED TO THE SLAB

MS PIPE
(100X100X3mm)
(4"X4")

MS PIPE (90X50X3mm)

[3.5" X 2"]

MS BRACING 45X45X5mm (thickness)

MS PIPE 100X100X3mm (thickness)

4 - 7" 1/2’

10 - 10’

7" - 8.5"

2 - 9"

5.11"
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Qutab Institutional Area
New Delhi 110016
India
Ph. 011 2654 4100   email- www.devalt.org
K. P&J Detail
DST TIME LEARN
SHEET - 19

NOTES:
1. TO RETAIN AND CONSERVE ALL TREES ON
   SITE.
2. ALL MEASUREMENTS IN FEET & INCHES.
3. ALL LEVELS AT FINISH FLOOR LEVEL UNLESS
   OTHERWISE MENTIONED.
4. ANY OMISSIONS SHOULD BE BROUGHT TO
   THE ATTENTION OF THE ARCHITECT.

DETAIL-S1

MS ANGLE
35X35X4mm(thickness)
25X25X3mm(thickness)

4" WELD LENGTH
8½"

MS PIPE
90X50X3mm(thickness)

DETAIL-S2

MS ANGLE
35X35X4mm(thickness)
25X25X3mm(thickness)

4" WELD LENGTH
10"

MS PIPE
90X50X3mm(thickness)

DETAIL-F1

MS PIPE
100X100X3mm
(thickness)

1"

12"

CONCRETE
FILLING

MS PLATE
5mm thick
welded to MS pipe

DWG:
STAIRCASE DETAILS

REV. DATE:
NOTE:
1. TO RETAIN AND CONSERVE ALL TREES ON SITE.
2. ALL MEASUREMENT IN FEET/ INCHES.
3. ALL LEVEL AT FINISH FLOOR LEVEL, UNLESS OTHERWISE MENTIONED.
4. ANY DEVIATIONS SHOULD BE BROUGHT TO THE ATTENTION OF THE ARCHITECT.

DWG:
ROOF PLAN-Timber Truss
REV. DATE:
01/06/2020
NOTE:
1. TO RETAIN AND CONSERVE ALL TREES ON SITE.
2. ALL MEASUREMENT IN FEET/INCHES.
3. ALL LEVEL AT FINISH FLOOR LEVEL UNLESS OTHERWISE MENTIONED.
4. ANY OMISSIONS SHOULD BE BROUGHT TO THE ATTENTION OF THE ARCHITECT.

SHEET - 22

DOUBLE SHUTTER LARGE WINDOW

3' window frame
1.25' thick wood planks
3.5' width and 1.5' thick wood frame

DOUBLE SHUTTER DOOR

3' door frame
1.25' thick wood planks
Match with the concrete band
3.5' width and 1.5' thick wood frame

DESIGN LAYOUT AND CONSTRUCTION DETAILS FOR DIFFERENT TYPOLOGIES OF BUILDINGS IN MOUNTAINOUS REGIONS (UTTARAKHAND) | Design Compendium

DWG: DETAIL-D/W
REV. DATE: 31/10/2018
DOUBLE SHUTTER SMALL WINDOW

3" window frame

1.25" thick wood planks

3.5" width and 1.5" thick wood frame

1'-8"

2'

10"

10"
### Specifications and Bill of Quantities

<table>
<thead>
<tr>
<th>S. No.</th>
<th>ITEM</th>
<th>QTY</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FOUNDATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>EXCAVATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1.1</td>
<td>Earth work in excavation for trench, 6' wide and 2.83' deep</td>
<td>2249.18</td>
<td>cuft</td>
</tr>
<tr>
<td>1.2</td>
<td>PCC BED AT TRENCH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2.1</td>
<td>Laying of P.C.C in foundation 3&quot; thick with 1:4:8</td>
<td>148.22</td>
<td>cuft</td>
</tr>
<tr>
<td>1.3</td>
<td>REINFORCEMENTS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3.1</td>
<td>Laying of vertical reinforcement (40, 12mm bars) and (5, 8mm bars for triangular reinforcement tie) with stirups tie of 8mm bars @ 200mm spacing</td>
<td>1095.88</td>
<td>ft</td>
</tr>
<tr>
<td>1.4</td>
<td>RRM IN FOUNDATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.4.1</td>
<td>Laying of foundation Type 1, 2 &amp; 3 : RRM 1:6 mortar Foundation Type 1 - (Step 1 - 3.5' wide and 1' deep &amp; Step 2 - 2.5' wide and 1' deep), Foundation Type 2( Step 1 - 2.5' wide and 1' deep &amp; Step 2 - 1.75' wide and 1' deep &amp; Step 3 - 1.25' wide and 1.17' deep), Foundation Type 3 (Step 1 - 2.5' wide and 1.8' deep &amp; Step 2 - 1.25' wide and 1.8' deep)</td>
<td>1045.40</td>
<td>cuft</td>
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<td>1.5</td>
<td>PLINTH BAND</td>
<td></td>
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<tr>
<td>1.5.1</td>
<td>Laying of horizontal reinforcement, 4-16mm bars with stirup tie of 8mm bars @ 200mm spacing</td>
<td>451.07</td>
<td>ft</td>
</tr>
<tr>
<td>1.5.2</td>
<td>Laying plinth beam 1.25' wide and 0.5' thick in 1:1.5:3 ratio with laying of DPC 1.25' wide and 0.08' thick in 1:2:4 ratio</td>
<td>160.54</td>
<td>cuft</td>
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<tr>
<td>2</td>
<td>SUPER STRUCTURE- GROUND FLOOR</td>
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<tr>
<td>2.1</td>
<td>SILL LEVEL MASONARY</td>
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<tr>
<td>2.1.1</td>
<td>Total stone masonary: RRM 1:6 mortar, (1.25' wide and 3' high)</td>
<td>428.33</td>
<td>cuft</td>
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<tr>
<td>2.1.2</td>
<td>Installation of precast concrete door frames</td>
<td>136.00</td>
<td>running ft</td>
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<tr>
<td>2.2</td>
<td>SILL BAND</td>
<td></td>
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<tr>
<td>2.2.1</td>
<td>Laying sill band 1.25' wide and 0.25' thick in 1:1.5:3 ratio- Part A+B</td>
<td>40.07</td>
<td>cuft</td>
</tr>
<tr>
<td>2.2.2</td>
<td>Laying of horizontal reinforcement(4, 16mm) bars with stirups tie (8mm bars) @ 200mm spacing</td>
<td>318.95</td>
<td>ft</td>
</tr>
<tr>
<td>2.2.3</td>
<td>Installation of precast concrete window frames</td>
<td>168</td>
<td>running ft</td>
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<tr>
<td>2.3</td>
<td>LINTEL LEVEL MASONARY- PART A</td>
<td></td>
<td></td>
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<tr>
<td>2.3.1</td>
<td>Total concrete block masonary (1:2:4) in 1:6 mortar (0.66' wide and 3.75' high)</td>
<td>134.24</td>
<td>cuft</td>
</tr>
<tr>
<td>2.4</td>
<td>LINTEL BAND- PART A</td>
<td></td>
<td></td>
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<tr>
<td>2.4.1</td>
<td>Laying of horizontal reinforcement, 2 16mm bars with Stirups tie of 8mm bar @200mm spacing</td>
<td>158.95</td>
<td>ft</td>
</tr>
<tr>
<td>2.4.2</td>
<td>Laying lintel band 1.25' wide and 0.25' thick in 1:1.5:3 ratio</td>
<td>19.97</td>
<td>cuft</td>
</tr>
<tr>
<td>2.5</td>
<td>LINTEL LEVEL MASONARY- PART B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5.1</td>
<td>Total CSEB block masonary (1:2:4) masonary in 1:6 mortar (0.66' wide and 3.75' high)</td>
<td>226.76</td>
<td>cuft</td>
</tr>
<tr>
<td>2.6</td>
<td>LINTEL BAND- PART B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.6.1</td>
<td>Laying of horizontal reinforcement, 2 16mm bars with Stirups tie of 8mm bar @200mm spacing</td>
<td>239.99</td>
<td>ft</td>
</tr>
<tr>
<td>2.6.2</td>
<td>Laying lintel band 1.25' wide and 0.25' thick in 1:1.5:3 ratio</td>
<td>30.15</td>
<td>cuft</td>
</tr>
</tbody>
</table>
### Design Layout and Construction Details for Different Typologies of Buildings in Mountainous Regions (Uttarakhand) | Design Compendium

<table>
<thead>
<tr>
<th>S. No.</th>
<th>ITEM</th>
<th>QTY</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>INTERMIDIATORY FLOOR</td>
<td></td>
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<tr>
<td>3.1</td>
<td>ROOF</td>
<td></td>
<td></td>
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<tr>
<td>3.1.1</td>
<td>Laying of planks in 1:6 mortar</td>
<td>131</td>
<td>nos</td>
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<tr>
<td>3.1.2</td>
<td>Laying of joist in 1:6 mortar</td>
<td>90.00</td>
<td>running ft</td>
</tr>
<tr>
<td>3.2</td>
<td>ROOF BAND</td>
<td></td>
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<tr>
<td>3.2.1</td>
<td>Laying of roof band horizontal reinforcement, 2 10mm bars with stirrup tie of 8mm bar @ 200mm spacing</td>
<td>160.00</td>
<td>ft</td>
</tr>
<tr>
<td>3.2.2</td>
<td>Laying roof band 1.25' wide and 0.25' thick in 1:1.5:3 Ratio</td>
<td>20.10</td>
<td>cuft</td>
</tr>
<tr>
<td>3.3</td>
<td>PARAPET</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.3.1</td>
<td>Parapet CSEB (1:2:4) masonry in 1:6 mortar (0.66' wide and 3' high)</td>
<td>127.35</td>
<td>cuft</td>
</tr>
<tr>
<td>4</td>
<td>FIRST FLOOR - PART A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1</td>
<td>SILL LEVEL MASONARY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1.1</td>
<td>Total concrete block masonry (1:2:4) in 1:6 mortar (0.66' wide and 3' high)</td>
<td>114.64</td>
<td>cuft</td>
</tr>
<tr>
<td>4.2</td>
<td>SILL BAND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.2.1</td>
<td>Laying of horizontal reinforcement, 2 16mm bars with Stirups tie of 8mm bar @ 200mm spacing</td>
<td>158.95</td>
<td>ft</td>
</tr>
<tr>
<td>4.2.2</td>
<td>Laying sill band 0.66' wide and 0.25' thick in 1:1.5:3 ratio</td>
<td>0.94</td>
<td>cuft</td>
</tr>
<tr>
<td>4.3</td>
<td>LINTEL LEVEL MASONARY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.3.1</td>
<td>Total concrete block (1:2:4) masonry in 1:6 mortar (0.66' wide and 4' high)</td>
<td>152.86</td>
<td>cuft</td>
</tr>
<tr>
<td>4.4</td>
<td>LINTEL BAND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.4.1</td>
<td>Laying of horizontal reinforcement, 2 16mm bars with Stirups tie of 8mm bar @ 200mm spacing</td>
<td>158.95</td>
<td>ft</td>
</tr>
<tr>
<td>4.4.2</td>
<td>Laying lintel band 0.66' wide and 0.25' thick in 1:1.5:3 ratio</td>
<td>19.97</td>
<td>cuft</td>
</tr>
<tr>
<td>4.5</td>
<td>GABLE WALL MASONARY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.5.1</td>
<td>Concrete block (1:2:4) masonry in 1:6 mortar (0.66' wide and 4' high)</td>
<td>126.52</td>
<td>cuft</td>
</tr>
<tr>
<td>5</td>
<td>INSTALLATION ITEMS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.1</td>
<td>TIMBER TRUSS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.1.1</td>
<td>Chir Pine Shingles</td>
<td>2600.00</td>
<td>nos</td>
</tr>
<tr>
<td>5.1.2</td>
<td>Installation of pine purlin, batten, rafters, gausset plates, bottom and top chord, splice and cleat for 3 truss</td>
<td>99.00</td>
<td>cuft</td>
</tr>
<tr>
<td>5.2</td>
<td>STAIRCASE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.2.1</td>
<td>Staircase fabricated in MS angle and steps in timber planks</td>
<td>25.40</td>
<td>sqft</td>
</tr>
<tr>
<td>5.3</td>
<td>DOORS AND WINDOWS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.3.1</td>
<td>Installation of pine wood doors</td>
<td>8.00</td>
<td>nos.</td>
</tr>
<tr>
<td>5.3.2</td>
<td>Installation of pine wood windows</td>
<td>10.00</td>
<td>nos.</td>
</tr>
<tr>
<td>6</td>
<td>FINISHING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.1</td>
<td>PLASTERING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.1.1</td>
<td>Cement plaster finish of internal surfaces in (1:4) ratio cement sand mortar</td>
<td>1488.58</td>
<td>sqft</td>
</tr>
<tr>
<td>6.2</td>
<td>FLOORING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.2.1</td>
<td>IPS Flooring in ratio (1:2:4)</td>
<td>409.64</td>
<td>sqft</td>
</tr>
<tr>
<td>6.2.2</td>
<td>Mud flooring with concrete base 1:4:6 and mud plaster in 1:3 ratio</td>
<td>208.86</td>
<td>sqft</td>
</tr>
<tr>
<td>6.3</td>
<td>TERRACING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.3.1</td>
<td>Terracing in 1:4 ratio with proper slope and cutting</td>
<td>236.80</td>
<td>sqft</td>
</tr>
</tbody>
</table>
2. Rural Home Stay
Bagi Village, Dunda Block, Uttarkashi

Set of Drawings

Under the project:
Delivery of Eco-friendly Multi-Hazard Resistant Construction Technologies and Habitat Solutions in Mountain States

Supported by:
Department of Science and Technology, Government of India
Programme: TIME-LEARN

In collaboration with:
Project: Developing livelihoods by creating sustainable ecotourism opportunities in Uttarakhand and Himachal Pradesh

Supported by:
NMHS (National Mission on Himalayan Studies), Ministry of Environment, Forest and Climate Change, Government of India
HOME STAY
BAGI VILLAGE

SITE PLAN

TOTAL BUILT UP
AREA: 382.96 sq ft

TOTAL BUILT UP
AREA: 384 sq ft

EXISTING BLOCK

STONE

NOTE:
1- TO RETAIN AND CONSERVE ALL THE TREES ON SITE
2- ALL MEASUREMENTS IN FEET AND INCHES
3- ALL LEVELS AT FINISH FLOOR UNLESS OTHERWISE MENTIONED
4- ANY DESCREPENCIES SHOULD BE BROUGHT TO THE ATTENTION OF AN ARCHITECT.

DWG- SITE PLAN
REV DATE- 11/05/2020
PROJECT NAME- DST TIME LEARN
DRAWING- SITE PLAN
SCALE- 1:25
ARCHITECT- DEALT-
DATE-

Development Alternatives
www.devalt.org

New Delhi 110016
Ph. 011 3248 3000
email: www.devalt.org

Sheet-1
1. To retain and conserve all the trees on site.
2. All measurements in feet and inches unless otherwise mentioned.
3. Any discrepancies should be brought to the attention of an architect.

**Table: Vertical Reinforcement Details**

<table>
<thead>
<tr>
<th>Area</th>
<th>Vertical Reinforcement Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Window Corners &amp; T-Junctions</td>
<td>12 mm</td>
</tr>
<tr>
<td>Verandah</td>
<td>8 mm</td>
</tr>
<tr>
<td>Door</td>
<td>12 mm</td>
</tr>
</tbody>
</table>

- 3 NO. 8 MM BARS with triangular 6MM stirrups @ 200 spacing
- 12 MM Dia Vertical Reinforcement Bars.
- 10 MM Dia Vertical Reinforcement Bars.
- 3 NO. 8 MM BARS with triangular 6MM stirrups @ 200 spacing

**Design Layout and Construction Details for Different Typologies of Buildings in Mountainous Regions (Uttarakhand)**

<table>
<thead>
<tr>
<th>Scale</th>
<th>1:75</th>
</tr>
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<tbody>
<tr>
<td>Sheet</td>
<td>2</td>
</tr>
<tr>
<td>Date</td>
<td>14/05/2020</td>
</tr>
<tr>
<td>Architect</td>
<td>Devalt</td>
</tr>
<tr>
<td>Ph.</td>
<td>01126544100</td>
</tr>
<tr>
<td>Email</td>
<td><a href="http://www.devalt.org">www.devalt.org</a></td>
</tr>
</tbody>
</table>

**Development Alternatives**

109, 5-3 Tara crescent marg Qutumb institutional area New Delhi 110016 INDIA
NOTE:
1. TO RETAIN AND CONSERVE ALL THE TREES ON SITE
2. ALL MEASUREMENTS IN FEET AND INCHES
3. ALL LEVEL AT FINISH FLOOR LEVEL UNLESS OTHERWISE MENTIONED
4. ANY DESCREPENCIES SHOULD BE BROUGHT TO THE ATTENTION OF AN ARCHITECT.

SCHEDULE OF OPENINGS:
WINDOWS

<table>
<thead>
<tr>
<th>NAME</th>
<th>SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>W1</td>
<td>4' X 4'-3&quot;</td>
</tr>
<tr>
<td>W2</td>
<td>3' X 4'-3&quot;</td>
</tr>
<tr>
<td>W3</td>
<td>26&quot; X 4'-3&quot;</td>
</tr>
<tr>
<td>V1</td>
<td>18&quot; X 1'-6&quot;</td>
</tr>
</tbody>
</table>

SCHEDULE OF OPENINGS:
DOORS

<table>
<thead>
<tr>
<th>NAME</th>
<th>SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>3'-2&quot; X 6'-9&quot;</td>
</tr>
<tr>
<td>D2</td>
<td>2'-6&quot; X 6'-9&quot;</td>
</tr>
</tbody>
</table>

RRM MASONRY
16" Thick

CSEB MASONRY
13" Thick

CSEB COLUMN ABOVE
STONE MASONRY
13" Thick

REV DATE- 14/05/2020
NOTE:
1. RETAIN AND CONSERVE ALL THE TREES ON SITE
2. ALL MEASUREMENTS IN FEET AND INCHES
3. ALL LEVEL AT FINISH FLOOR LEVEL UNLESS OTHERWISE MENTIONED
4. ANY DESCREPENCIES SHOULD BE BROUGHT TO THE ATTENTION OF AN ARCHITECT.

1. TIMBER TRUSS
   LVL +15.5'

2. ROOF BAND
   LVL +9.10'

3. LINTEL LEVEL
   LVL +8.8'

4. SILL LEVEL
   LVL +4

5. PLINTH LEVEL
   LVL +1.3'

6. GROUND

PLANK & JOIST ROOF

PINE SHINGLE TRUSS SYSTEM

COMRESSED STABILISED EARTH BLOCK MASONRY

STONE MASONRY

PLINTH BEAM

LINTEL BAND

SILL BAND

NORTH ELEVATION
NOTE:
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DESIGN LAYOUT AND CONSTRUCTION DETAILS FOR DIFFERENT TYPOLOGIES OF BUILDINGS IN MOUNTAINOUS REGIONS (UTTARAKHAND) | Design Compendium

SOUTH ELEVATION

TIMBER TRUSS
LVL +15'6"

ROOF BAND
LVL +19'10"

LINTEL LEVEL
LVL +18'6"

SILL LEVEL
LVL +14'

PLINTH LEVEL
LVL +11'3"

GROUND

PINE SHINGLE TRUSS SYSTEM

LINTEL BAND

COMPRESSED STABILISED EARTH BLOCK MASONRY

SILL BAND

STONE MASONRY

PLINTH BEAM

SOUTH ELEVATION

DEVELOPMENT ALTERNATIVES,
B-32 Tara crescent marg
Qutumb institutional area
New Delhi 110016
INDIA
Ph.01126544100
e-mail-www.devalt.org

SHEET-5

REV DATE-
22/08/2020

ARCHITECT-

DEALT-

DATE-
NOTE:
1. TO RETAIN AND CONSERVE ALL THE TREES ON SITE
2. ALL MEASUREMENTS IN FEET AND INCHES
3. ALL LEVEL AT FINISH FLOOR LEVEL UNLESS OTHERWISE MENTIONED
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DESIGN LAYOUT AND CONSTRUCTION DETAILS FOR DIFFERENT TYPOLOGIES OF BUILDINGS IN MOUNTAINOUS REGIONS (UTTARAKHAND) | Design Compendium

NOTE:
1. TO RETAIN AND CONSERVE ALL THE TREES ON SITE
2. ALL MEASUREMENTS IN FEET AND INCHES
3. ALL LEVEL AT FINISH FLOOR LEVEL UNLESS OTHERWISE MENTIONED
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WEST ELEVATION

PLINTH BEAM
STONE MASONRY
SILL BAND
COMPRRESSED STABILISED EARTH BLOCK MASONRY
LINTEL BAND
ROOF BAND
LINTEL LEVEL
SILL LEVEL
PLINTH LEVEL
GROUND
TIMBER TRUSS

REV DATE-
22/06/2020

ARCHITECT-
DEALT-
DATE-

DEVELOPMENT ALTERNATIVES,
B-32 Tara crescent marg
Qutumb institutional area
New Delhi-110016
INDIA
Ph.01126544100
email-www.devalt.org

38
For Detailed wall section Refer SHEET 12-Wall Section DD'

NOTE:
1-TO RETAIN AND CONSERVE ALL THE TREES ON SITE
2-ALL MEASUREMENTS IN FEET AND INCHES
3-ALL LEVEL AT FINISH FLOOR LEVEL UNLESS OTHERWISE MENTIONED
4-ANY DEVIATIONS SHOULD BE BROUGHT TO THE ATTENTION OF AN ARCHITECT.

REV DATE- 11/05/2020

DESIGN LAYOUT AND CONSTRUCTION DETAILS FOR DIFFERENT TYPOLOGIES OF BUILDINGS IN MOUNTAINOUS REGIONS (UTTARAKHAND) | Design Compendium
DESIGN LAYOUT AND CONSTRUCTION DETAILS FOR DIFFERENT TYPOLOGIES OF BUILDINGS IN MOUNTAINOUS REGIONS (UTTARAKHAND) | Design Compendium

ROOM

VERANDAH

SECTION-BB'

NOTE:
1. TO RETAIN AND CONSERVE ALL THE TREES ON SITE
2. ALL MEASUREMENTS IN FEET AND INCHES
3. ALL LEVEL AT FINISH FLOOR LEVEL UNLESS OTHERWISE MENTIONED
4. ANY DISCREPANCIES SHOULD BE BROUGHT TO THE ATTENTION OF AN ARCHITECT.

ROOM

VERANDAH

SECTION-BB'

NOTE:
1. TO RETAIN AND CONSERVE ALL THE TREES ON SITE
2. ALL MEASUREMENTS IN FEET AND INCHES
3. ALL LEVEL AT FINISH FLOOR LEVEL UNLESS OTHERWISE MENTIONED
4. ANY DISCREPANCIES SHOULD BE BROUGHT TO THE ATTENTION OF AN ARCHITECT.
VERANDAH SECTION-CC'

VERTICAL REINFORCEMENT DETAILS

<table>
<thead>
<tr>
<th>WINDOW</th>
<th>DOOR</th>
<th>VERTICAL REINFORCEMENT DETAILS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>From foundation PCC to Lintel Beam</td>
</tr>
</tbody>
</table>

NOTE:
1- TO RETAIN AND CONSERVE ALL THE TREES ON SITE
2- ALL MEASUREMENTS IN FEET AND INCHES
3- ALL LEVEL AT FINISH FLOOR LEVEL UNLESS OTHERWISE MENTIONED
4- ANY DESCREPENCIES SHOULD BE BROUGHT TO THE ATTENTION OF AN ARCHITECT.
### DESIGN LAYOUT AND CONSTRUCTION DETAILS FOR DIFFERENT TYPOLOGIES OF BUILDINGS IN MOUNTAINOUS REGIONS (UTTARAKHAND) | Design Compendium

#### DETAIL -A

- **Plinth Beam**
  - 3" TH. 1:1.5:3
- **RRM in Cement Mortar**
  - 15" TH. 1:6
- **PCC 3" TH.**
  - 1:4:8

#### DETAIL -B

- **8mm Bars**
  - @ 200C/C
- **Plinth Beam**
- **Strip Foundation (Verrandah)**

#### DETAIL -C

- **13"**
- **3 NO. 8 mm bars with triangular 6mm stirrups @ 200C/C**

#### TABLE: VERTICAL REINFORCEMENT DETAILS

<table>
<thead>
<tr>
<th>Element</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Window Corners &amp; T-Junctions</td>
<td>12mm</td>
</tr>
<tr>
<td>Door</td>
<td>10mm</td>
</tr>
</tbody>
</table>

#### Foundation Details

- From Foundation PCC to Lintel Band
- From Sill Band to Lintel Band
- From Foundation PCC to Roof Band
- From Foundation PCC to Lintel Beam

### CONSTRUCTION DETAILS- VERANDAH

### SHEET-11

**Note:**
1. To retain and conserve all the trees on site.
2. All measurements in feet and inches.
3. All level at finish floor level unless otherwise mentioned.
4. Any discrepancies should be brought to the attention of an architect.

**Project Name:** Development Alternatives, B-32 Tara Crescent Marg, Qutub Institutional Area, New Delhi-110016, India

**Contact:** Ph. 011-26544100, Email: www.devalt.org
1. To retain and conserve all the trees on site.
2. All measurements in feet and inches unless otherwise mentioned.
3. Any discrepancies should be brought to the attention of an architect.

Design Compendium

PINE SHINGLE ROOF
LVL +15'

ROOF BAND
LVL +9.3'

LINTEL LEVEL
LVL +8.3'

SILL LEVEL
LVL +4.3'

PLINTH LEVEL
LVL +15'

GROUND LEVEL

FOUNDATION
LVL -2.9'

8mm stirrups @200mm spacing

VERTICAL REINFORCEMENT DETAILS

DOOR

PCC BASE
Avg. TH 1.5'

ROOM

PCC 3" TH.
1:4:8

SILL BAND 3" TH.
1:1.5:3

STONE MASONRY
16" Thick

FINISHED FLOOR
1" Thick

PLINTH BEAM
3" TH. 1:1.5:3

RRM IN CEMENT MORTAR
18" TH. (1:6)

REFERENCES
DETAIL A
DETAIL B
DETAIL C

NOTE:

Refer DETAIL A

Refer DETAIL B

Refer DETAIL C
### Table: Vertical Reinforcement Details

<table>
<thead>
<tr>
<th>Area</th>
<th>Reinforcement Details</th>
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</thead>
<tbody>
<tr>
<td>Window Corners &amp; T-Juncts</td>
<td>12mm</td>
</tr>
<tr>
<td>Verandah</td>
<td>8mm</td>
</tr>
<tr>
<td>Door</td>
<td>10mm</td>
</tr>
</tbody>
</table>

### Details

- **Detail -A**
  - PLINTH BEAM 3" Thick
  - 6mm stirrups @200 C/C
  - 2 No. Rebar
  - 1'-6"

- **Detail -B**
  - SILL BAND 3" Thick
  - 6mm stirrups @200 C/C
  - 2 No. Rebar
  - 1'-4"

- **Detail -C**
  - SILL BAND 3" Thick
  - 6mm stirrups @200 C/C
  - 2 No. Rebar
  - 1'-1"

### Construction Details - PLINTH, SILL AND LINTEL BAND

**Note:**
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DESIGN LAYOUT AND CONSTRUCTION DETAILS FOR DIFFERENT TYPOLOGIES OF BUILDINGS IN MOUNTAINOUS REGIONS (UTTARAKHAND) | Design Compendium

REFERENCE PLAN

COURSE PLAN - COMPRESSED STABALIZED EARTH BLOCK

NOTE:
1. TO RETAIN AND CONSERVE ALL THE TREES ON SITE
2. ALL MEASUREMENTS IN FEET AND INCHES
3. ALL LEVEL AT FINISH FLOOR LEVEL UNLESS OTHERWISE MENTIONED
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REV DATE- 12/05/2020

DETAIL A-COURSE 1,3,5

DETAIL B-COURSE 1,3,5

DETAIL C

VERTICAL REINFORCEMENT PLAN -
CSEB COLUMN DETAIL
(VERANDAH)

3 NO. 8 mm bars
with triangular
6mm stirrups @ 200C/C
DESIGN LAYOUT AND CONSTRUCTION DETAILS FOR DIFFERENT TYPOLOGIES OF BUILDINGS IN MOUNTAINOUS REGIONS (Uttarakhand) | Design Compendium

ROOM (14' x 11'2'')

VERANDAH (4'8'' x 14'5'')

TOILET (4'4'' x 6'6'')

REFERENCE PLAN

COURSE PLAN - COMPRESSED STABALIZED EARTH BLOCK

DETAIL A - COURSE 2, 4, 6

DETAIL B - COURSE 2, 4, 6

DETAIL C

VERICAL REINFORCEMENT PLAN - CSEB COLUMN DETAIL (VERANDAH)

NOTE:
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DWG - COURSE LAYOUT - EVEN
REV DATE - 12/05/2020

ARCHITECT - DEALT - DATE -

PROJECT NAME - DST TIME LEARN
PH +91 01126544100
EMAIL - www.devalt.org

SHEET - 15
NOTE:
1. RETAIN AND CONSERVE ALL THE TREES ON SITE
2. ALL MEASUREMENTS IN FEET AND INCHES
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DATE: DOOR WINDOW Schedule
REV DATE: 12/05/2020

SCHEDULE OF OPENINGS:
WINDOWS

<table>
<thead>
<tr>
<th>NAME</th>
<th>SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>W1</td>
<td>4' X 4'-3&quot;</td>
</tr>
<tr>
<td>W2</td>
<td>3' X 4'-3&quot;</td>
</tr>
<tr>
<td>W3</td>
<td>3' X 4'3&quot;</td>
</tr>
<tr>
<td>V1</td>
<td>16&quot; X 16&quot;</td>
</tr>
</tbody>
</table>

SCHEDULE OF OPENINGS:
DOORS

<table>
<thead>
<tr>
<th>NAME</th>
<th>SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>3'-2&quot; X 6'-9&quot;</td>
</tr>
<tr>
<td>D2</td>
<td>2'-6&quot; X 6'-9&quot;</td>
</tr>
</tbody>
</table>

Development Alternatives
B-32 Tara crescent marg
Qutumb institutional area
New Delhi 110016
INDIA
Ph. 01126544100
email: www.devalt.org
NOTE:
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DATE:
07/04/2020

PROJECT NAME:
DST TIME LEARN

ARCHITECT:
DEALT:
DATE-07/04/2020

THE GOVERNMENT OF INDIA
DEPARTMENT OF DEVELOPMENTAL ALTERNEVES
DEVELOPMENT Alternatives

DEVAALITEGAL
Ph.01126544100
e-mail-www.devalt.org

SHEET-12
TIMBER TRUSS ROOF DETAIL

C-WOODEN BATTEN (0.9"X1.9")

B-WOODEN RAFTER (1.9"X1.9")

H-TOP CHORD (1.5"X3")

D-TENSION MEMBERS (1.5"X2.3")

E-compression members (1.5"X1.5")

J5-SPLICE (2.4"X7.8")

D-(2)HEEL GUSSET (11"X14")

I-CLEAT (3"X7")

J-(2)HEEL GUSSET (11"X14")

J-(3)INTERMEDIATE GUSSET (7"X9")

G-BOTTOM CHORD (1.5"X3")

A-PURLINS (2.4"X4.7")

J-6 SPLICE (2.4"X7.8")

F-VERTICAL STRUT (1.5"X2.3")

J-(3)-INTERMEDIATE GUSSET

J-(4)-SPLICE

J-(5)-SPLICE

DETAIL OF CLEAT

NOTE:
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DESIGN LAYOUT AND CONSTRUCTION DETAILS FOR DIFFERENT TYPOLOGIES OF BUILDINGS IN MOUNTAINOUS REGIONS (UTTARAKHAND) | Design Compendium

13" THICK COMPRESSED STABALIZED EARTH BLOCK WALL
2" THICK FLOOR FINISH
10MM CEMENT MORTAR

DETAIL X
NEGATIVE REINF. 6 mm BAR 2 NOs. PER PLANK
SPACING BOTH WAYS
IN SITU CONCRETE M 15
CONCRETE BED 1:1.5:3
BED FOR JOIST RCC 4 NO 10MM BAR 6 MM STIRRUPS WIDTH EQUAL TO WALL THICKNESS

DETAIL Y
CSEB WALL 13" THK
FLOOR FINISH 1.2" THK
BASE FLOOR M15-IN SITU CONCRETE
PRE-CAST RC PLANK
6MM BAR 2 PER PLANK
2 NO 8MM BAR

NOTE:
1. TO RETAIN AND CONSERVE ALL THE TREES ON SITE
2. ALL MEASUREMENTS IN FEET AND INCHES
3. ALL LEVEL AT FINISH FLOOR LEVEL UNLESS OTHERWISE MENTIONED
4. ANY DIScrePENCIES SHOULD BE BROUGHT TO THE ATTENTION OF AN ARCHITECT.

ARCHITECT:
DEALE:
DATE:
M15-IN SITU CONCRETE
PRE-CAST RC PLANK
6MM BAR 2 PER PLANK
2 NO 8MM BAR

ARCHITECT:
DEALE:
DATE:
M15-IN SITU CONCRETE
PRE-CAST RC PLANK
6MM BAR 2 PER PLANK
2 NO 8MM BAR

ARCHITECT:
DEALE:
DATE:
## Specifications and Bill of Quantities

<table>
<thead>
<tr>
<th>S. No.</th>
<th>ITEM</th>
<th>QTY</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>FOUNDATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.1</td>
<td>EXCAVATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.1.1</td>
<td>Tota Earth work in excavation for trench (2.5' wide and 2.9' deep) in room, toilet and bathroom and (2' wide and 1' deep in verandah)</td>
<td>563.95</td>
<td>cuft</td>
</tr>
<tr>
<td>A.2</td>
<td>PCC BED AT TRENCH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.2.1</td>
<td>Total P.C.C in foundation 3&quot; thick and 2.5' wide with 1:4:8 running over the excavation in room and toilet/bathroom and 3&quot; thick and 2' wide in verandah.</td>
<td>56.45</td>
<td>cuft</td>
</tr>
<tr>
<td>A.3</td>
<td>VERTICAL REINFORCEMENTS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.3.1</td>
<td>Laying of vertical reinforcement (12mm bars) in room and toilet/bathroom</td>
<td>230.40</td>
<td>ft</td>
</tr>
<tr>
<td>A.3.2</td>
<td>Laying vertical reinforcements (9, triangular 8mm bars) in verandah columns</td>
<td>100.80</td>
<td>ft</td>
</tr>
<tr>
<td>A.3.3</td>
<td>Stirups tie for vertical reinforcement @200mm spacing in verandah columns (Number 18)</td>
<td>18.00</td>
<td>ft</td>
</tr>
<tr>
<td>A.4</td>
<td>RRM IN FOUNDATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.4.1</td>
<td>Total RRM in Foundation Type-1, 1:6 mortar (2' wide at step 1 and 1.5' wide at step -2 and 3.4' deep) &amp; Foundation Type-2, 1:6 mortar (9&quot; wide and 1' deep).</td>
<td>395.35</td>
<td>cuft</td>
</tr>
<tr>
<td>A.5</td>
<td>PLINTH BAND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.5.1</td>
<td>Plinth band horizontal reinforcement (4, 12mm bars)</td>
<td>190.60</td>
<td>ft</td>
</tr>
<tr>
<td>A.5.2</td>
<td>Stirups tie for horizontal reinforcement @200mm spacing, 6mm bars</td>
<td>176.00</td>
<td>ft</td>
</tr>
<tr>
<td>A.5.3</td>
<td>Plinth band in concrete 1:1.5:3 ratio - 3&quot; deep and 1.5' wide in room and bathroom &amp; 9&quot; wide and 6&quot; deep in verandah</td>
<td>40.40</td>
<td>cuft</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>SUPER STRUCTURE- GROUND FLOOR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.1</td>
<td>RANDOM RUBBLE STONE MASONARY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.1.1</td>
<td>Total RRM from plinth to sill level 1:6 mortar (1.3' wide and 2.5' deep</td>
<td>291.525</td>
<td>cuft</td>
</tr>
<tr>
<td>B.2</td>
<td>SILL BAND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.2.1</td>
<td>Sill band horizontal reinforcement (2, 12mm bars)</td>
<td>63.53</td>
<td>ft</td>
</tr>
<tr>
<td>B.2.2</td>
<td>Stirups tie for horizontal reinforcement @200mm spacing, 6mm bars</td>
<td>45.00</td>
<td>ft</td>
</tr>
<tr>
<td>B.2.3</td>
<td>Sill band in concrete 1:1.5:3 ratio - 3&quot; deep and 1.5' wide in room and bathroom</td>
<td>27.46</td>
<td>cuft</td>
</tr>
<tr>
<td>B.3</td>
<td>DOOR WINDOW FRAMES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.3.1</td>
<td>Installation of door frames in room and toilet (2 Nos.)</td>
<td>33.00</td>
<td>ft</td>
</tr>
<tr>
<td>B.3.2</td>
<td>Installation of window frames in room (3 Nos.)</td>
<td>37.00</td>
<td>ft</td>
</tr>
<tr>
<td>B.4</td>
<td>COMPRESSED STABILIZED EARTH BLOCKS MASONRY</td>
<td></td>
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<tr>
<td>B.4.1</td>
<td>Total CSEB production</td>
<td>3500.00</td>
<td>Nos.</td>
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<tr>
<td>B.4.2</td>
<td>CSEB Masonry mortar 1:6</td>
<td>250.00</td>
<td>cuft</td>
</tr>
<tr>
<td><strong>B.5</strong></td>
<td>LINTEL BAND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.5.1</td>
<td>Lintel band horizontal reinforcement (2, 12mm bars)</td>
<td>190.60</td>
<td>ft</td>
</tr>
<tr>
<td>B.5.2</td>
<td>Stirups tie for horizontal reinforcement @200mm spacing, 6mm bars</td>
<td>120.00</td>
<td>ft</td>
</tr>
<tr>
<td>B.5.3</td>
<td>Lintel band in concrete 1:1.5:3 ratio - 3&quot; deep and 1.5' wide in room and bathroom and verandah</td>
<td>31.45</td>
<td>cuft</td>
</tr>
<tr>
<td>S. No.</td>
<td>ITEM</td>
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</tr>
<tr>
<td>--------</td>
<td>------</td>
<td>-----</td>
<td>------</td>
</tr>
<tr>
<td>B.6</td>
<td>ROOF BAND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.6.1</td>
<td>Roof band horizontal reinforcement (2, 12mm bars)</td>
<td>63.53</td>
<td>ft</td>
</tr>
<tr>
<td>B.6.2</td>
<td>Stirups tie for horizontal reinforcement @200mm spacing, 6mm bars</td>
<td>45.00</td>
<td>ft</td>
</tr>
<tr>
<td>B.6.3</td>
<td>Roof band in concrete 1:1.5:3 ratio - 3” deep and 1.5’ wide in room and bathroom</td>
<td>23.23</td>
<td>Cuft</td>
</tr>
<tr>
<td>C</td>
<td>ROOF- PLANK AND JOIST</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.1.1</td>
<td>Installation of planks at roof of Room</td>
<td>25.00</td>
<td>Nos.</td>
</tr>
<tr>
<td>C.1.2</td>
<td>Installation of joist at roof of Room, kitchen and toilet, 3 nos.</td>
<td>28.00</td>
<td>ft</td>
</tr>
<tr>
<td>C.1.3</td>
<td>Laying of 6mm horizontal steel bars with 6mm stirrups in 4” thick cement concrete for screeding over plank and joist roof in 1:1.5:3 ratio</td>
<td>140.80</td>
<td>Cuft</td>
</tr>
<tr>
<td>D</td>
<td>ROOF- TIMBER TRUSS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D.1.1</td>
<td>Installation of chir pin timber truss</td>
<td>1000.00</td>
<td>Nos.</td>
</tr>
<tr>
<td>D.1.2</td>
<td>Laying of chir pine timber shingles</td>
<td>30.00</td>
<td>Cuft</td>
</tr>
<tr>
<td>E</td>
<td>INSTALLATION OF DOORS AND WINDOWS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E.1.1</td>
<td>Installation of two doors, one each in room, nd toilet. Two doors size - 2.5 ft x 6.9 ft and one door size 3.1 ft x 6.9ft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E.1.2</td>
<td>Installation of two windows, two in room window sizes - 3ft x 4 ft (1 Nos.) 4 ft x 4 ft (1 Nos.)</td>
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<td></td>
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<tr>
<td>E.1.3</td>
<td>Installation of MS ventilator in toilet, size - 1.5 ft x 1.5 ft</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3. Residence
Siror Village, Bhatwari Block, Uttarkashi

Set of Drawings

Under the project:
Delivery of Eco-friendly Multi-Hazard Resistant Construction Technologies and Habitat Solutions in Mountain States

Supported by:
Department of Science and Technology, Government of India
Programme: TIME-LEARN
Construction and Structural Drawings

EXCAVATION LAYOUT
30' WIDE
PLINTH LAYOUT
15' WIDE

EXCAVATION LAYOUT
30' WIDE
PLINTH LAYOUT
15' WIDE

NOTE:
1. TO RETAIN AND CONSERVE ALL THE TREES ON SITE
2. ALL MEASUREMENTS IN FEET AND INCHES
3. ALL LEVEL AT FINISH FLOOR LEVEL UNLESS OTHERWISE MENTIONED
4. ANY DESCREPENCIES SHOULD BE BROUGHT TO THE ATTENTION OF AN ARCHITECT.

Table: Vertical Reinforcement Details

<table>
<thead>
<tr>
<th>Area</th>
<th>Measurement</th>
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</thead>
<tbody>
<tr>
<td>WINDOW CORNERS &amp; T-JUNCTIONS</td>
<td>12mm</td>
</tr>
<tr>
<td>DOOR</td>
<td>12mm</td>
</tr>
<tr>
<td></td>
<td>From foundation till Lintel Band</td>
</tr>
<tr>
<td></td>
<td>From Sill band till Lintel Band</td>
</tr>
<tr>
<td></td>
<td>From foundation till Roof Band</td>
</tr>
</tbody>
</table>

DWG- PLINTH AND EXCAVATION LAYOUT
REV DATE- 07/07/2020

ARCHITECT- DEVALT
DATE- 07/07/2020

PROJECT NAME- Development Alternatives, B-32 Tara crescent marg Qutumb institutional area New Delhi 110016 INDIA
Ph. 011 26544100 email www.devalt.org

SHEET- 2
GROUNDFLOOR PLANN

SCHEDULE OF OPENINGS:

<table>
<thead>
<tr>
<th>NAME</th>
<th>SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>W1</td>
<td>3' X 4'-3''</td>
</tr>
<tr>
<td>W2</td>
<td>3' X 4'-3''</td>
</tr>
<tr>
<td>W3</td>
<td>3' X 4'-3''</td>
</tr>
<tr>
<td>W4</td>
<td>3' X 4'-3''</td>
</tr>
<tr>
<td>V-I</td>
<td>1'6'' X 1'-6''</td>
</tr>
</tbody>
</table>

SCHEDULE OF OPENINGS:

<table>
<thead>
<tr>
<th>NAME</th>
<th>SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>3'-2'' X 6'-9''</td>
</tr>
<tr>
<td>D2</td>
<td>2'-6'' X 6'-9''</td>
</tr>
<tr>
<td>D3</td>
<td>2'-6'' X 6'-9''</td>
</tr>
</tbody>
</table>

NOTE:
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DESIGN LAYOUT AND CONSTRUCTION DETAILS FOR DIFFERENT TYPOLOGIES OF BUILDINGS IN MOUNTAINOUS REGIONS (UTTARAKHAND) | Design Compendium

NOTE:
1. TO RETAIN AND CONSERVE ALL THE TREES ON SITE
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4. ANY DISCREPANCIES SHOULD BE BROUGHT TO THE ATTENTION OF AN ARCHITECT.

KITCHEN
ROOM
TOILET

SECTION-AA'

For Detailed wall section Refer SHEET 11-Wall Section DD

SECTION-AA'

PLANK&JOIST ROOF
(Refer sheet 13)

PARAPET-1

PARAPET-2

STONE MASONRY
12" THICK

SILL BAND
3" Thick

CONCRETE BLOCK
MASONRY 8"THICK

LINTEL BAND
3"THICK

PLANK&JOIST ROOF
(Refer sheet 13)

PLAN & PROJECTIONS

PLINTH LEVEL
LVL -2'9"

SILL LEVEL
LVL +4'6"

LINTEL LEVEL
LVL +8'9"

ROOF LEVEL
LVL +10'11"

PARAPET LEVEL
LVL +12'11"

GROUND LEVEL

W1

1'-6"
NOTE:
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CONSTRUCTION DETAILS - PLINTH, SILL AND LINTEL BAND
DESIGN LAYOUT AND CONSTRUCTION DETAILS FOR DIFFERENT TYPOLOGIES OF BUILDINGS IN MOUNTAINOUS REGIONS (UTTARAKHAND) | Design Compendium

**NOTE:**
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**PLAN-TYPICAL PLANK (T-1)**

**PLAN-TYPICAL PLANK (T-2)**

**DETAIL X**
- CONCRETE BED 1:1.5:3
- SPACING BOTH WAYS
- REFFER DETAIL "Y"
- BED FOR JOIST RCC 4 NO 10MM BAR 6 MM STIRRUPS WIDTH EQUAL TO WALL THICKNESS

**DETAIL Y**
- CSEB Wall 9" THK
- Floor Finish 1.2" THK
- Base Floor M15-In Situ Concrete
- Pre-Cast RC Plank 6mm Bar 2 per plank 2 no 8mm bar

**REVIEW DATE:**
- CONSTRUCTION DETAILS-Plank&Joist Roof
- 23/06/2020

**PROJECT NAME:**
- DIST TIME LEARN

**ARCHITECT:**
- DEVELOPMENT ALTERNATIVES

**E-52 Tara crescent marg Qutumb institutional area New Delhi 110016 INDIA Ph.01126544100 email-www.devalt.org**
NOTE:
1. RETAIN AND CONSERVE ALL THE TREES ON SITE
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COURSE PLAN- CONCRETE BLOCK

DETAIL A-Course 2,4,6

DETAIL B-Course 2,4,6

CAVITY TO BE FILLED WITH 1:2:4 MICRO CONCRETE USING 6MM DOWN AGGREGATE

DETAIL A

ROOM
(12'10"X10'4"")

TOILET
(7'6"X4'6"")

KITCHEN
(8'4"X5'8"")

VERANDAH
(9'4"X4'4")

REFFER
DETAIL "B"

REFFER
DETAIL "A"

8'4"

13'10"

W1

8'6"

7'6"

D2

D3

D1

W2

W3

W1

V1

D

C

B

A

C

B

A

VERANDAH
(9'4"X4'4")

9'4"

5'8"

8'4"

W1

D2

D1

W2

W3

W1

V1

C

B

A

C

B

A

DETAIL A

DETAIL A-Course 2,4,6

DETAIL B-Course 2,4,6

CAVITY TO BE FILLED WITH 1:2:4 MICRO CONCRETE USING 6MM DOWN AGGREGATE

DETAIL A

REFFER DETAIL "A"

8'4"

13'10"

W1

8'6"

7'6"

D2

D3

D1

W2

W3

W1

V1

D

C

B

A

C

B

A

DETAIL A

DETAIL A-Course 2,4,6

DETAIL B-Course 2,4,6

CAVITY TO BE FILLED WITH 1:2:4 MICRO CONCRETE USING 6MM DOWN AGGREGATE

DETAIL A

REFFER DETAIL "A"

8'4"

13'10"

W1

8'6"

7'6"

D2

D3

D1

W2

W3

W1

V1

D

C

B

A

C

B

A

DETAIL A

DETAIL A-Course 2,4,6

DETAIL B-Course 2,4,6

CAVITY TO BE FILLED WITH 1:2:4 MICRO CONCRETE USING 6MM DOWN AGGREGATE

DETAIL A

REFFER DETAIL "A"

8'4"

13'10"

W1

8'6"

7'6"

D2

D3

D1

W2

W3

W1

V1

D

C

B

A

C

B

A

DETAIL A

DETAIL A-Course 2,4,6

DETAIL B-Course 2,4,6

CAVITY TO BE FILLED WITH 1:2:4 MICRO CONCRETE USING 6MM DOWN AGGREGATE

DETAIL A

REFFER DETAIL "A"

8'4"

13'10"

W1

8'6"

7'6"

D2

D3

D1

W2

W3

W1

V1

D

C

B

A

C

B

A

DETAIL A

DETAIL A-Course 2,4,6

DETAIL B-Course 2,4,6

CAVITY TO BE FILLED WITH 1:2:4 MICRO CONCRETE USING 6MM DOWN AGGREGATE

DETAIL A

REFFER DETAIL "A"

8'4"

13'10"

W1

8'6"

7'6"

D2

D3

D1

W2

W3

W1

V1

D

C

B

A

C

B

A

DETAIL A

DETAIL A-Course 2,4,6

DETAIL B-Course 2,4,6

CAVITY TO BE FILLED WITH 1:2:4 MICRO CONCRETE USING 6MM DOWN AGGREGATE

DETAIL A

REFFER DETAIL "A"

8'4"

13'10"

W1

8'6"

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W2

W3

W1

V1

D

C

B

A

C

B

A

DETAIL A

DETAIL A-Course 2,4,6

DETAIL B-Course 2,4,6

CAVITY TO BE FILLED WITH 1:2:4 MICRO CONCRETE USING 6MM DOWN AGGREGATE

DETAIL A

REFFER DETAIL "A"

8'4"

13'10"

W1

8'6"

7'6"

D2

D3

D1

W2

W3

W1

V1

D

C

B

A

C

B

A

DETAIL A

DETAIL A-Course 2,4,6

DETAIL B-Course 2,4,6

CAVITY TO BE FILLED WITH 1:2:4 MICRO CONCRETE USING 6MM DOWN AGGREGATE

DETAIL A

REFFER DETAIL "A"

8'4"

13'10"

W1

8'6"

7'6"

D2

D3

D1

W2

W3

W1

V1

D

C

B

A

C

B

A

DETAIL A

DETAIL A-Course 2,4,6

DETAIL B-Course 2,4,6

CAVITY TO BE FILLED WITH 1:2:4 MICRO CONCRETE USING 6MM DOWN AGGREGATE

DETAIL A

REFFER DETAIL "A"

8'4"

13'10"

W1

8'6"

7'6"

D2

D3

D1

W2

W3

W1

V1

D

C

B

A

C

B

A

DET
Roof Plan For Lean To Roof and Plank & Joist Roof

NOTE:
1. TO RETAIN AND CONSERVE ALL THE TREES ON SITE
2. ALL MEASUREMENTS IN FEET AND INCHES
3. ALL LEVEL AT FINISH FLOOR LEVEL UNLESS OTHERWISE MENTIONED
4. ANY DEVIATIONS SHOULD BE BROUGHT TO THE ATTENTION OF AN ARCHITECT.

PROJ. TIME LEARN
PROPERTY
DATE- 05/08/2020
DRAWN- ROOF PLAN
INVESTIGATION
5MM THK MS PLATE
590X590
DWG- DETAILED PLAN- Pine Shingle and Plank & Joist
REV.01
ARCHITECT
DEALT- 07/04/2020
DRAWING- ROOF PLAN
Scale- 1:75
ARCHITECT- Devalt
DEVELOPMENT OPTIONS
B-32 Tara crescent marg Qutumb institutional area
New Delhi 110016 INDIA
Ph. 01126544100 email- www.devalt.org

SHEET-17
# Specifications and Bill of Quantities

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<td>EXCAVATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.1.1</td>
<td>Total Earth work incl excavation for trench (2.5’ wide and 2.9’ deep) in room, kitchen and toilet and (2’ wide and 1’ deep in verandah)</td>
<td>680.40</td>
<td>cuft</td>
</tr>
<tr>
<td><strong>A.2</strong></td>
<td>PCC BED AT TRENCH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.2.1</td>
<td>Total P.C.C in foundation 3” thick and 2.5’ wide with 1:4:8 running over the excavation in room, kitchen and toilet.</td>
<td>50.40</td>
<td>cuft</td>
</tr>
<tr>
<td><strong>A.3</strong></td>
<td>VERTICAL REINFORCEMENTS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.3.1</td>
<td>Laying of vertical reinforcement (6, 12mm bars) in Room</td>
<td>87.00</td>
<td>ft</td>
</tr>
<tr>
<td>A.3.2</td>
<td>Laying of vertical reinforcement (6, 12mm bars) in Kitchen and Toilet</td>
<td>50.00</td>
<td>ft</td>
</tr>
<tr>
<td>A.3.3</td>
<td>Laying vertical reinforcements (12, 12mm bars) from sill level to lintel level</td>
<td>66.00</td>
<td>ft</td>
</tr>
<tr>
<td><strong>A.4</strong></td>
<td>RRM IN FOUNDATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.4.1</td>
<td>Total RRM in foundation in room, kitchen and toilet, Step -1 - 1:6 mortar (2’ wide and 1’6” deep). 1:6 mortar</td>
<td>302.40</td>
<td>cuft</td>
</tr>
<tr>
<td>A.4.2</td>
<td>Total RRM in foundation in room, kitchen and toilet, Step -2 - 1:6 mortar (1.5’ wide and 2’ deep). 1:6 mortar</td>
<td>302.40</td>
<td>cuft</td>
</tr>
<tr>
<td><strong>A.5</strong></td>
<td>PLINTH BAND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.5.1</td>
<td>Plinth band horizontal reinforcement (2, 12mm bars)</td>
<td>197.80</td>
<td>ft</td>
</tr>
<tr>
<td>A.5.2</td>
<td>Stirups tie for horizontal reinforcement @200mm spacing, 6mm bars</td>
<td>119.40</td>
<td>ft</td>
</tr>
<tr>
<td>A.5.3</td>
<td>Plinth band in concrete 1:1.5:3 ratio - 3” deep and 2’ wide in room, kitchen and toilet</td>
<td>49.45</td>
<td>cuft</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td><strong>SUPER STRUCTURE- GROUND FLOOR</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.1</td>
<td>RANDOM RUBBLE STONE MASONARY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.1.1</td>
<td>Total RRM till sill level 1:6 mortar (1.5’ wide and 2.5’ deep)</td>
<td>429.30</td>
<td>cuft</td>
</tr>
<tr>
<td><strong>B.2</strong></td>
<td>SILL BAND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.2.1</td>
<td>Sill band horizontal reinforcement (2, 12mm bars)</td>
<td>197.80</td>
<td>ft</td>
</tr>
<tr>
<td>B.2.2</td>
<td>Stirups tie for horizontal reinforcement @200mm spacing, 8mm bars</td>
<td>119.40</td>
<td>ft</td>
</tr>
<tr>
<td>B.2.3</td>
<td>Sill band in concrete 1:1.5:3 ratio - 3” deep and 1.5’ wide in room, kitchen and toilet</td>
<td>37.09</td>
<td>cuft</td>
</tr>
<tr>
<td><strong>B.3</strong></td>
<td>DOOR WINDOW FRAMES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.3.1</td>
<td>Installation of precast RCC door frames in room, kitchen and toilet (Total 3 nos. doors, one in each)</td>
<td>51.30</td>
<td>ft</td>
</tr>
<tr>
<td>B.3.2</td>
<td>Installation of precast RCC window frames in room, kitchen and toilet (Total 4 nos. windows, two in kitchen and two in room)</td>
<td>58.00</td>
<td>ft</td>
</tr>
<tr>
<td><strong>B.4</strong></td>
<td>INSTALLATION OF DOORS AND WINDOWS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.4.1</td>
<td>Installation of three doors, one each in room, kitchen and toilet. Two doors size - 2.5 ft x 7.2 ft and one door size 3.1 ft x 7.2 ft</td>
<td>3.00</td>
<td>Nos.</td>
</tr>
<tr>
<td>B.4.2</td>
<td>Installation of four windows, two in room and two in kitchen and toilet, window sizes - 3’ ft x 4 ft (3 Nos.), 4’ ft x 4 ft (1 Nos.)</td>
<td>4.00</td>
<td>Nos.</td>
</tr>
<tr>
<td>B.4.3</td>
<td>Installation of MS ventilator in toilet, size - 1.5 ft x 1.5 ft</td>
<td>1.00</td>
<td>Nos.</td>
</tr>
<tr>
<td><strong>B.5</strong></td>
<td>CONCRETE BLOCK MASONRY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.5.1</td>
<td>Solid concrete block</td>
<td>915.00</td>
<td>Nos.</td>
</tr>
<tr>
<td>B.5.2</td>
<td>Hollow concrete block</td>
<td>135.00</td>
<td>Nos.</td>
</tr>
<tr>
<td>B.5.3</td>
<td>Hollow concrete block</td>
<td>180.00</td>
<td>Nos.</td>
</tr>
<tr>
<td>B.5.4</td>
<td>Concrete block Masonry in mortar 1:6 ratio</td>
<td>314.71</td>
<td>cuft</td>
</tr>
<tr>
<td>S. No.</td>
<td>ITEM</td>
<td>QTY</td>
<td>UNIT</td>
</tr>
<tr>
<td>-------</td>
<td>------</td>
<td>-----</td>
<td>------</td>
</tr>
<tr>
<td>B.6</td>
<td>LINTEL BAND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.6.1</td>
<td>Lintel band horizontal reinforcement (2, 12mm bars)</td>
<td>98.90</td>
<td>ft</td>
</tr>
<tr>
<td>B.6.2</td>
<td>Stirups tie for horizontal reinforcement @200mm spacing, 6mm bars</td>
<td>119.40</td>
<td>ft</td>
</tr>
<tr>
<td>B.6.3</td>
<td>Lintel band in concrete 1:1.5:3 ratio - 3” deep and 9” wide in room, kitchen and toilet</td>
<td>18.54</td>
<td>cuft</td>
</tr>
<tr>
<td>B.7</td>
<td>ROOF BAND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.7.1</td>
<td>Roof band horizontal reinforcement (2, 12mm bars)</td>
<td>104.40</td>
<td>ft</td>
</tr>
<tr>
<td>B.7.2</td>
<td>Stirups tie for horizontal reinforcement @200mm spacing, 8mm bars</td>
<td>63.45</td>
<td>ft</td>
</tr>
<tr>
<td>B.7.3</td>
<td>Roof band in concrete 1:1.5:3 ratio - 3” deep and 9” wide in room</td>
<td>9.79</td>
<td>cuft</td>
</tr>
<tr>
<td>C</td>
<td>ROOF- PLANK AND JOIST</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.1.1</td>
<td>Installation of planks at roof of Room</td>
<td>30.00</td>
<td>Nos.</td>
</tr>
<tr>
<td>C.1.2</td>
<td>Installation of planks at roof of kitchen and toilet</td>
<td>29.00</td>
<td>Nos.</td>
</tr>
<tr>
<td>C.1.3</td>
<td>Installation of joist at roof of Room, kitchen and toilet, 3 nos.</td>
<td>32.50</td>
<td>cuft</td>
</tr>
<tr>
<td>C.1.4</td>
<td>Laying of 6mm horizontal steel bars with 6mm stirrups in 4” thick cement concrete for screeding over plank and joist roof in 1:1.5:3 ratio</td>
<td>59.15</td>
<td>ft</td>
</tr>
<tr>
<td>D</td>
<td>ROOF- TIMBER TRUSS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D.1.1</td>
<td>Laying of Chir Pine Shingles over timber understructure</td>
<td>250.00</td>
<td>Nos.</td>
</tr>
<tr>
<td>D.1.2</td>
<td>Installation of Purlin, battons, wooden beam, wooden post and wooden plate for roofing over verandah</td>
<td>9.00</td>
<td>cuft</td>
</tr>
<tr>
<td>E</td>
<td>FINISHING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E.1.1</td>
<td>IPS Flooring in room, verandah and toilet</td>
<td>sqft</td>
<td></td>
</tr>
<tr>
<td>E.1.2</td>
<td>Mud plastering on interiors of room and toilet from sill level to roof level</td>
<td>sq.ft</td>
<td></td>
</tr>
<tr>
<td>E.1.3</td>
<td>Cement plastering in interiors of room and toilet till sill level</td>
<td>sq.ft</td>
<td></td>
</tr>
<tr>
<td>E.1.4</td>
<td>Cement plastering on plank and joist roof in room, toilet and verandah</td>
<td>sq.ft</td>
<td></td>
</tr>
<tr>
<td>E.1.5</td>
<td>Paint work over plastering till sill level and roof of room, toilet and verandah</td>
<td>sq.ft</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>PLUMBING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F.1.1</td>
<td>Sanitary fittings (WC, Washbasin, Taps)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F.1.2</td>
<td>Plumbing connection from toilet to soak pit with pipes and fitting complete</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F.1.3</td>
<td>Water pipeline connection from JAL nigam main pipeline to kitchen and toilet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>ELECTRICAL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G.1.1</td>
<td>1 tubelight in room, 1 bulb in toilet and 2 bulb in verandah fitting with wiring and switches complete</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Structural validation of community building at Kamad village, Uttarkashi-Uttarakhand

under DST-TIME LEARN Programme

Process for structural validation

The community building in Kamad village has been constructed as a model for disaster resistant construction in the mountainous district of Uttarkashi. As such, structural safety of the given building technologies was essential pre-requisite for architectural design. The design of the building was based on structural guidelines which have been developed for earthquake resistant construction in the country, with focus on non-engineered construction in rural areas, such as the Kamad village in Uttarkashi.

Following documents were consulted at the design stage for structural integrity of building –

- Guidelines for Earthquake resistant non-engineered construction – IAEE and NICEE (National Information Centre of Earthquake Engineering)
- Manual on Hazard Resistant Construction in India – developed under GOI-UNDP-DRM Programme

The draft designs prepared on the basis of above guidelines were submitted to NCPDP-CEDAP for Structural Validation of the design. The basis for validating the drawings are provisions of IS 4326: Design and construction of earthquake resistant buildings and IS 13828: Improving Earthquake resistance of low strength masonry buildings -Guidelines. As per IS 4326 this building being a community centre is considered as Category E building. Design aspects were identified based on the prescriptive recommendations of IS 13828 only that would induce major seismic vulnerabilities in the building. The design and construction details went through two stages of check and modifications to satisfy requirements for structural safety as specified by NCPDP-CEDAP.

Summary of design features for structural compliance with codal provisions for earthquake resistant construction

<table>
<thead>
<tr>
<th>Structural requirement as specified by NCPDP-CEDAP</th>
<th>Compliance in building design and detail – based on recommendations of NCPDP-CEDAP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Building Shape and Size</strong></td>
<td>Structural separation of the ground floor and the double storeyed section of the community building. This satisfies requirements of both vertical and plan irregularity.</td>
</tr>
<tr>
<td><strong>Vertical regularity</strong></td>
<td>Functional requirements dictated accessibility of terrace area and connection between the two sections of the building. This was achieved by a connecting corridor which serves as landing for staircase. The corridor is connected with the ground floor section of the building and is simply supported on brackets provided in the double-storied section. This will ensure that torsion caused by asymmetric</td>
</tr>
<tr>
<td>In case of buildings with a floor above, there must be no vertical irregularity due to the respective designs of both floors– this could be a small room on the upper floor which causes asymmetry in the structure. This will result in torsion under seismic conditions, which is not permitted in Category E buildings, unless a static analysis for seismic forces is carried out.</td>
<td></td>
</tr>
<tr>
<td><strong>Plan regularity</strong></td>
<td></td>
</tr>
</tbody>
</table>

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Ministry of Science & Technology
Department of Science & Technology

70
In case of plan irregularity, such as in the case of L-shape plan, the projecting section should not be more than 15% of the dimension of the structure. Constraint to lateral forces will not arise in case of earthquake.

<table>
<thead>
<tr>
<th>Foundation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provision of strip footing under all load bearing walls and exclusion of any eccentric foundation</td>
</tr>
<tr>
<td>Mortar ratio – cement: sand 1:6</td>
</tr>
<tr>
<td>Strip footing has been provided under all load bearing walls. The depth of the footing is till a strata with sufficient bearing capacity – this is as per existing conditions of rocky strata at shallow depths which is found throughout the region. A 150mm deep RCC beam is provided under the veranda columns and supported by 450mm thick stone masonry till 450mm depth</td>
</tr>
</tbody>
</table>

| Veranda – For veranda with columns to support the overhead slab, the columns should be tied with a beam at the plinth level and adequately supported by masonry below |

<table>
<thead>
<tr>
<th>Seismic bands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous RCC bands on all walls of building – both external as well as internal walls - at plinth, sill, lintel and roof level.</td>
</tr>
<tr>
<td>Continuous RCC bands of 75mm thickness were provided in all walls of the building. These are reinforced in accordance with guidelines for earthquake resistant construction.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vertical Reinforcement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single rod vertical reinforcement should be provided at all corner, T-junctions and on both sides of all openings to impart ductility to the masonry walls – Single storey – 12mm bar Double storied – 16mm in ground floor and 12mm in upper floor The vertical reinforcement must extend from the foundation as continuous with adequate overlap</td>
</tr>
<tr>
<td>All corners, T-junctions and sides of door-window openings are re-inforced with single bar, as specified. All reinforcement, except for openings extends from foundation PCC to the roof band. Reinforcement for doors extends form plinth beam to lintel band and for windows, extends from sill band to lintel band. For SCEB wall, the proper masonry bond was followed for creating cavity in the wall for vertical reinforcement. For concrete blocks, a keyhole-type cavity of 120mm dia was introduced in the block to allow for vertical bar to be inserted.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Masonry</th>
</tr>
</thead>
<tbody>
<tr>
<td>All masonry should be constructed in 1:4 cement: sand mortar In case of seismic stresses, the partition walls should behave as shear walls. Pilasters in masonry should have thickness equal to masonry thickness In veranda, masonry columns should be reinforced.</td>
</tr>
<tr>
<td>Partition walls are 200mm thick. Masonry columns in the verandah are reinforced with 3 No, 8mm deformed bars with stirrups at 135 degrees. The gable area of the walls in case of sloping roof has been kept lightweight. Gable masonry has been replaced by timber truss and in-fill timber planks.</td>
</tr>
<tr>
<td>Gable should be kept lightweight and flexible to minimize seismic hazard</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td><strong>Material regularity</strong> – Different masonry materials should not be combined at the same level for seismic considerations – they will behave differently, which will result in asymmetry and, hence torsion.</td>
</tr>
<tr>
<td>The building divides two different materials into two separate layers – RRM till sill and CSEB or concrete blocks above sill. Also, CSEB and concrete block masonry is physically separated to avoid joining two different materials at the same level.</td>
</tr>
<tr>
<td><strong>Roof</strong></td>
</tr>
<tr>
<td><strong>Plank and Joist roof slab</strong></td>
</tr>
<tr>
<td>The slab should be designed to behave as Rigid diaphragm, which is necessary for transferring shear forces to the shear walls.</td>
</tr>
<tr>
<td>Bearing for RCC joists should extend to the full thickness of walls.</td>
</tr>
<tr>
<td>The 7’6” long joist for the verandah will have a minimum bearing of 4” on masonry.</td>
</tr>
<tr>
<td>A screed concrete 40mm thick is provided over the planks with 6mm bars @ 6” spacing both ways. Triangular rings project out of joist for shear connection with the screed concrete.</td>
</tr>
<tr>
<td>100mm thick concrete bed, extending 150mm on both sides of joist has been provided for bearing the joists. MS angles 25x25mm project out of the bed concrete for additional anchorage of joists to the masonry through 12mm dia bolted connection.</td>
</tr>
<tr>
<td><strong>Door window openings</strong></td>
</tr>
<tr>
<td>All openings should be at a distance of at least 450mm from the inside corner of rooms and must be at least 600mm apart. The cumulative width of openings should not be more than 50% of the total length of the unsupported wall.</td>
</tr>
<tr>
<td>All openings are at least 450mm from inside corner of rooms. Cumulative width of all openings is more than 40% of the total wall length.</td>
</tr>
</tbody>
</table>

**Further suggestions by NCPDP-CEDAP**

- It is advisable to inform people about the seismic safety implications of the lightweight flexible gable walls
- In drawings, the same information should not be repeated on different sheets
- In drawings, Cross references to specific details should be made.

Note: The above-mentioned information has been derived originally from the structural validation report approved by Rajendre Desai, NCPDP. Based on the review of the drawings and information provided by DA to NCPDP, the design is in compliance with the relevant building codes, and hence, could be considered Earthquake Resistant.
About Development Alternatives Group

Development Alternatives (DA) is a premier social enterprise with a global presence in the fields of green economic development, social equity and environmental management. It is credited with numerous technology and delivery system innovations that help create sustainable livelihoods in the developing world. DA focuses on empowering communities through strengthening people’s institutions and facilitating their access to basic needs; enabling economic opportunities through skill development for green jobs and enterprise creation; and promoting low carbon pathways for development through natural resource management models and clean technology solutions.