STRUCTURAL DRAWINGS

PROJECT:- DESIGN OF PROPOSED G + 2 STOREY RESIDENTIAL BUILDING AT P/LING.(CATEGORY IV)
### List of Structural Drawings for G+2 Category IV Quarter (Two Bedroom) at Phuntsholing

<table>
<thead>
<tr>
<th>DRG. NO.</th>
<th>DRAWING TITLE</th>
<th>DATE OF ISSUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>STR/00</td>
<td>General Notes on Structural Drawings</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/01</td>
<td>Footing Layout Plan</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/02</td>
<td>Column Layout Plan</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/03</td>
<td>Footing &amp; Wall Foundation Details</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/04</td>
<td>Column Details</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/05</td>
<td>Typical Splice location and details in column</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/06</td>
<td>Typical Splice location and splices in beam</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/07</td>
<td>Beam - Column Junction Details</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/08</td>
<td>Plinth Beam Layout Plan</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/09</td>
<td>Plinth Beam Details</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/10</td>
<td>First Floor Beam layout plan</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/11</td>
<td>First Floor Beam Details</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/12</td>
<td>Second Floor Beam layout plan</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/13</td>
<td>Second Floor Beam Details</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/14</td>
<td>Roof Beam Layout Plan</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/15</td>
<td>Roof Beam Details</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/16</td>
<td>Lintel Band Details</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/17</td>
<td>Vertical reinforcement in project wall and lintel anchorage.</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/18</td>
<td>Cornice Details</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/19</td>
<td>Slab Layout Plan</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/20</td>
<td>Slab Bottom reinforcement Plan</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/21</td>
<td>Slab Top reinforcement Plan</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/22</td>
<td>Slab Section Details</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/23</td>
<td>Staircase Layout Plan &amp; Details</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/24</td>
<td>Main Roof Truss Layout plan</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/25</td>
<td>Purlin Layout Plan</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/26</td>
<td>Truss Elevation</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/27</td>
<td>Truss Member Schedule</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/28</td>
<td>Truss Connection Details</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/29</td>
<td>Truss Connection Details</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/30</td>
<td>Prop Details</td>
<td>May-2016</td>
</tr>
<tr>
<td>STR/31</td>
<td>Kitchen Slab Details</td>
<td>May-2016</td>
</tr>
</tbody>
</table>
A. GENERAL

1. Read this drawings in conjunction with architect's and other engineers' drawings and specifications, and such other written instructions as may be issued.

2. All dimensions are in millimetre unless stated otherwise.

3. Dimensions shall not be scaled from the drawings.

4. Design conforms to:
   - IS446:2000 Code of Practice for Plain and Reinforced Concrete
   - IS383-1961 Graded Aggregate for Concrete
   - IS1939-1963 Code of Practice for Reinforced Concrete
   - IS 875 - 1985 Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures

5. Verify all setting out dimensions with the engineer/architect. Verify location and dimensions of changes, inserts, openings, washes, drips, depressions, and other project requirements not shown on the structural drawings.

6. If in doubt, ask.

7. Refer any discrepancy to engineer/architect before proceeding with the work.

8. All construction materials and workmanship shall comply with the specifications for building and road works together with the requirements of all relevant codes of practice referred to herein and the requirements of all statutory authorities.

9. Check all dimensions before starting work.

10. Always refer additional notes provided in the drawings.

11. Unless otherwise indicated, details shown are to be considered typical for similar conditions.

12. No framing or structural members are to be modified, notched, or cut without the approval of the engineer.

13. The owner shall familiarize themselves with the drawings. Any discrepancies shall be brought to the attention of the engineer before proceeding with the affected work. Any variations or substitutions of materials or details from those indicated on the drawings may only be made with prior approval of the engineer.

B. FOUNDATION

1. Footings are designed for an allowable bearing capacity of 150kPa. Verify the soil strength and obtain approval from the engineer before placing concrete.

2. Foundation shall bear on undisturbed natural material or properly placed and compacted controlled structural fill having a minimum bearing capacity of 150kPA.

3. Controlled structural fill shall consist of clean granular material free of organic or other deleterious matter and conform to the requirements of standards and quality control authority.

4. Masonry walls in the form of random rubble masonry shall be provided below the exterior as well as interior plinth beam.

5. The depth of footings required to be provided varies from the depth specified above.

6. All excavation shall be dry before placing any concrete.

7. If seepage is encountered during foundation excavation, pump out water before placing concrete.

8. The foundations under the concrete base slab shall be compacted thoroughly and a minimum 200mm layer of course aggregate shall be placed over the compacted earth and sealed with 75mm thick layer of blinding concrete.

9. Backfilling against building foundation walls shall be done only after walls are braced to prevent movement.

10. Care shall be taken not to overstress any adjacent retaining walls and structures during backfilling against foundations.

11. Compaction of foundation shall be approved by engineer prior to placement of concrete.

C. LOADING

1. This structure has been designed for the following nominal loads:

   1.1 DEAD LOADS:
      - Unit weight of wall: 19.6 KN/M3
      - Unit weight of RCC: 24 KN/M3
      - Unit weight of PCC: 15 KN/M3

   1.2 SUPERIMPOSED LOADS (LIVE LOADS):
      - Live load for floors: 2.0 N/MM2
      - Live load for staircases: 3.0 N/MM2
      - Live load for roof: 0.75 N/MM2 (not accessible)

   1.3 WIND LOAD:
      - Basic wind speed (assumed): 45 M/S
      - Building class: B
      - Terrain category: III

   1.4 EARTHQUAKE DESIGN DATA
      - Seismic zone: V
      - Basic seismic force resisting system: Special moment resisting frame


3. Do not place or store building materials on concrete members without engineer's approval.

D. CONCRETE

1. Concrete quality shall comply with B446:2000

2. Project assessment of concrete strength is required.

3. Grade of concrete is M20 (1:1.5:3) for all RCC works.

4. MECHANICALLY VIBRATE CONCRETE IN THE FORM TO GIVE MAXIMUM COMPACTION WITHOUT SEGREGATION OF THE CONCRETE.

5. CURE CONCRETE AS REQUIRED BY THE CLAUSE 13.5 OF IS456:2000 AND WORK SPECIFICATIONS.

6. MECHANICALLY VIBRATE CONCRETE IN THE FORM TO GIVE MAXIMUM COMPACTION WITHOUT SEGREGATION OF THE CONCRETE.

7. CURE CONCRETE AS REQUIRED BY THE CLAUSE 13.5 OF B446:2000 AND WORK SPECIFICATIONS.

8. In the drawings the beam sizes are designated with X depth (includes slab thickness if any).

9. Concrete sizes as drawn are minimum and do not include applied finishes.

10. Do not make unspecified holes or chases without engineer's prior approval.

11. Do not place conduits, pipes and the like within cover concrete.

12. Aggregates shall comply with clause 5.3 of IS456:2000. Nominal size of coarse aggregates shall be 20mm.

13. The characteristic strength of concrete at 28 days shall be 20MPA, the concrete shall be assessed as per the acceptance criteria outlined in clause 18 of B446:2000 or any other statutory authorities.

14. All formworks for beams and slabs are to be removed before construction of walls or other permanent loadings. All formwork and its removal must be in accordance to B446:2000.

15. All floor slabs are reinforced concrete slabs.

---

ROYAL GOVERNMENT OF BHUTAN
National Housing Development Corporation Ltd,
Design & Planning Services,
PO Box 1439,
Thimphu.
E. REINFORCEMENT

1. Grade of steel used for RCC works shall be Fe500(TMT).

2. Bar notation gives the following information in this order: number of bars; bar size (mm); spacing (mm, if required).

3. Reinforcement is represented diagrammatically and not necessarily in true projection.

4. Lap reinforcement only at locations shown in the drawings. Lap length shall comply with IS456:2000. Lap splices shall not be less than the development length in tension (generally 47x Ø).

5. Reinforcement shall not be cut, bent or heated on site without engineer’s prior approval.

6. The deviation of reinforcement from its specified position shall not exceed the following (mm):

   6.1) Tolerance for cover -0, +10 mm. Where a negative value indicates a decrease in specified cover, and positive value indicates an increase in cover.

   6.2) Tolerances on placing of reinforcement:

   i) For slabs and staircase -10, +10 mm.

   ii) For beams, columns and foundation -15, +15 mm.

7. Spacers and supports shall be located at centres close enough (preferably not exceeding 750mm C/C for column and beam reinforcement, and 450mm for slab reinforcement) to prevent displacement of reinforcement by workmen or equipment during fixing and subsequent concrete placement within the tolerance given in 6 above.

8. The cover to the reinforcement nearest to the concrete surface shall not be less than the following except where specified otherwise:

   - Beams: 30 mm
   - Columns: 40 mm
   - Floor slabs and staircase: 20 mm
   - Foundation: 50 mm


10. Reinforcement shall be subject to laboratory test to determine ductile property.

11. Installation of reinforcement shall be completed at least 24 hours prior to scheduled concrete placement. Notify engineer at least 48 hours prior to scheduled concrete placement, to allow time for inspection.

F. TIMBER

1. All structural timber shall conform to the IS883. (If available use the Bhutanese Timber Code)

2. Moisture content of the structural timber shall not exceed 12%.

3. All structural timber shall have a minimum allowable bending stress, Fb, of 7MPa, a minimum allowable horizontal shear stress, Fv, of 0.6MPa, a minimum modulus of elasticity, E, of 9800 MPa, and maximum unit weight of 5.75 KN/m3.

G. FORMWORK

1. Properly brace and shore formwork to maintain alignment and tolerance in accordance with IS456:2000.


NOTES:
1. GROUND LEVEL REFERS TO THE LEVELLED GROUND AFTER HAVING REMOVED ALL THE TOP ORGANIC SOIL.
2. THE MINIMUM DEPTH OF FOUNDATION SHALL BE 1500MM FROM THE GROUND LEVEL.
3. BACK FILL SHALL BE FULLY COMPACTED BEFORE PLACING GROUND FLOOR CONCRETE.
4. PROPER ANCHORAGE OF BEAM BARS IN EXTERIOR COLUMN SHALL BE PROVIDED AS DETAILED IN DRAWING NO. STR/08.
5. IN ORDER TO ACHIEVE PROPER ANCHORAGE OF BEAM BARS INTO EXTERIOR COLUMNS, ALL EXTERIOR COLUMN SHALL BE CAST ONLY UP TO 3/4 OF THEIR HEIGHT BEFORE LAYING BEAM REINFORCEMENT IN UPPER FLOOR.

REFERENCE:
1. REFER DRG. NO. STR/02 FOR COLUMN LAYOUT PLAN
2. REFER DRG. NO. STR/03 FOR FOOTING & WALL FOUNDATION DETAILS
3. REFER DRG. NO. STR/04 FOR COLUMN DETAILS
4. REFER DRG. NO. STR/05 FOR COLUMN SPLICE DETAILS.
5. REFER DRG. NO. STR/06 FOR BEAM SPLICE DETAILS
6. REFER DRG. NO. STR/07 FOR BEAM- COLUMN JUNCTION DETAILS.
NOTES:
1. GROUND LEVEL REFERS TO THE LEVELLED GROUND AFTER HAVING REMOVED ALL THE TOP ORGANIC SOIL.
2. THE MINIMUM DEPTH OF FOUNDATION SHALL BE 1500MM FROM THE GROUND LEVEL.
3. BACK FILL SHALL BE FULLY COMPACTED BEFORE PLACING GROUND FLOOR CONCRETE.
4. PROPER ANCHORAGE OF BEAM BARS IN EXTERIOR COLUMN SHALL BE PROVIDED AS DETAILED IN DRAWING NO. STR/08.
5. IN ORDER TO ACHIEVE PROPER ANCHORAGE OF BEAM BARS INTO EXTERIOR COLUMNS, ALL EXTERIOR COLUMN SHALL BE CAST ONLY UP TO 3/4 OF THEIR HEIGHT BEFORE LAYING BEAM REINFORCEMENT IN UPPER FLOOR.

REFERENCE:
1. REFER DRG. NO. STR/02 FOR COLUMN LAYOUT PLAN
2. REFER DRG. NO. STR/03 FOR FOOTING & WALL FOUNDATION DETAILS
3. REFER DRG. NO. STR/04 FOR COLUMN DETAILS
4. REFER DRG. NO. STR/05 FOR COLUMN SPLICE DETAILS
5. REFER DRG. NO. STR/06 FOR BEAM SPLICE DETAILS
6. REFER DRG. NO. STR/07 FOR BEAM-COLUMN JUNCTION DETAILS.
FOOTING SCHEDULE

<table>
<thead>
<tr>
<th>FOOTING MARK</th>
<th>FOOTING SIZE</th>
<th>BOTTOM REBAR IN L-DIRECTION</th>
<th>BOTTOM REBAR IN B-DIRECTION</th>
<th>TOP REBAR IN BOTH DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>2000</td>
<td>120@180 c/c</td>
<td>120@180 c/c</td>
<td>100@180 c/c</td>
</tr>
<tr>
<td>F2</td>
<td>2200</td>
<td>120@150 c/c</td>
<td>120@180 c/c</td>
<td>100@180 c/c</td>
</tr>
<tr>
<td>F3</td>
<td>2400</td>
<td>120@180 c/c</td>
<td>120@150 c/c</td>
<td>100@180 c/c</td>
</tr>
</tbody>
</table>

NOTES:
1. GROUND LEVEL REFERS TO THE LEVELLED GROUND AFTER HAVING REMOVED ALL THE TOP ORGANIC SOIL.
2. THE MINIMUM DEPTH OF FOUNDATION SHALL BE 1500MM FROM THE GROUND LEVEL.
3. BACK FILL SHALL BE FULLY COMPACTED BEFORE PLACING GROUND FLOOR CONCRETE.
4. PROPER ANCHORAGE OF BEAM BARS IN EXTERIOR COLUMNS SHALL BE PROVIDED AS DETAILED IN DRAWING NO. STR/07.
5. IN ORDER TO ACHIEVE PROPER ANCHORAGE OF BEAM BARS INTO EXTERIOR COLUMNS, ALL EXTERIOR COLUMNS SHALL BE CAST ONLY UP TO 3/4 OF THEIR HEIGHT BEFORE LAYING BEAM REINFORCEMENT IN UPPER FLOOR.

FOOTING & WALL FOUNDATION DETAILS
COLUMN SCHEDULE

<table>
<thead>
<tr>
<th>Type</th>
<th>Size</th>
<th>Main Bar</th>
<th>Ties (S1), at splices &amp; below the plinth level</th>
<th>Ties (S2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>400 X 400</td>
<td>8-200</td>
<td>2-80 @ 75 c/c</td>
<td>2-80 @ 150 c/c</td>
</tr>
<tr>
<td>C2</td>
<td>400 X 400</td>
<td>4-250+4-160</td>
<td>2-80 @ 75 c/c</td>
<td>2-80 @ 150 c/c</td>
</tr>
<tr>
<td>C3</td>
<td>400 X 400</td>
<td>4-250+4-200</td>
<td>2-80 @ 75 c/c</td>
<td>2-80 @ 150 c/c</td>
</tr>
</tbody>
</table>

TYPICAL COLUMN DETAILS SHOWING TIES

NOTES:
1. ALL SPLICES TO BE PROVIDED NEAR THE MIDDLE OF COLUMN.
2. NOT MORE THAN 50% OF COLUMN BARS SHALL BE SPLICED AT ONE SECTION.
3. SPLICING OF COLUMN BARS AT BASEMENT AND GROUND FLOOR IS NOT PERMITTED.
4. COLUMN DETAILS IS SAME UP TO ROOF LEVEL.
5. CLOSER SPACING OF TIES OF 75 MM C/C SHOULD BE PROVIDED THROUGHOUT THE COLUMN SUPPORTING STAIRCASE.
6. TIES SPACING OF 75 MM C/C SHOULD BE PROVIDED IN ALL COLUMNS UP TO GROUND FLOOR.
7. COLUMN SHOULD CONTINUE TILL THE BEAM SUPPORTING TRUSSES AND BEAMS.
8. IN ORDER TO ACHIEVE PROPER ANCHORAGE OF BEAM BARS INTO EXTERIOR COLUMNS, ALL EXTERIOR COLUMN SHALL BE CAST ONLY UP TO 3/4 OF THEIR HEIGHT BEFORE LAYOUT BEAM REINFORCEMENT IN UPPER FLOORS.
9. \( L_d = 16 \text{ MM} = 950 \\
    20 \text{ MM} = 1150 \\
    25 \text{ MM} = 1450 \)

REFERENCES:
1. REFER DRG. NO. STR/01 & 02 FOR FOOTING & COLUMN LAYOUT PLAN.
2. REFER DRG. NO. STR/03 FOR FOOTING & WALL FOUNDATION DETAILS.
3. REFER DRG. NO. STR/06 FOR COLUMN SPLICE DETAILS.
4. REFER DRG. NO. STR/07 FOR BEAM COLUMN JUNCTION DETAILS.
5. REFER DRG. NO. STR/23 FOR STAIRCASE DETAILS.

COLUMN DETAILS

PROJECT: PHUNTHOING HOUSING PROJECT
NAME OF THE DRAWING: COLUMN DETAILS
CATEGORY: (2 BEDROOMS STOREY) BUILDING
SCALE: 1:50
DATE: May-2016
DRAWING NO.: STR004

NOTE: ALL DIMENSIONS ARE IN MILLIMETERS. DO NOT MEASURE FROM THE DRAWING. REPORT ANY DISCREPANCIES TO THE ARCHITECT.

NAME OF THE DRAWING: COLUMN DETAILS
DATE: May-2016
DRAWING NO.: STR004

PROJECT: PHUNTHOING HOUSING PROJECT
NAME OF THE DRAWING: COLUMN DETAILS
CATEGORY: (2 BEDROOMS STOREY) BUILDING
SCALE: 1:50
DATE: May-2016
DRAWING NO.: STR004

NOTE: ALL DIMENSIONS ARE IN MILLIMETERS. DO NOT MEASURE FROM THE DRAWING. REPORT ANY DISCREPANCIES TO THE ARCHITECT.

NAME OF THE DRAWING: COLUMN DETAILS
DATE: May-2016
DRAWING NO.: STR004

ROYAL GOVERNMENT OF BHUTAN
National Housing Development Corporation Ltd.
Design & Planning Services,
PO Box 1439
Thimphu
NOTES:

1. ALL SPLICES TO BE PROVIDED NEAR THE MIDDLE OF COLUMN.
2. NOT MORE THAN 50% OF COLUMN BARS SHALL BE SPLICED AT ONE SECTION.
3. SPLICING OF COLUMN BARS AT BASEMENT AND GROUND FLOOR IS NOT PERMITTED.
4. COLUMN DETAILS IS SAME UP TO ROOF LEVEL.
5. CLOSER SPACING OF TIES OF 75 MM C/C SHOULD BE PROVIDED THROUGHOUT THE COLUMN SUPPORTING STAIRCASE.
6. TIES SPACING OF 75 MM C/C SHOULD BE PROVIDED IN ALL COLUMNS UP TO GROUND FLOOR.
7. COLUMN SHOULD CONTINUE TILL THE BEAM SUPPORTING TRUSSES AND BEAMS.
8. IN ORDER TO ACHIEVE PROPER ANCHORAGE OF BEAM BARS INTO EXTERIOR COLUMNS, ALL EXTERIOR COLUMN SHALL BE CAST ONLY UP TO 3/4 OF THEIR HEIGHT BEFORE LAYOUT BEAM REINFORCEMENT IN UPPER FLOORS.
1. Splicing of bottom beam bars shall be provided 2D away from the face of the column.
2. Splicing of top beam bars shall be at mid span (L/2).
3. Not more than 50% of beam bars shall be spliced at one section.
4. Stirrups spacing at splices shall be 80 @ 75c/c.
5. Splicing length shall not be less than development length, Ld.

TYPICAL ARRANGEMENT OF STIRRUPS & SPLICES IN BEAMS

NOTES:
- 1. Splicing of bottom beam bars shall be provided 2D away from the face of the column.
- 2. Splicing of top beam bars shall be at mid span (L/2).
- 3. Not more than 50% of beam bars shall be spliced at one section.
- 4. Stirrups spacing at splices shall be 80 @ 75c/c.
- 5. Splicing length shall not be less than development length, Ld.
TYPICAL EXTERIOR BEAM - COLUMN CONNECTION DETAIL (SIDE VIEW)

TYPICAL EXTERIOR BEAM - COLUMN CONNECTION DETAIL (PLAN VIEW)

TYPICAL INTERIOR BEAM - COLUMN CONNECTION DETAIL (SIDE VIEW)

TYPICAL INTERIOR BEAM - COLUMN CONNECTION DETAIL (PLAN VIEW)

BEAM - COLUMN CONNECTION DETAILS

Ld = 1150 MM FOR 200
- 1450 MM FOR 250
- 950 MM FOR 16
- 700 MM FOR 120

COLUMN TIES WITHIN THE JOINT

COLUMN TIE

BEAM BAR BENT FOR ANCHORAGE

COLUMN TIE

PCC

SECONDARY BEAM

PRIMARY BEAM

PRIMARY-SECONDARY BEAM JUNCTION DETAILS

50 MM (MAX)

COLUMN REINFORCEMENTS

COLUMN REINFORCEMENTS

BEAM REINFORCEMENTS

BEAM REINFORCEMENTS

BEAM BAR BENT FOR ANCHORAGE

BEAM STIRRUPS

Received at 2023.04.10 by -

ROYAL GOVERNMENT OF BHUTAN
National Housing Development Corporation Ltd.
Design & Planning Services,
PO Box 1439
Thimphu
L-SECTION OF FIRST FLOOR BEAM ALONG GRID 2 & 3 (300x400)

L-SECTION OF FIRST FLOOR BEAM ALONG GRID 1 (300x400)

L-SECTION OF FIRST FLOOR BEAM ALONG GRID A, B, E & F (300x400)

L-SECTION OF FIRST FLOOR BEAM ALONG GRID C & D (300x400)

REFERENCES:
1. REFER DRG. NO. STR/18 FOR FIRST FLOOR BEAM LAYOUT PLAN.
2. REFER DRG. NO. STR/07 FOR BEAM-COLUMN JUNCTION DETAILS.
3. REFER DRG. NO. STR/06 FOR BEAM SPLICE DETAILS.
4. REFER DRG. NO. STR/23 FOR STAIRCASE DETAILS.

400 300
SECTION 2-2
SECTION 3-3

400 300
SECTION 1-1
SECTION 4-4

Stirrups Details
S1 = 8Ø @ 100c/c
S2 = 8Ø @ 150c/c
SECOND FLOOR BEAM LAYOUT PLAN
REFERENCES:
1. REFER DRG. NO. STR/12 FOR SECOND FLOOR BEAM LAYOUT PLAN.
2. REFER DRG. NO. STR/07 FOR BEAM-COLUMN JUNCTION DETAILS.
3. REFER DRG. NO. STR/06 FOR BEAM SPLICE DETAILS.
4. REFER DRG. NO. STR/23 FOR STAIRCASE DETAILS.

STIRRUPS DETAILS:
S1 = 8Ø @ 100c/c
S2 = 8Ø @ 150c/c
ROOF BEAM LAYOUT PLAN

PROJECT: PHUNSHIKHANG HOUSING PROJECT
CATEGORY N (2 BEDROOM 3 STOREY) BUILDING

NAME OF THE DRAWING: ROOF BEAM LAYOUT PLAN
SCALE: NTS
DATE: May 2016

NOTE:
1. ALL DIMENSIONS IN MILLIMETERS
2. DO NOT MEASURE FROM THIS DRAWING
3. REPORT ANY DISCREPANCIES TO THE ARCHITECT

REVISION DATE CONTENT

ROYAL GOVERNMENT OF BHUTAN
National Housing Development Corporation Ltd.
Design & Planning Services,
PO Box 1439
Thimphu
L-SECTION OF ROOF BEAM ALONG GRID 1, 2 & 3 (300x350)

L-SECTION OF ROOF BEAM ALONG GRID A, B, C, D, E & F (300x350)

REFERENCES:
1. REFER DRG. NO. STR/16 FOR ROOF BEAM LAYOUT PLAN.
2. REFER DRG. NO. STR/07 FOR BEAM-COLUMN JUNCTION DETAILS.
3. REFER DRG. NO. STR/06 FOR BEAM SPLICE DETAILS.
4. REFER DRG. NO. STR/23 FOR STAIRCASE DETAILS.

Stirrups Details
S1 = 8Ø @100c/c
S2 = 8Ø @150c/c
NOTES:

1. LINTEL BAND SHALL BE PROVIDED FOR THE FULL LENGTH OF WALLS.

2. LAP LENGTH OF LINTEL BAND REINFORCEMENT SHALL NOT BE LESS THAN 47XØ OF BAR.

3. LINTEL BAND SHALL EXTEND FROM COLUMN TO COLUMN ENCLOSING PROJECTED WALLS

4. LINTEL BAND REINFORCEMENT SHALL BE PROPERLY ANCHORED TO COLUMNS.

LINTEL BAND DETAILS
TYPICAL Lintel Band Detail at Corner Over Non Projected External Wall

TYPICAL Lintel Band Detail at Middle Over Non Projected External Wall

TYPICAL Lintel Band Detail at Corner Over Projected External Wall

TYPICAL Lintel Band Detail at Middle Over Projected External Wall

NOTES:
1. Vertical reinforcement shall be provided within walls where wall are projected outward from the main building line.
2. Vertical reinforcement shall extend from second floor slab/beam to roof slab/beam.
3. Vertical reinforcement shall be properly anchored to floor slab/beam and embedment length shall not less than 470 of bar.
4. Lintel band shall continue throughout the length of wall.

VERTICAL REINFORCEMENT FOR PROJECTED WALL AND LINTAL ANCHORAGE
NOTES & REFERENCES:
1. Notify engineers if cornice differ significantly at site from the details given herein.
2. Refer to architectural drawings for location and coverage of cornice.

1. NOTIFY ENGINEERS IF CORNICE DIFFER SIGNIFICANTLY AT SITE FROM THE DETAILS GIVEN HEREBIN.
2. REFER ARCHITECTURAL DRAWINGS FOR LOCATION & COVERAGE OF CORNICE.
REFERENCES:

1. REFER DRAWING NO. STR/20, STR/21, STR/22 FOR SLAB DETAILS.
1. REFER DRAWING NO. STR/23 FOR STAIRCASE DETAILS.

NOTES:

FLOOR SLAB THICKNESS 120 MM
ROOF SLAB THICKNESS 100 MM
NO SLAB ON THE VERANDAH IN ROOF SLAB
REFERENCES:
1. REFER DRAWING NO. STR/22 FOR SLAB SECTION DETAILS.
2. REFER DRAWING NO. STR/22 FOR TYPICAL ANCHORAGE OF SLAB BAR INTO BEAMS.
3. REFER DRAWING NO. STR/23 FOR STAIRCASE DETAIL.

NOTES:
FLOOR SLAB THICKNESS 120 MM
ROOF SLAB THICKNESS 100 MM
NO SLAB ON THE VERANDAH IN ROOF SLAB
REFERENCES:

1. REFER DRAWING NO. STR/22 FOR SLAB SECTION DETAILS.
2. REFER DRAWING NO. STR/22 FOR TYPICAL ANCHORAGE OF SLAB BAR INTO BEAMS.
3. REFER DRAWING NO. STR/23 FOR STAIRCASE DETAIL.

NOTES:

FLOOR SLAB THICKNESS 120 MM
ROOF SLAB THICKNESS 100 MM
NO SLAB ON THE VERANDAH IN ROOF SLAB

PROJECT:
PHUNTSHOLING HOUSING PROJECT

NAME OF THE DRAWING:

CATEGORY A (2 BEDROOM 3 STOREY) BUILDING

TITLE: REINFORCEMENT PLAN

DRAWING NO.: STR21

NOTE:
- ALL DIMENSIONS IN MILLIMETERS
- DO NOT MEASURE FROM THE DRAWING
- REPORT ANY DECeriorATIONS TO THE ARCHITECT

ROYAL GOVERNMENT OF BHUTAN
National Housing Development Corporation Ltd.
Design & Planning Services
PO Box 1439
Thimphu
SLAB SECTION DETAILS

NOTES:
1. FLOOR SLAB THICKNESS IS 120 MM
2. ROOF SLAB THICKNESS IS 100 MM
3. ADOPT SAME SECTION DETAILS FOR ALL SLABS

REFERENCES:
1. REFER DRAWING NO. STR/20 & STR/21 FOR TOP AND BOTTOM REINFORCEMENT
2. REFER DRAWING NO. STR/23 FOR STAIRCASE DETAIL.
### TRUSS MEMBER SCHEDULE

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>STEEL TUBES SIZE</th>
<th>SECTION THICKNESS, (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOP &amp; BOTTOM CHORD</td>
<td>60.03 ODM, 5.070 Kg/m</td>
<td>3.60</td>
</tr>
<tr>
<td>STRUT (INCLINED)</td>
<td>60.03 ODM, 5.070 Kg/m</td>
<td>3.60</td>
</tr>
<tr>
<td>STRUT (VERTICAL)</td>
<td>60.03 ODM, 5.070 Kg/m</td>
<td>3.60</td>
</tr>
<tr>
<td>PURLIN</td>
<td>60.03 ODM, 5.070 Kg/m</td>
<td>3.60</td>
</tr>
</tbody>
</table>

**NOTES:**
1. ALL WELDING SHOULD BE FILLET WELD OF MINIMUM 6 MM THICK
2. SIZE OF COMPLETE PENETRATION BUTT WELD GREATER THAN EQUAL TO MEMBER THICKNESS
3. STEEL GRADE ST35 (Yst 22 GRADE)
TRUSS CONNECTION DETAILS
1. SAME TRUSS CONNECTION DETAILS SHALL BE ADOPTED IN ALL CONNECTIONS.

REFERENCES:
1. REFER DRG. NO. STR/24 FOR TRUSS LAYOUT PLAN
2. REFER DRG. NO. STR/25 FOR TRUSS ELEVATION
3. REFER DRG. NO. STR/29 FOR PROP DETAILS
1. REFER DRG. NO. STR/24 FOR TRUSS LAYOUT PLAN.
2. REFER DRG. NO. STR/25 FOR TRUSS ELEVATION.
3. REFER DRG. NO. STR/26 FOR TRUSS MEMBER SCHEDULE.
4. REFER DRG. NO. STR/27 & STR/28 FOR TRUSS CONNECTION DETAILS.

REFERENCES:
1. REFER DRG. NO. STR/24 FOR TRUSS LAYOUT PLAN.
2. REFER DRG. NO. STR/25 FOR TRUSS ELEVATION.
3. REFER DRG. NO. STR/26 FOR TRUSS MEMBER SCHEDULE.
4. REFER DRG. NO. STR/27 & STR/28 FOR TRUSS CONNECTION DETAILS.

NOTE:
H= HEIGHT OF PROP (REFER ARCHITECTURAL DRAWING FOR PROP HEIGHT)

REFERENCES:
1. REFER DRG. NO. STR/24 FOR TRUSS LAYOUT PLAN.
2. REFER DRG. NO. STR/25 FOR TRUSS ELEVATION.
3. REFER DRG. NO. STR/26 FOR TRUSS MEMBER SCHEDULE.
4. REFER DRG. NO. STR/27 & STR/28 FOR TRUSS CONNECTION DETAILS.
KITCHEN WORK TOP DETAIL

NOTES:
1. KITCHEN SLAB IS 75MM THICK
2. COVER TO KITCHEN SLAB IS 15MM
3. REFER ARCHITECTURAL DRAWING FOR LOCATION OF SLAB

KITCHEN SLAB BOTTOM REINFORCEMENT PLAN

DETAIL A

8Ø @ 120MM C/C BOTHWAYS

NOTES:
- ALL DIMENSIONS IN MILLIMETERS
- DO NOT MEASURE FROM THE DRAWING
- REPORT ANY DISCREPANCIES TO THE ARCHITECT

KITCHEN SINK

SINK