

PROJECT: PROPOSED DESIGN OF SECURITY QUARTERS AT GELEPHU AIRPORT

CLIENT: DEPARTMENT OF AIR TRANSPORT

BUILDING: DINNING HALL & KITCHEN

STRUCTURAL DRAWINGS

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ROYAL GOVERNMENT OF BHUTAN
DEPARTMENT OF CIVIL AVIATION

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Client

Ministry of Information and Communications
Department of Air Transport

Aviation Planners & Engineers

Leading Edge Aviation Planning Professionals

Civil Engineering Consultant

Gyaltshen Consultancy

Project Title

BHUTAN DOMESTIC AIRPORT DESIGN & SUPERVISION
GELEPHU AIRPORT SECURITY QUATERS

No. Revision

No.	Revision	Date	By

Drawing Title

Drawing List	
Scale	nts @ A3
Date	December 2016
Drawn By	S Tobgay, P Dorji & A Pradhan
Drawing Number	STR - 100
LEAPP Project Code	12246

Rev No.
R0

TECHNICAL NOTES

CODES AND STANDARDS

1.

IS 456:2000

PLAIN AND REINFORCED CONCRETE CODE OS PRACTICE.
2.

IS 1893: 2002

CRITERIA FOR EARTHQUAKE RESISTANT DESIGN OF STRUCTURES.
3.

IS13920:1993

DUCTILE DETAILING OF REINFORCED CONCRETE STRUCTUR
SUBJECTED TO SEISMIC FORES.
4.

S 4326:1993

EARTHQUAKE RESISTANT DESIGN AND CONSTRUCTION OF BUILDINGS.
5.

BTS-002-2003

BUILDING CODE OF BHUTAN 2003.
6.

MANUAL FOR TIMBER ENGINEERING DESIGN (NUDC).

LOADS.

1. THIS STRUCTURE HAS BEEN DESIGNED FOR THE FOLLOWING LOADS.

(a).

DEAD LOADS:

UNIT WEIGHT OF BRICK WALL

19 kN/m³

UNIT WEIGHT OF RCC

25 kN/m³

UNIT WEIGHT OF PCC

24 kN/m³

UNIT WEIGHT OF STONE

28 kN/m³

(b).

SUPERIMPOSED (LIVELOADS)

LIVELOAD FOR FLOORS

2 kN/m²

LIVE LOAD FOR ROOF

0.75 kN/m² (IS:875)

(c).

WIND LOAD

WIND PRESSURE

1.276 kN/m² (BST-002-2003)

(d).

EARTHQUAKE LOAD

AS PER IS 1893:2002, ZONE V
2. MAINTAIN STRUCTURE IN STABLE CONDITION DURING CONSTRUCTION.
3. DONOT PLACE OR STORE BUILDING MATERIALS ON CONCRETE MEMBERS WITHOUT ENGINEER'S APPROVAL.

CONCRETE.

1. CONCRETE QUALITY SHALL COMPLY WITH IS 456:2000
2. PROJECT ASSESSMENT OF CONCRETE STRENGTH IS REQUIRED.
3. GRADE OF CONCRETE IS M20 (1:1.5:3) FOR ALL RCC WORKS.
4. FOR THE ABOVE GRADE TO BE ACHIEVED, MAXIMUM FREE WATER-CEMENT RATIO SHALL BE 0.5, MINIMUM CEMENT CONTENT SHALL BE 300 Kg/m³ AND MAXIMUM AMOUNT OF WATER SHALL BE 180 L.
5. WATER USED FOR MIXING AND CURING SHALL COMPLY WITH CLAUSE 5.4 OF IS 456:2000.

GENERAL NOTES FOR STRUCTURAL DRAWINGS.

1. STRUCTURAL DRAWINGS SHALL BE READ IN CONJUNCTION WITH ARCHITECTURAL DRAWINGS AND OTHER ENGINEERS' DRAWINGS AND SPECIFICATIONS.
2. ALL DIMENSIONS ARE IN MM AND RELATIVE LEVEL IN M UNLESS STATED OTHERWISE.
3. DIMENSIONS SHALL NOT BE SCALED FROM THE DRAWINGS.
4. VERIFY ALL SETTING OUT DIMENSIONS WITH ENGINEER/ARCHITECT.
5. REFER ANY DISCREPANCY TO ENGINEER/ARCHITECT BEFORE PROCEEDING THE WORK.
6. 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.
7. ALWAYS REFER ADDITIONAL NOTES PROVIDED IN THE DRAWINGS.

FOUNDATIONS AND FOOTINGS.

1. FOOTINGS ARE DESIGNED FOR AN ALLOWABLE BEARING CAPACITY OF 150 kN/m².
2. SOIL TYPE MEDIUM AS PER IS:1893-2002.
3. WALLS SHALL BE PROVIDED BELOW THE EXTERIOR PLINTH BEAM. IT IS RECOMMENDED TO PROVIDE THE SAME BELOW THE INTERNAL PLINTH BEAM.
4. FOOTINGS ARE DESIGNED CONSIDERING THE MINIMUM DEPTH OF 1.5 M BELOW THE ORIGINAL GROUND LEVEL.
5. ALL CONCRETE SHALL BE PLACED "IN THE DRY" FOR FOUNDATIONS.
6. COMPACTION OF FOUNDATION SHALL BE APPROVED BY ENGINEER PRIOR TO PLACEMENT OF CONCRETE.
7. MECHANICALLY VIBRATE CONCRETE IN THE FORM TO GIVE MAXIMUM COMPACTION WITHOUT SEGREGATION OF THE CONCRETE.
8. CURE CONCRETE AS REQUIRED BY THE CLAUSE 13.5 OF IS456:2000 AND WORK SPECIFICATIONS.
9. CONCRETE SIZES AS DRAWN ARE MINIMUM AND DONOT INCLUDE APPLIED FINISHES.
10. DONOT MAKE UNSPECIFIED HOLES OR CHASES WITHOUT ENGINEER'S APPROVAL.
11. DONOT PLACE CONDUITS, PIPES etc. WITHIN CONCRETE COVER.
12. AGGREGATES SHALL COMPLY WITH CLAUSE 5.3 OF IS456:2000. NOMINAL SIZE OF COARSE AGGREGATES SHALL BE 20MM.
13. THE CHARACTERISTICS STRENGTH OF CONCRETE AT 28 DAYS SHALL BE 20MPA. NOTE THAT THE MEAN COMPRESSIVE STRENGTH OBTAINED FROM THE LABORATORY HAS TO BE WELL ABOVE THIS VALUE.
14. ALL FORMWORKS FOR BEAMS AND SLABS ARE TO REMOVED BEFORE CONSTRUCTION OF WALLS OR OTHER PERMANENT LOADINGS. ALL FORMWORK AND ITS REMOVAL MUST BE IN ACCORDANCE TO IS 456:2000.



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Gyaltshen Consultancy

Project Title

BHUTAN DOMESTIC AIRPORT DESIGN & SUPERVISION
GELEPHU AIRPORT SECURITY QUATERS

No. Revision

No.	Revision	Date	By

Drawing Title

Technical Notes

Scale nts @ A3

Date December 2016

Drawn By S Tobgay, P Dorji & A Pradhan

Drawing Number

STR - 101

LEAPP Project Code

12246

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REINFORCEMENT.

1. GRADE OF STEEL USED FOR RCC WORKS SHALL BE FE500.
2. BAR NOTATION GIVES THE FOLLOWING INFORMATION IN THIS ORDER: NUMBER OF BARS, BAR SIZE (MM), SPACING (MM, IF REQUIRED).
3. REINFORCEMENT IS REPRESENTED DIAGRAMATICALLY AND NOT NECESSARILY IN TRUE PROJECTION.
4. LAP REINFORCEMET 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 47Ø).
5. REINFORCEMENT SHALL NOT BE CUT, BENT OR HEATED ON SITE WITHOUT ENGINEER'S APPROVAL.
6. THE DEVIATION OF REINFORCEMENT FROM ITS SPECIFIED POSITION SHALL NOT EXCEED THE FOLLOWING(MM)
 - (a). TOLERANCE FOR COVER -0,+10MM. WHERE A NEGATIVE VALUE INDICATE A DECREASE IN SPECIFED COVER, AND POSITIVE VALUE INDICATES AN INCREASE IN COVER.
 - (b). TOLERANCE ON PLACEMENT OF REINFORCEMENT.
FOR BEAMS, COLUMNS AND FOUNDATION -15,+15MM.
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 DISPLACMENT OF REINFORCEMENT BY WORKMEN OR EQUIPMENT DURING FIXING AND SUBSEQUENT CONCRTE PLACEMENT WITHIN TOLERANCE GIVEN ABOVE.
8. THE COVER TO THE REINFORCEMENT NEAREST THE CONCRETE SURFACE SHALL NOT LESS THAN THE FOLLOWING EXCEPT WHERE SPECIFIED OTHERWISE:

FOUNDATION	75 MM
COLUMNS	40 MM
BEAMS	30 MM
SLABS	25 MM
9. BENDING OF REINFORCEMENT IN BEAMS AND COLUMNS SHALL COMPLY WITH TH REQUIREMENTS OF IS 456:2000
10. FORMWORK SHALL COMPLY WITH CLAUSE 11 OF IS 456:2000
11. STRIPPING OF FORMWORK SHALL COMPLY WITH CLAUSE 11.3 OF IS:456:2000

WELDING AND BOLTING.

1. WELDING TO BE CARRIED OUT IN ACCORDANCE WITH IS 816:1969, IS 819:1957, IS 1024:1979, IS 1261:1959, IS 1323:1982 AND IS: 9595: 1980 AS APPROPRIATE.
2. THE STRENGTH OF ELECTRODE USED FOR WELDING SHALL BE EQUAL TO OR GREATER THAN THE STRENGTH OF MEMBER THAT IS BEING WELDED.
3. ALL WELD SHALL BE COMPLETE PENETRATION BUTT WELD.
4. ALL BOLTS SHALL BE HIGH STRENGTH FRICTION GRIP GALVANIZED M16 AND M20 IN ACCORDANCE WITH IS 3757:1967 AND IS 800: 1984.
5. ALL MEMBERS OF STEEL TRUSS SHALL BE DRY AND THROUGHLY CLEANED FROM ALL LOOSESCALE AND RUST PRIOR TO PAINTING.
6. THE MEMBERS SHALL BE PROVIDED WITH COAT OF ZINC COATING.



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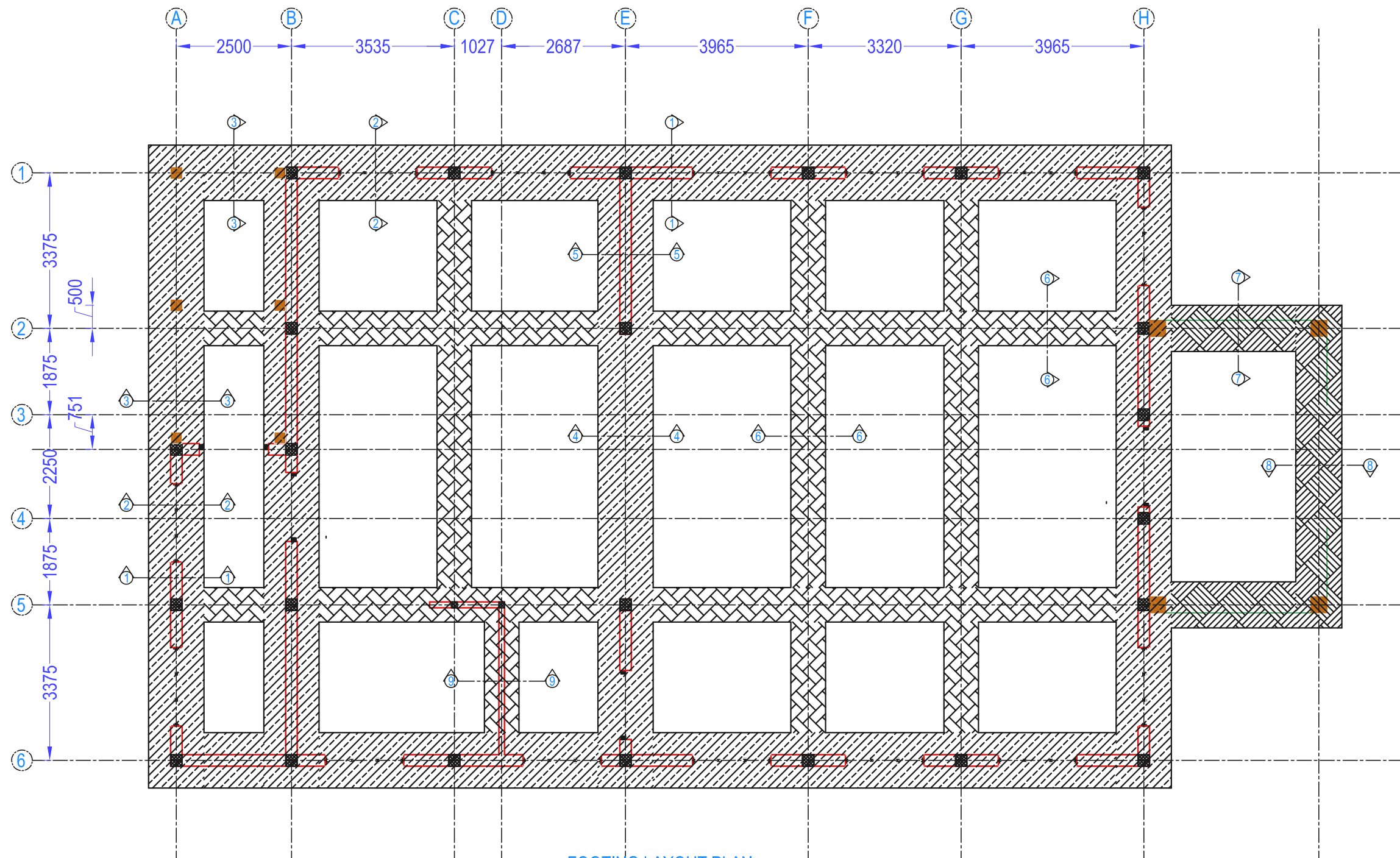
STR - 102

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FOOTING LAYOUT PLAN
SCALE 1 : 100



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No. Revision

No.	Revision	Date	By

Drawing Title

Plan Showing Footing Layout

Scale 1 : 100 @ A3

Date December 2016

Drawn By S Tobgay, P Dorji & A Pradhan

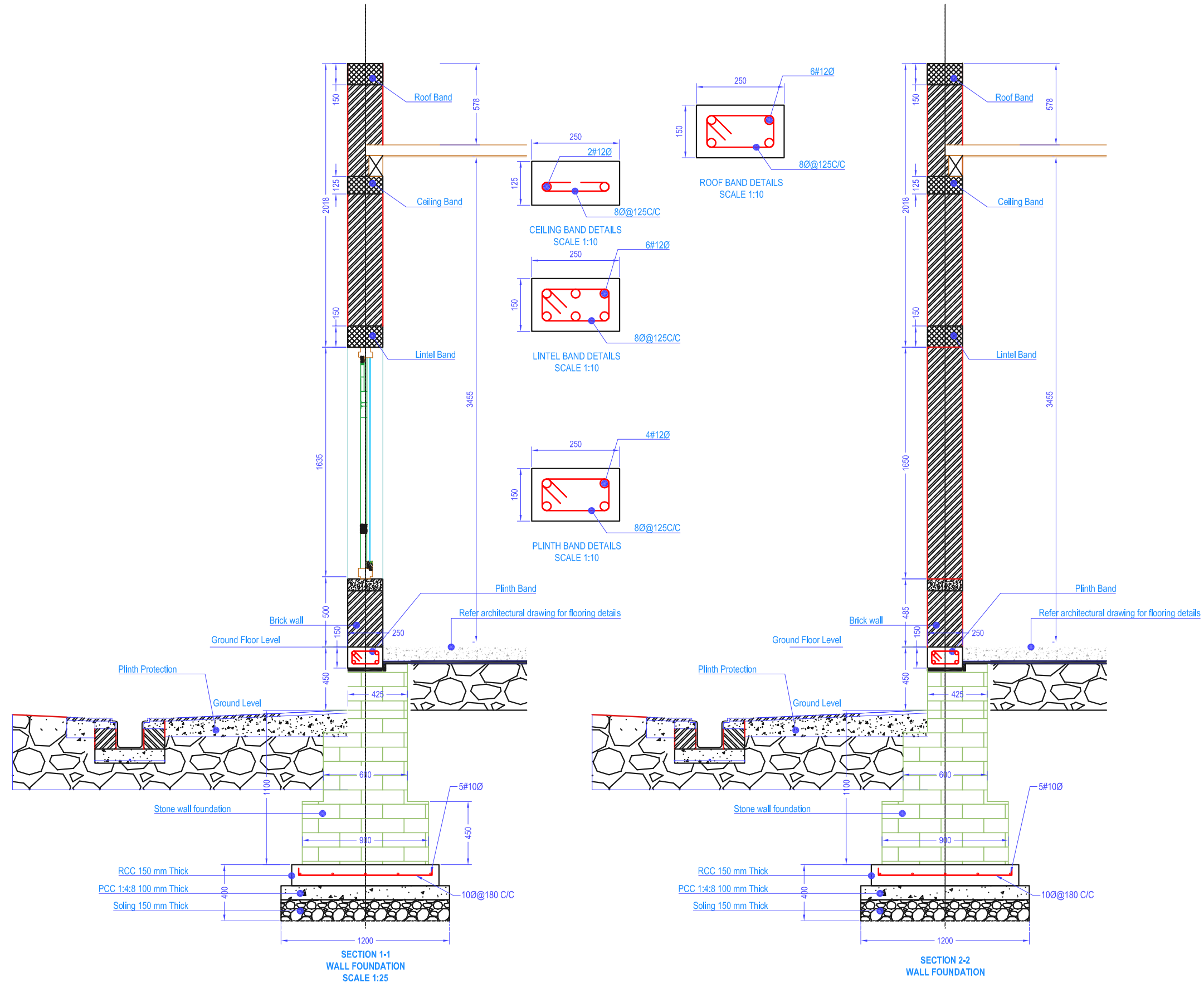
Drawing Number

STR - 200

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BHUTAN DOMESTIC AIRPORT DESIGN & SUPERVISION
GELEPHU AIRPORT SECURITY QUARTERS

No./Revision

No./Revision	Date	By

Drawing Title

Footling Details

Scale 1 : 30 @ A3

Date December 2016

Drawn By S Tobgay, P Dorji & A Pradhan

Drawing Number

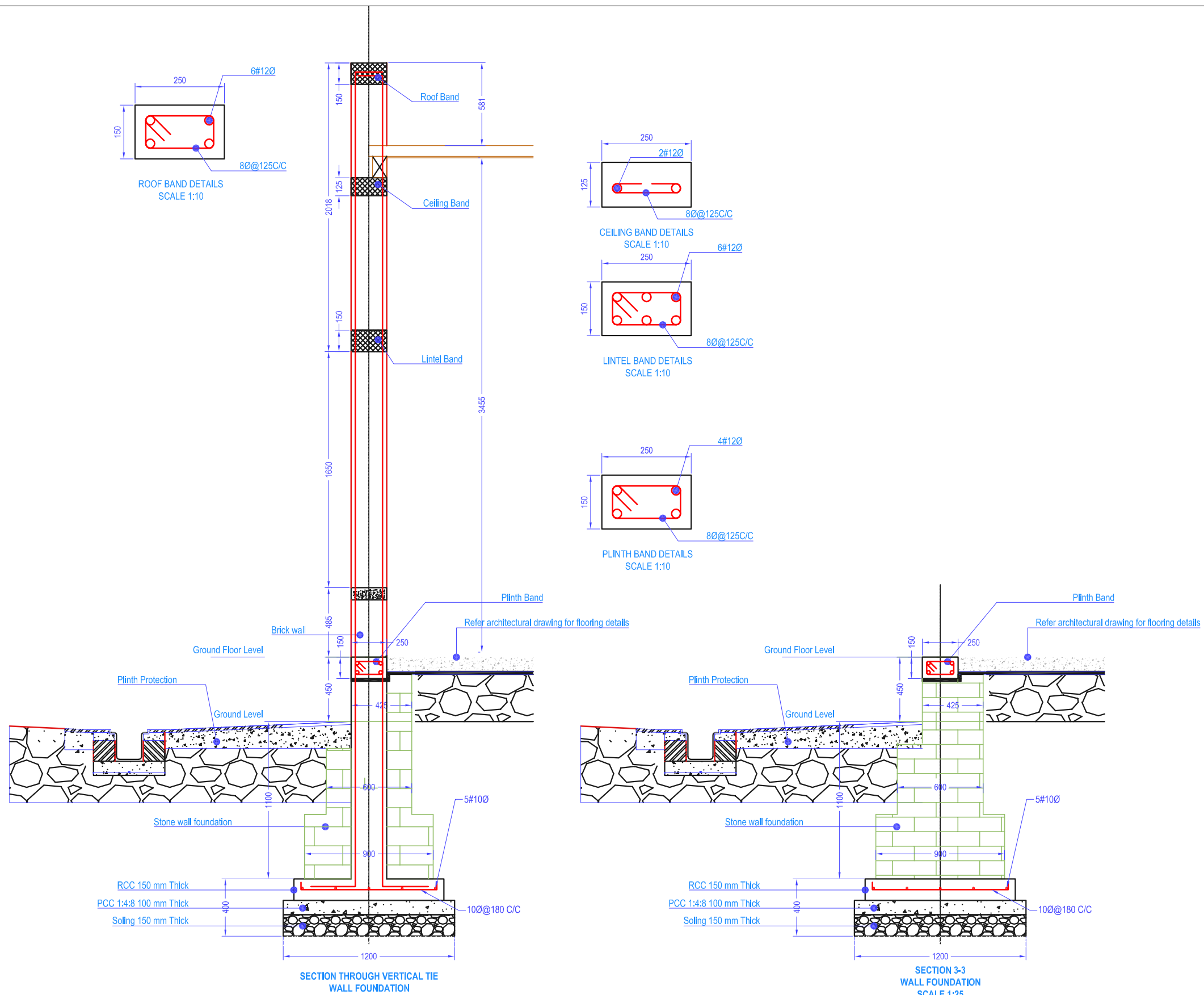
STR - 201

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Scale 1 : 30 @ A3

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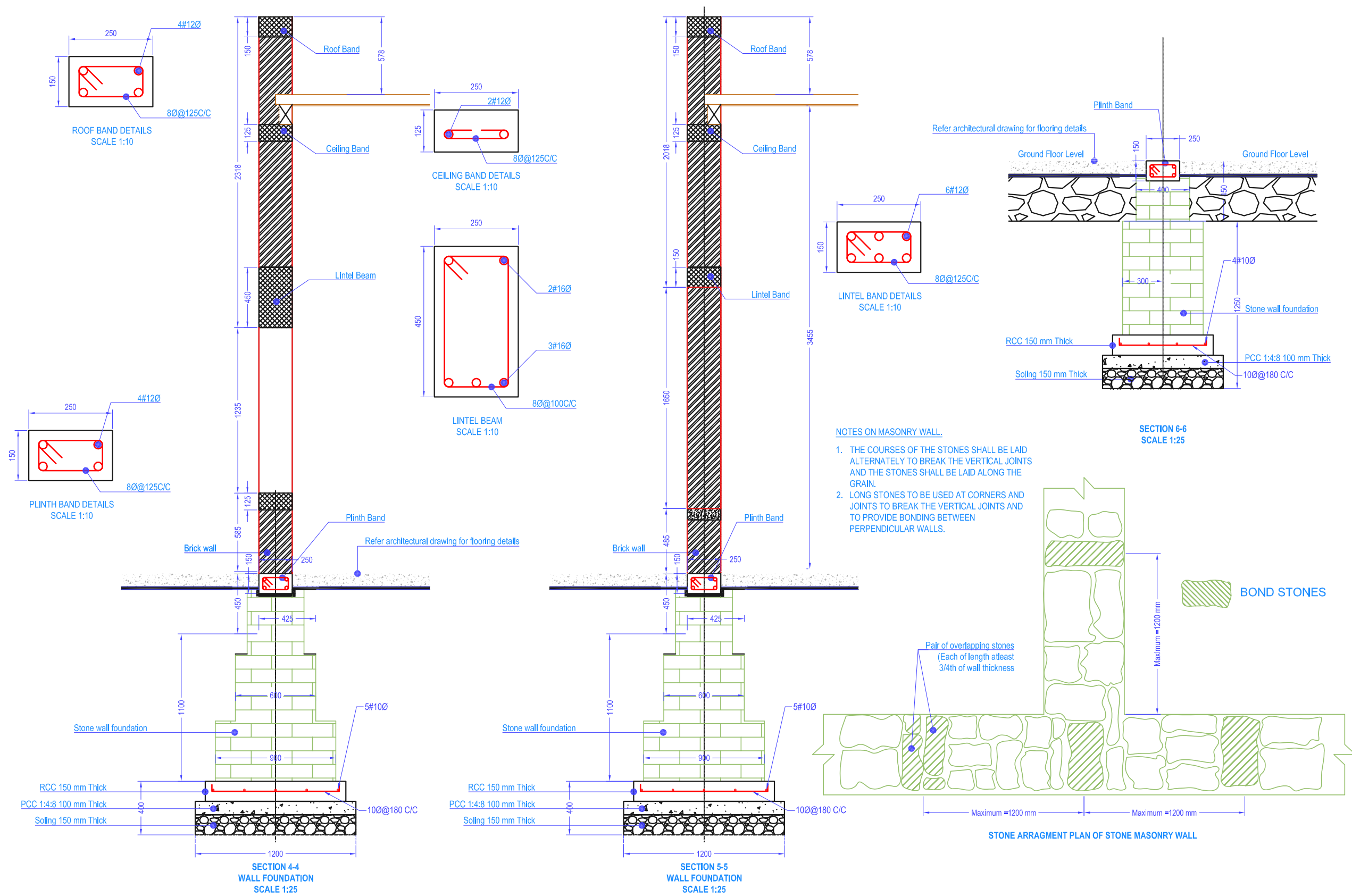
STR - 202

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Rev No.

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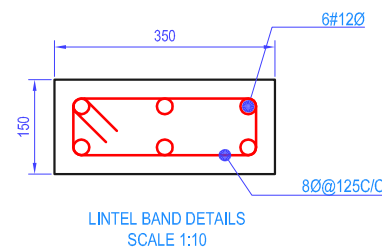
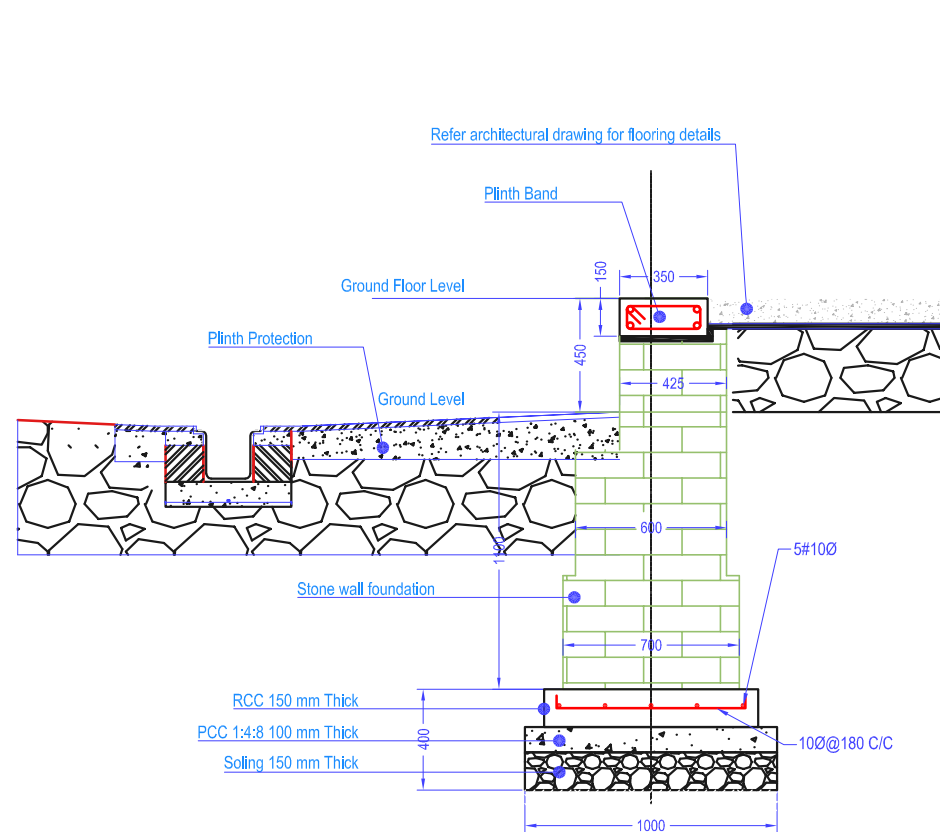
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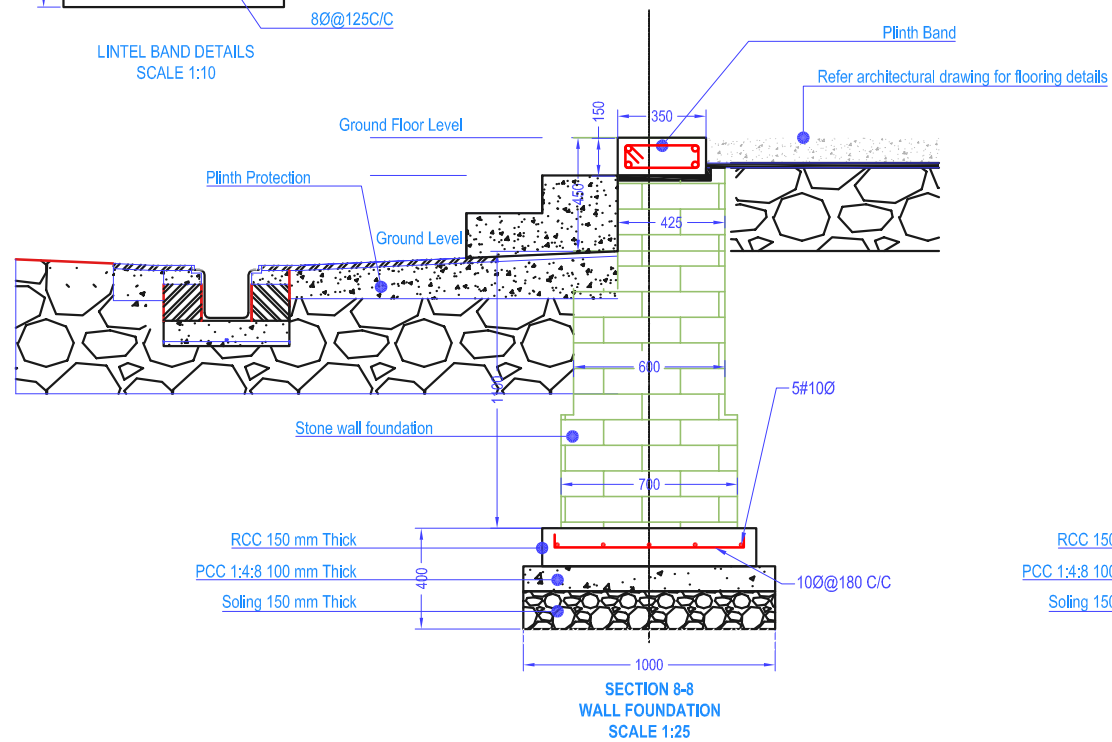
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BHUTAN DOMESTIC AIRPORT DESIGN & SUPERVISION
GELEPHU AIRPORT SECURITY QUATERS

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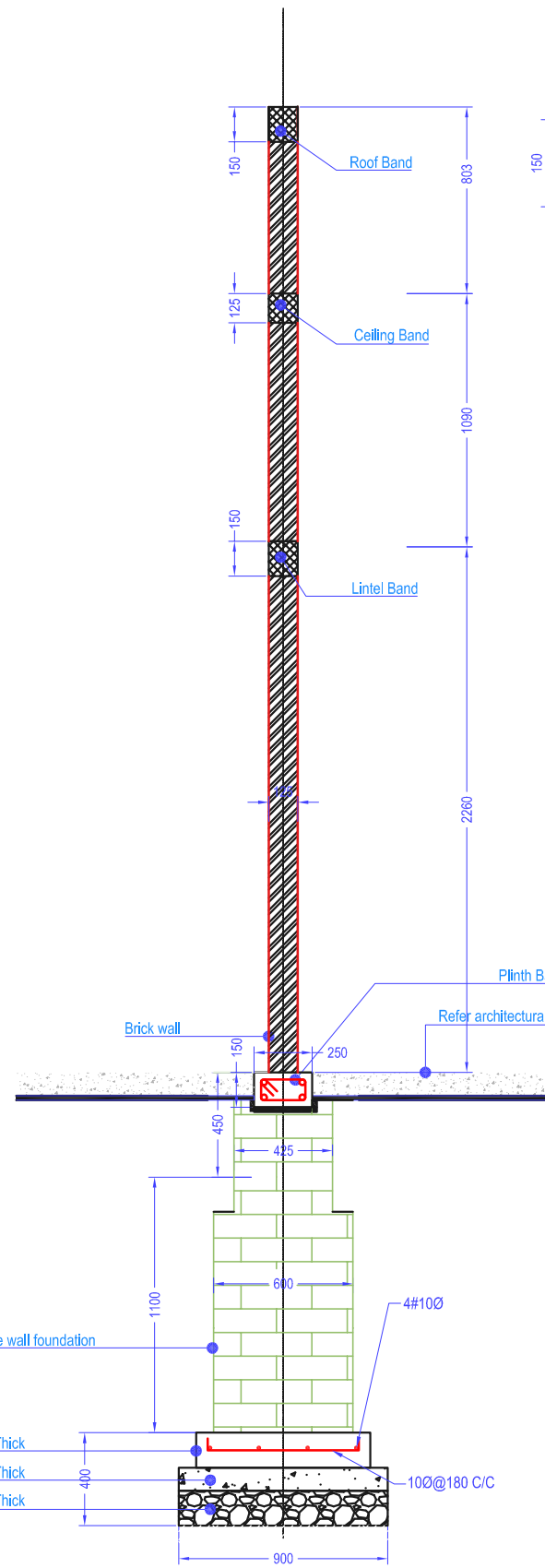
Drawing Title
Footing Details
Scale 1 : 30 @ A3
Date December 2016
Drawn By S Tobgay, P Dorji & A Pradhan
Drawing Number STR - 203
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Rev No. R0



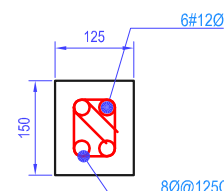
LINTEL BAND DETAILS
SCALE 1:10



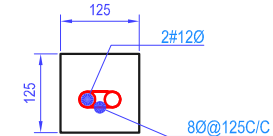
SECTION 8-8
WALL FOUNDATION
SCALE 1:25



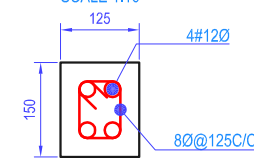
SECTION 9-9
WALL FOUNDATION
SCALE 1:25



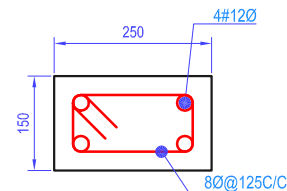
ROOF BAND
DETAILS
SCALE 1:10



CEILING BAND DETAILS
SCALE 1:10



LINTEL BAND DETAILS
SCALE 1:10



PLINTH BAND DETAILS
SCALE 1:10



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GELEPHU AIRPORT SECURITY QUATERS

No./Revision

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Drawing Title

Footings Details

Scale 1 : 30 @ A3

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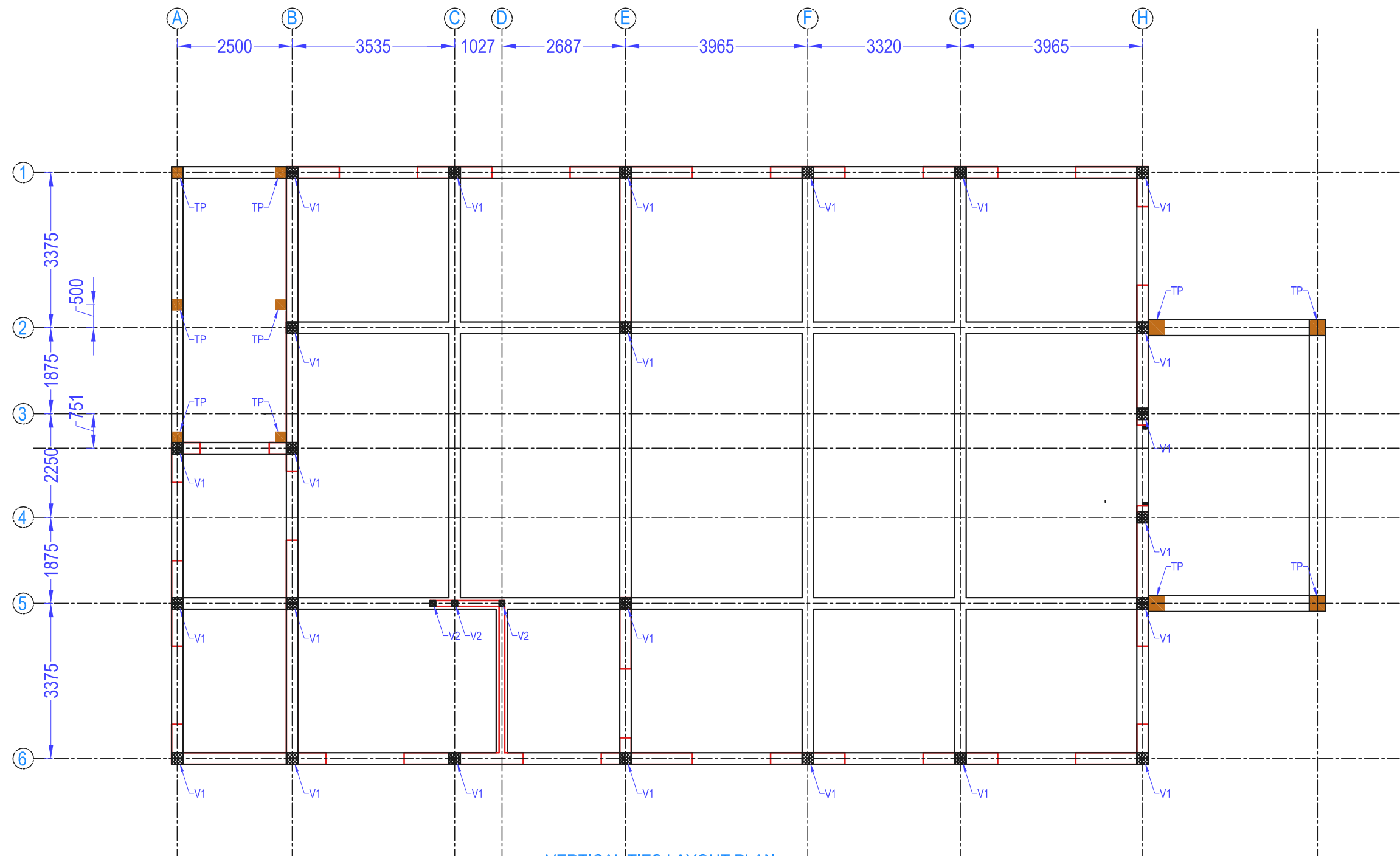
STR - 204

LEAPP Project Code

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VERTICAL TIES LAYOUT PLAN
SCALE 1 : 100



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GELEPHU AIRPORT SECURITY QUATERS

No. Revision

No.	Revision	Date	By

Drawing Title

Plan Showing Vertical Tie-Column Layout Plan

Scale 1 : 100 @ A3

Date December 2016

Drawn By S Tobgay, P Dorji & A Pradhan

Drawing Number

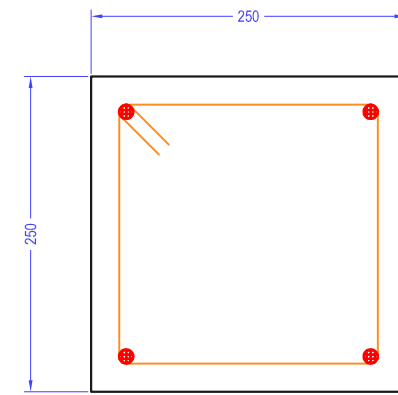
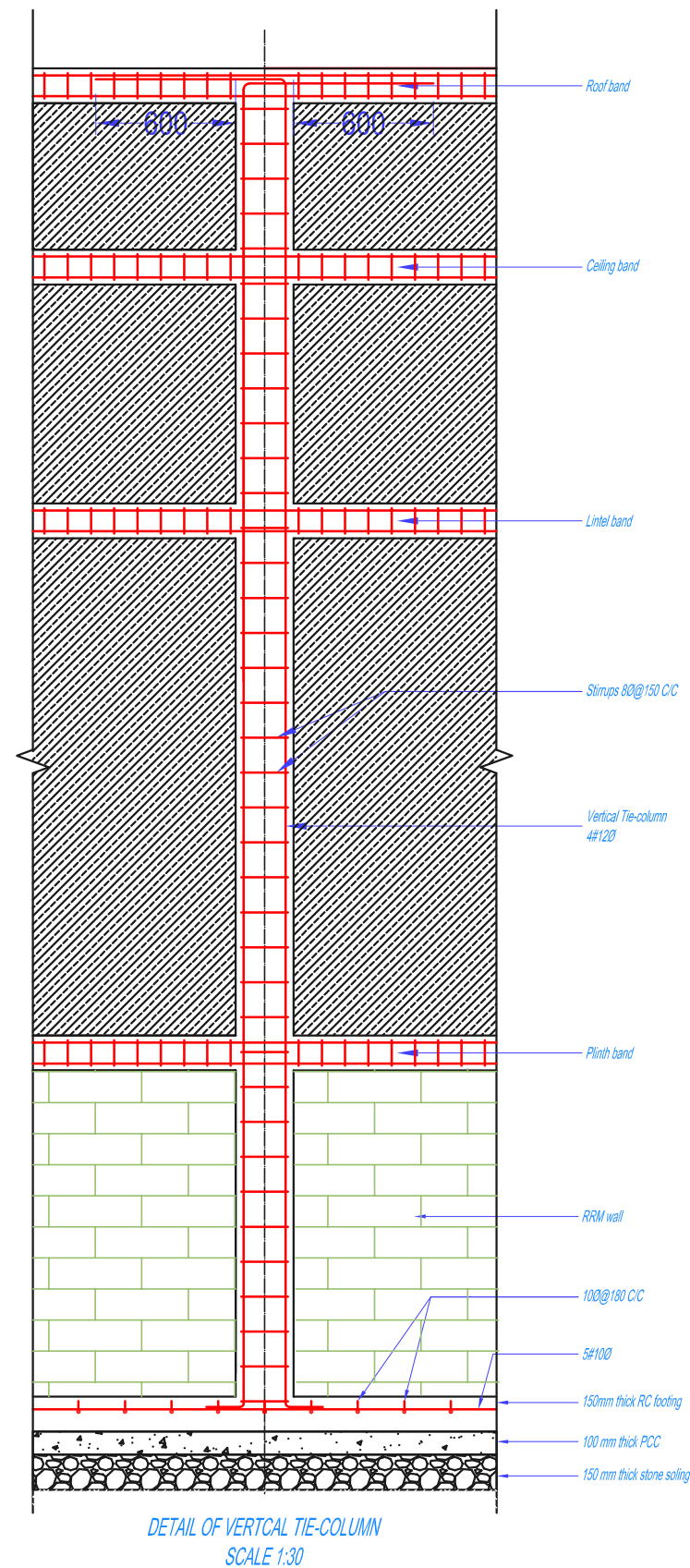
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LEAPP Project Code

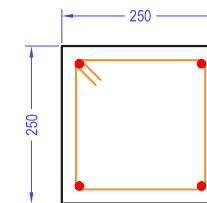
12246

Rev No.

R0



Vertical Tie-Column V1 Section
Scale 1:5



Vertical Tie-Column V2 Section
Scale 1:5

Construction Sequence

1. Laying/Placing of reinforcement bars
2. Brick Masonry work
3. Shuttering works
4. Concrete works



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Drawing Title

Vertical Tie-Column Details

Scale 1 : 30 @ A3

Date December 2016

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Drawing Number

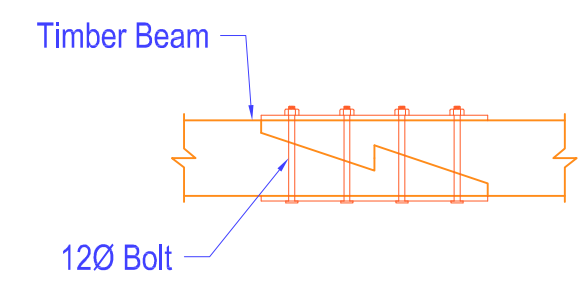
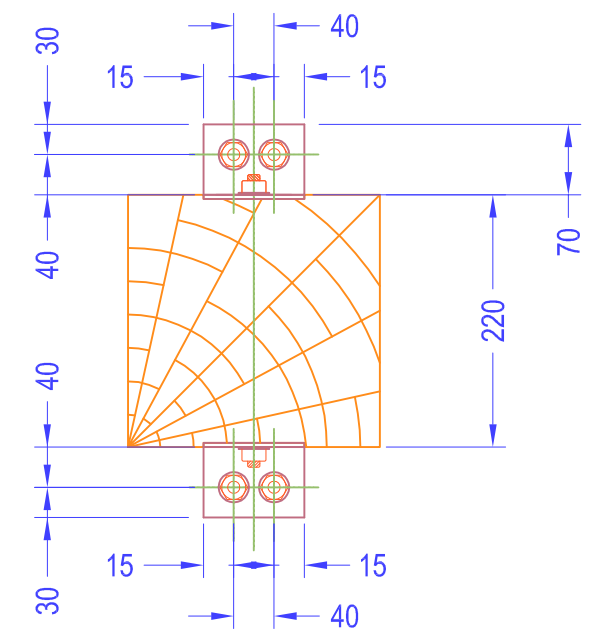
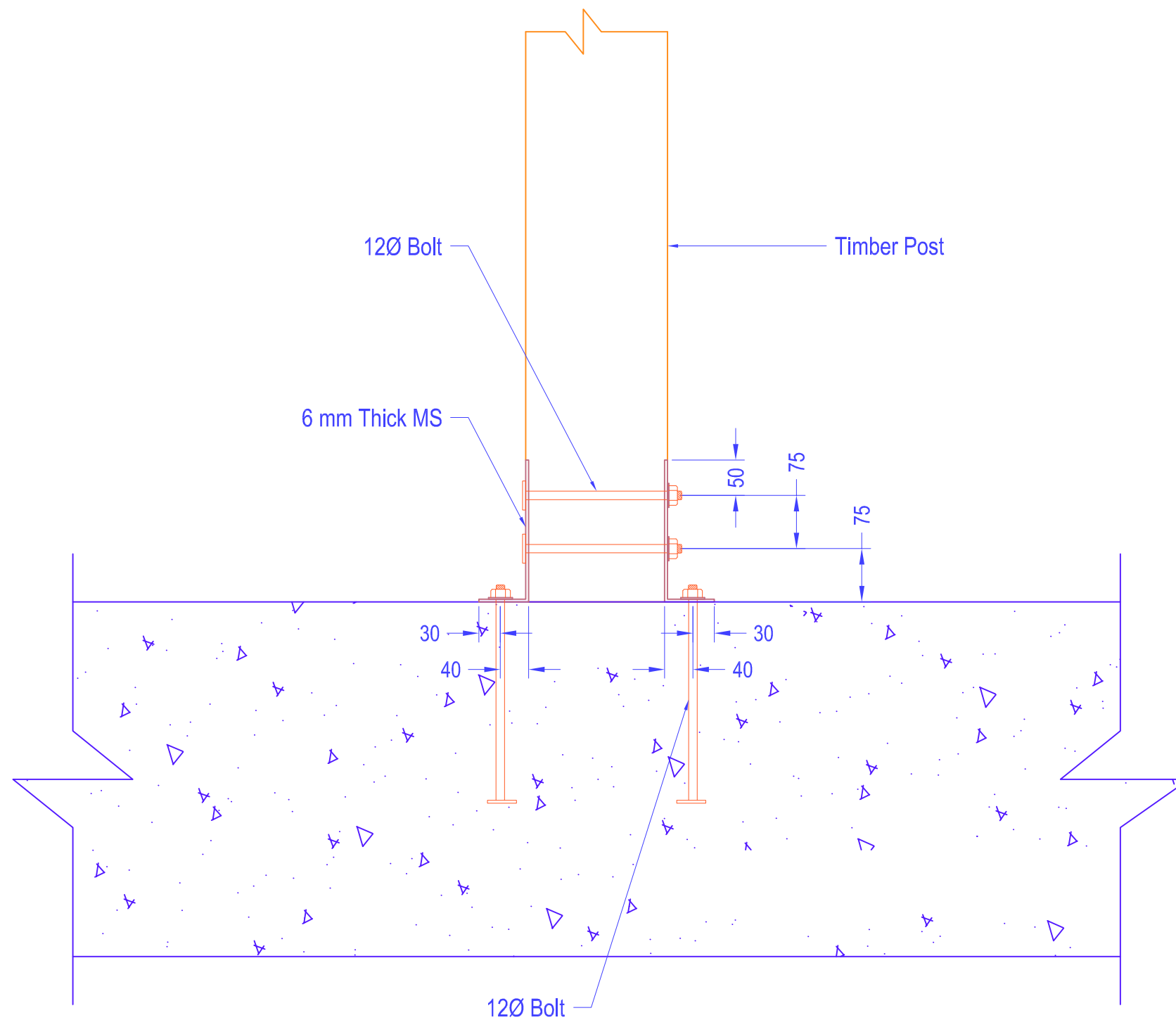
STR - 301

LEAPP Project Code

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TIMBER POST CONNECTION DETAILS
SCALE 1:15



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No.	Revision	Date	By

Drawing Title
Timber Post Connection Details

Scale 1 : 15 @ A3

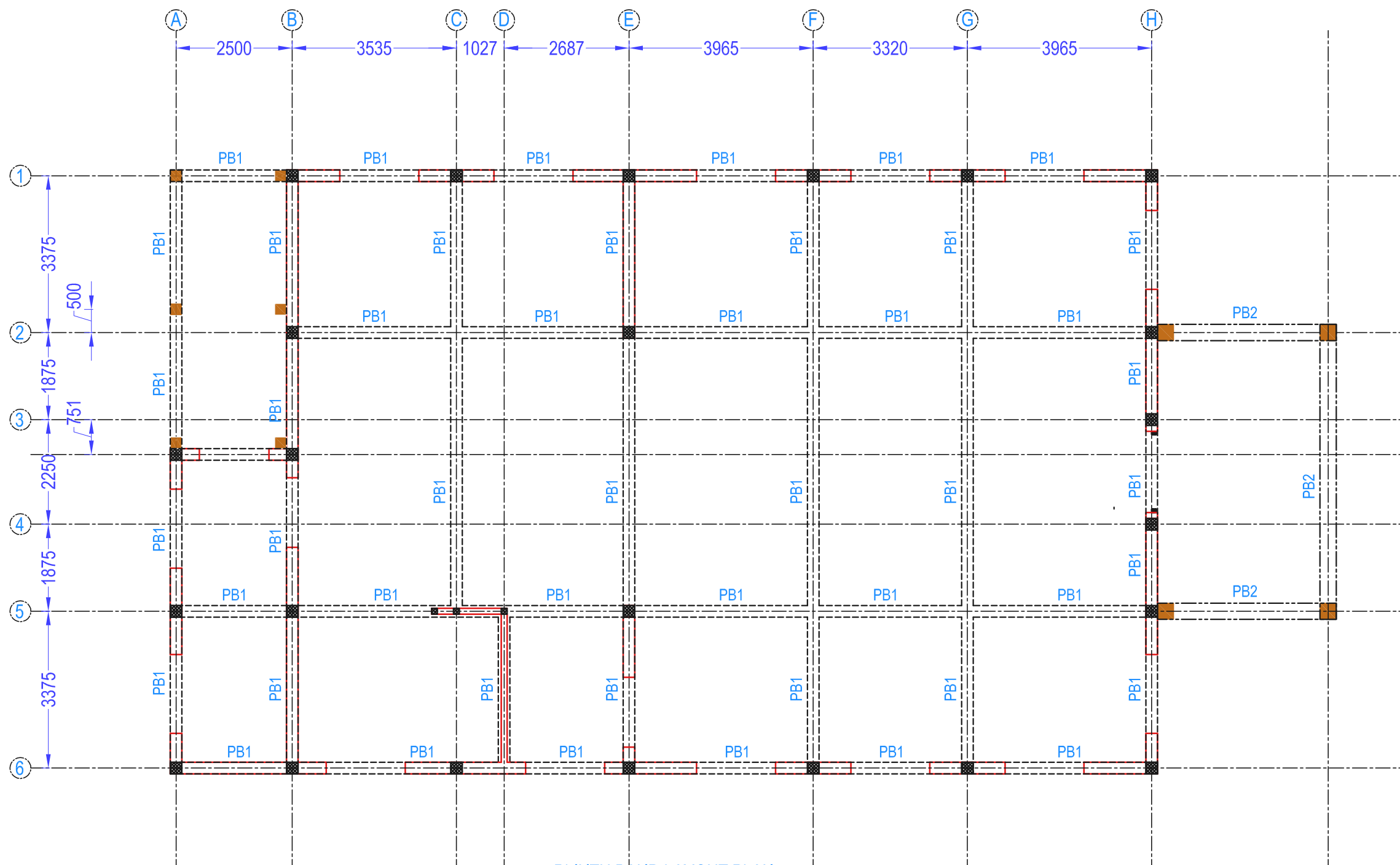
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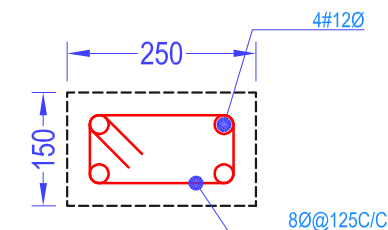
Drawing Number STR - 301

Rev No. R0

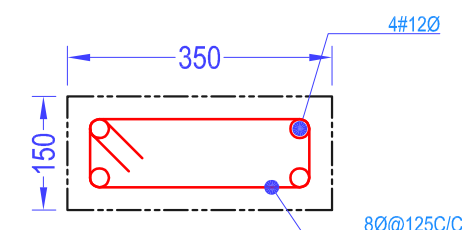
LEAPP Project Code 12246



PLINTH BAND LAYOUT PLAN
SCALE 1 : 100



PB1 SECTION
SCALE 1:10



PB2 SECTION
SCALE 1:10



ROYAL GOVERNMENT OF BHUTAN
DEPARTMENT OF CIVIL AVIATION

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Aviation Planners & Engineers

Leading Edge Aviation Planning Professionals

Civil Engineering Consultant

Gyaltshen Consultancy

Project Title

BHUTAN DOMESTIC AIRPORT DESIGN & SUPERVISION
GELEPHU AIRPORT SECURITY QUATERS

No. Revision

No.	Revision	Date	By

Drawing Title

Plan Showing Plinth Band Layout Plan & Details

Scale 1 : 100; 1 : 25 @ A3

Date December 2016

Drawn By S Tobgay, P Dorji & A Pradhan

Drawing Number

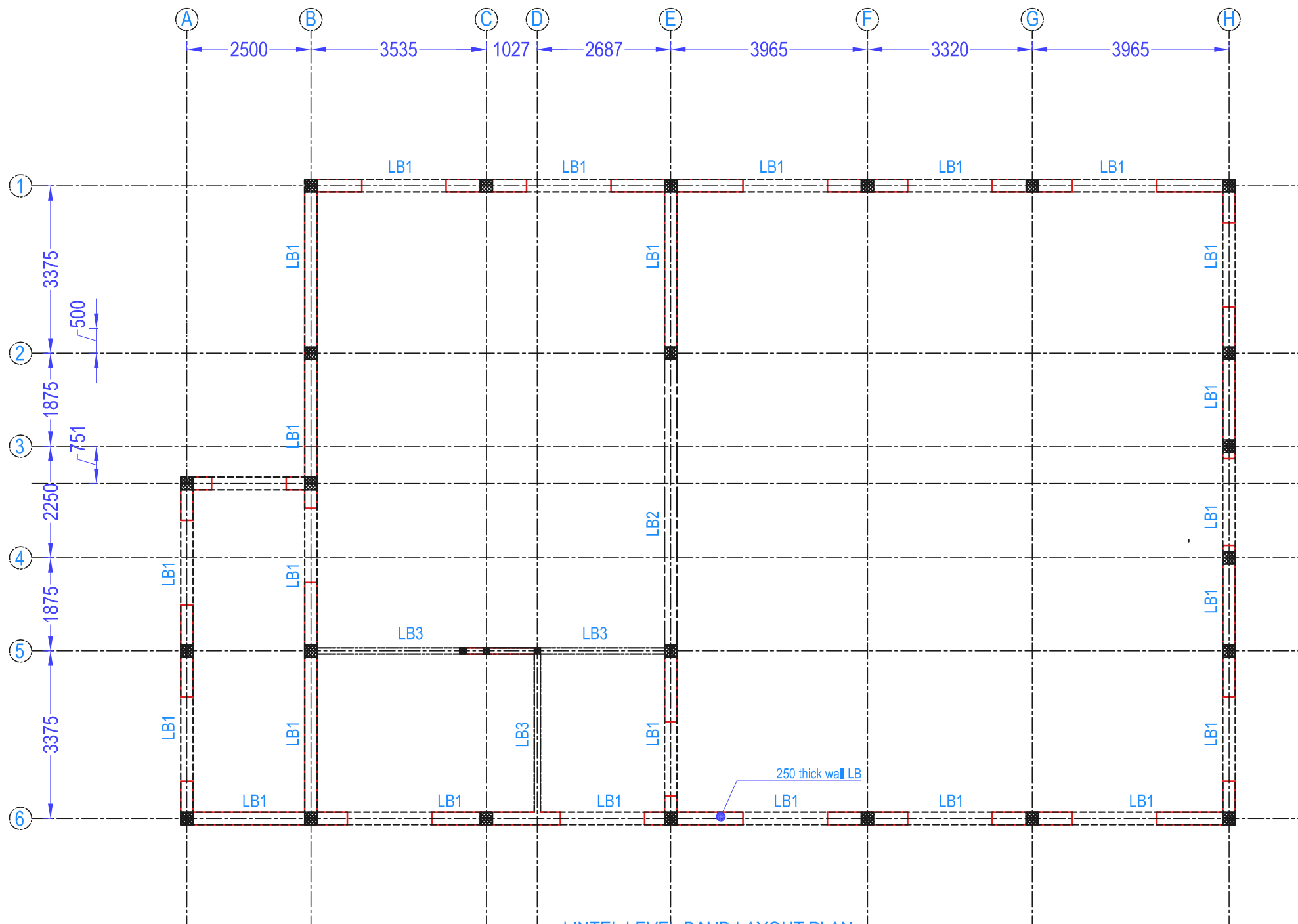
STR - 400

LEAPP Project Code

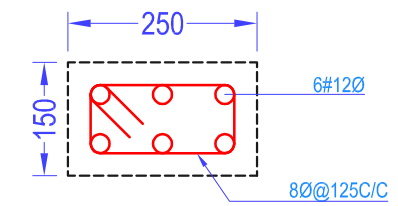
12246

Rev No.

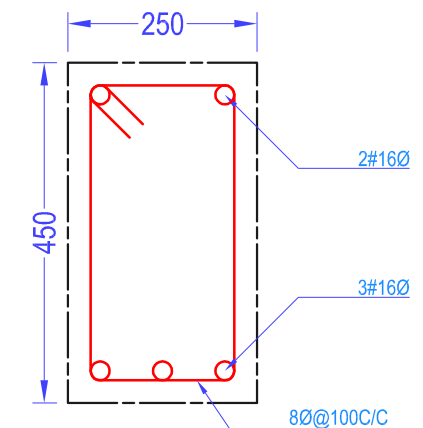
R0



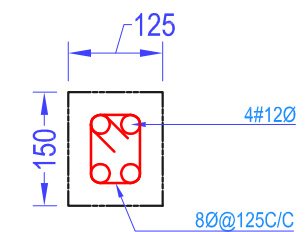
LINTEL LEVEL BAND LAYOUT PLAN
SCALE 1 : 100



SECTION LB1
SCALE 1:10



SECTION LB2
SCALE 1:10



SECTION LB3
SCALE 1:10



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Project Title

BHUTAN DOMESTIC AIRPORT DESIGN & SUPERVISION
GELEPHU AIRPORT SECURITY QUATERS

No./ Revision

No./ Revision	Date	By

Drawing Title

Plan Showing Lintel Level Band Layout Plan & Details

Scale 1 : 100; 1 : 25 @ A3

Date December 2016

Drawn By S Tobgay, P Dorji & A Pradhan

Drawing Number

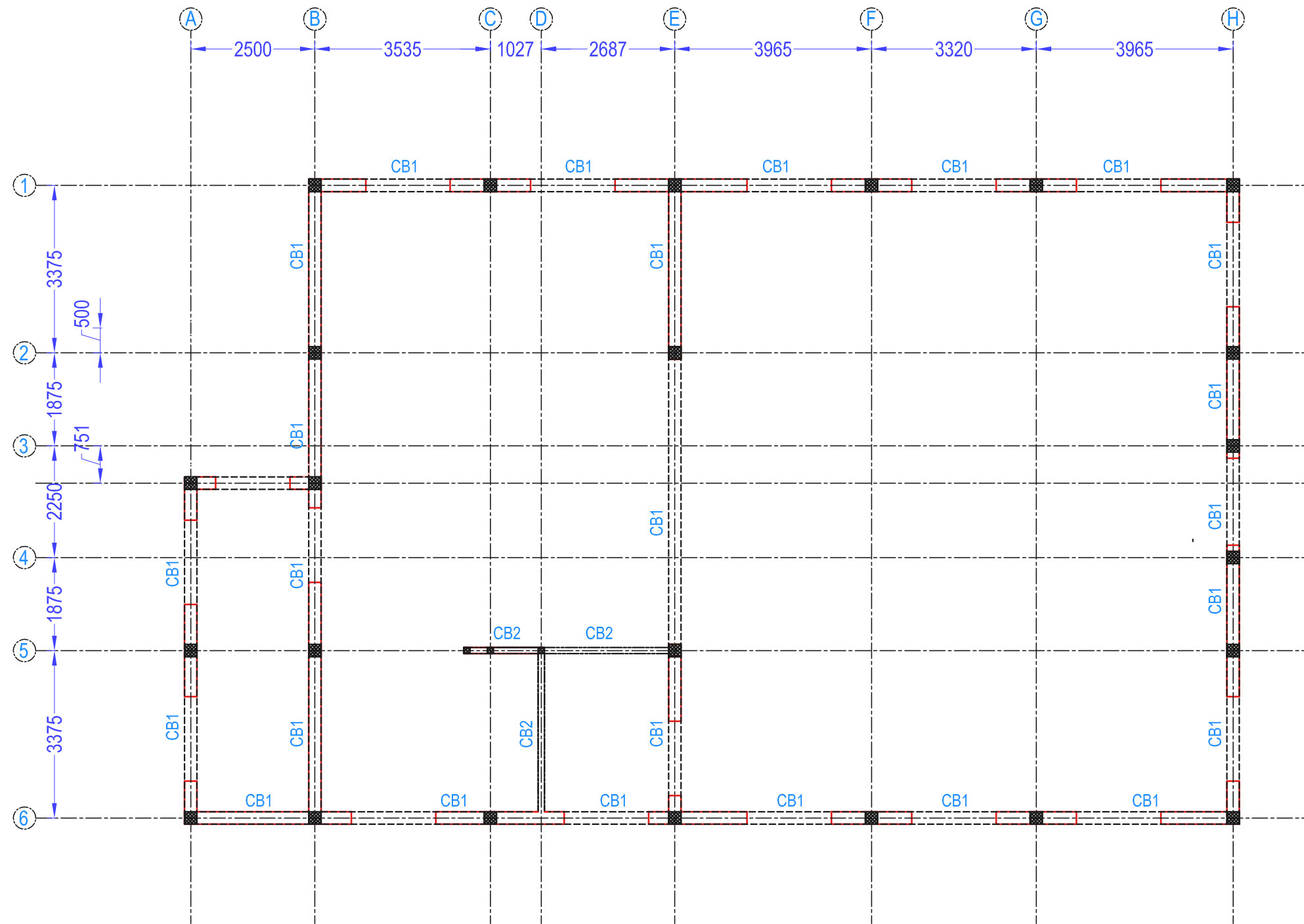
STR - 401

LEAPP Project Code

12246

Rev No.

R0



CEILING LEVEL BAND LAYOUT PLAN
SCALE 1 : 100



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BHUTAN DOMESTIC AIRPORT DESIGN & SUPERVISION
GELEPHU AIRPORT SECURITY QUATERS

No. Revision

No.	Revision	Date	By

Drawing Title

Plan Showing Ceiling Level Band Layout Plan & Details

Scale 1 : 100; 1 : 25 @ A3

Date December 2016

Drawn By S Tobgay, P Dorji & A Pradhan

Drawing Number

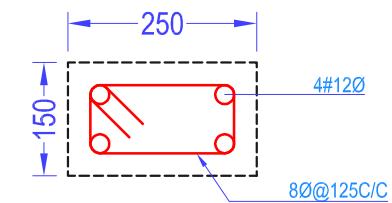
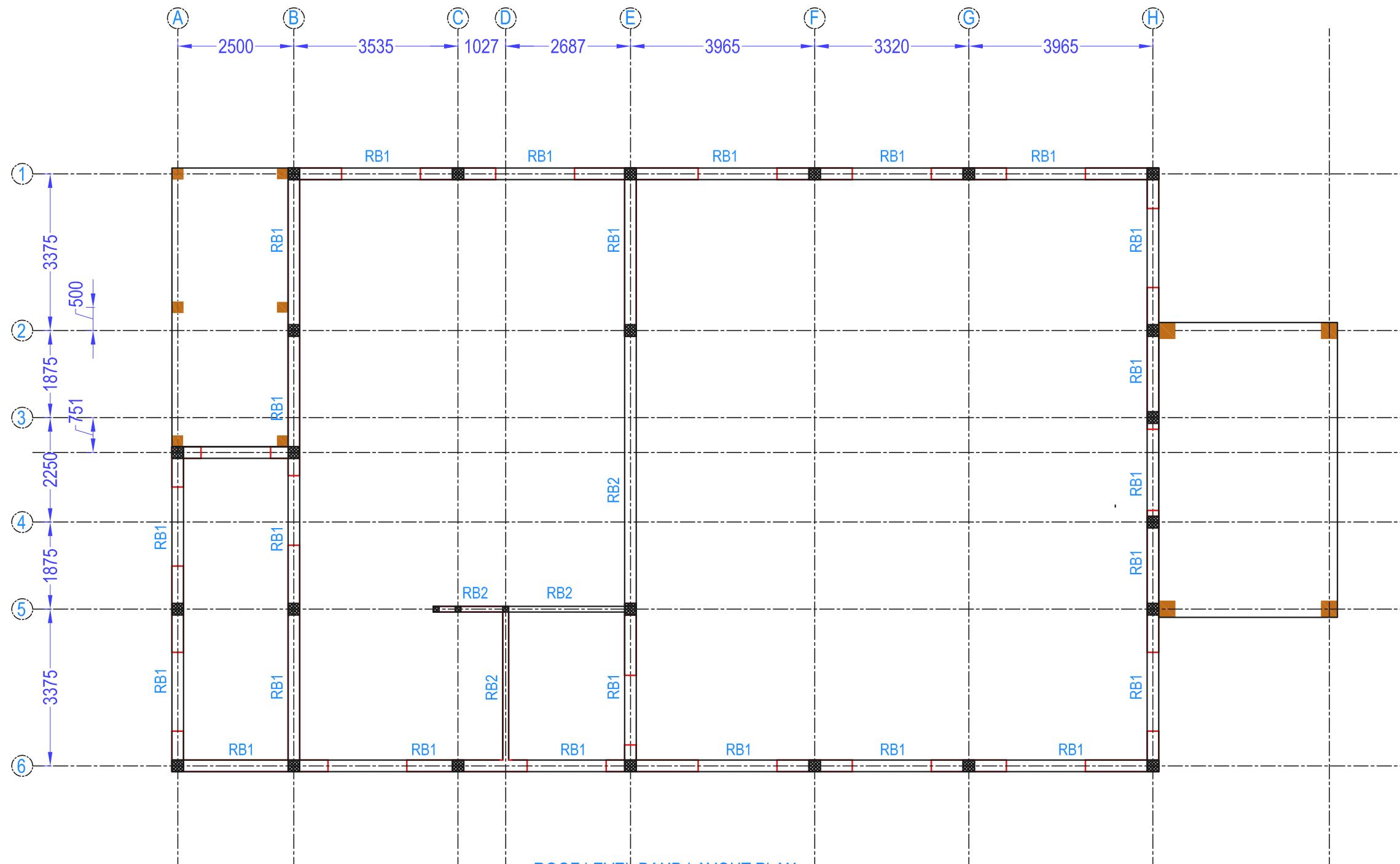
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LEAPP Project Code

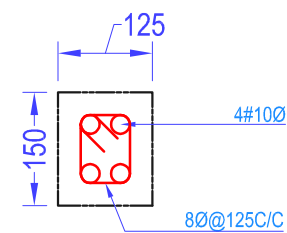
12246

Rev No.

R0



SECTION RB1
SCALE 1:10



SECTION RB2
SCALE 1:10

ROOF LEVEL BAND LAYOUT PLAN
SCALE 1 : 100



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Project Title

BHUTAN DOMESTIC AIRPORT DESIGN & SUPERVISION
GELEPHU AIRPORT SECURITY QUATERS

No. Revision

No.	Revision	Date	By

Drawing Title

Plan Showing Roof Band Layout Plan & Details

Scale 1 : 100; 1 : 25 @ A3

Date December 2016

Drawn By S Tobgay, P Dorji & A Pradhan

Drawing Number

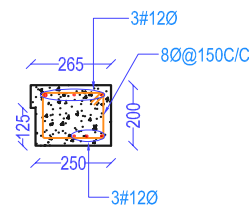
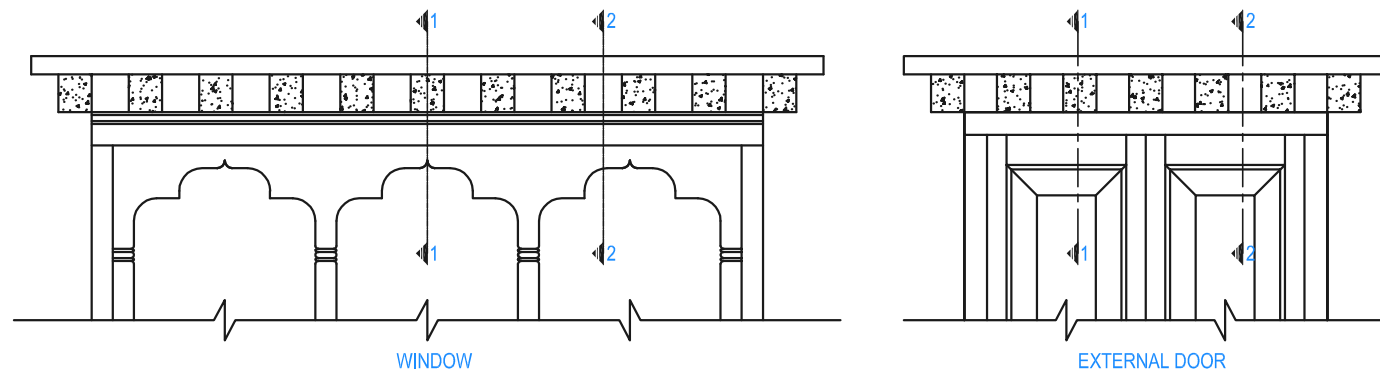
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LEAPP Project Code

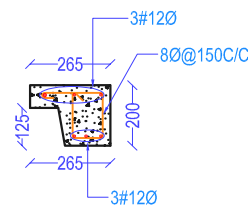
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Rev No.

R0

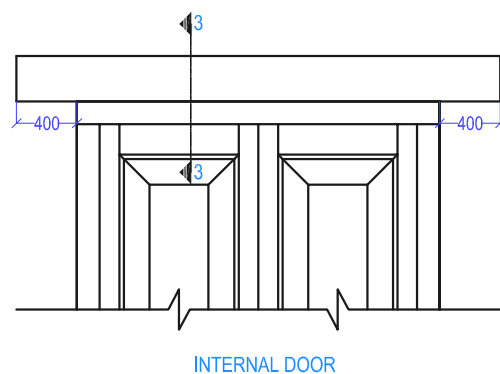


SECTION 1-1

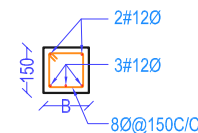


SECTION 2-2

NOTES:
THE EXTERNAL WALL WILL HAVE A BAND LINTEL
AND ALL THE INTERNAL WILL HAVE A CUT
LINTEL/LINTEL BEAM ABOVE THE OPENINGS.



INTERNAL DOOR



SECTION 3-3

LINTEL DETAILS
SCALE 1:25



ROYAL GOVERNMENT OF BHUTAN
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BHUTAN DOMESTIC AIRPORT DESIGN & SUPERVISION
GELEPHU AIRPORT SECURITY QUATERS

No. Revision

No.	Revision	Date	By

Drawing Title

Cornice Details

Scale 1 : 25 @ A3

Date December 2016

Drawn By S Tobgay, P Dorji & A Pradhan

Drawing Number

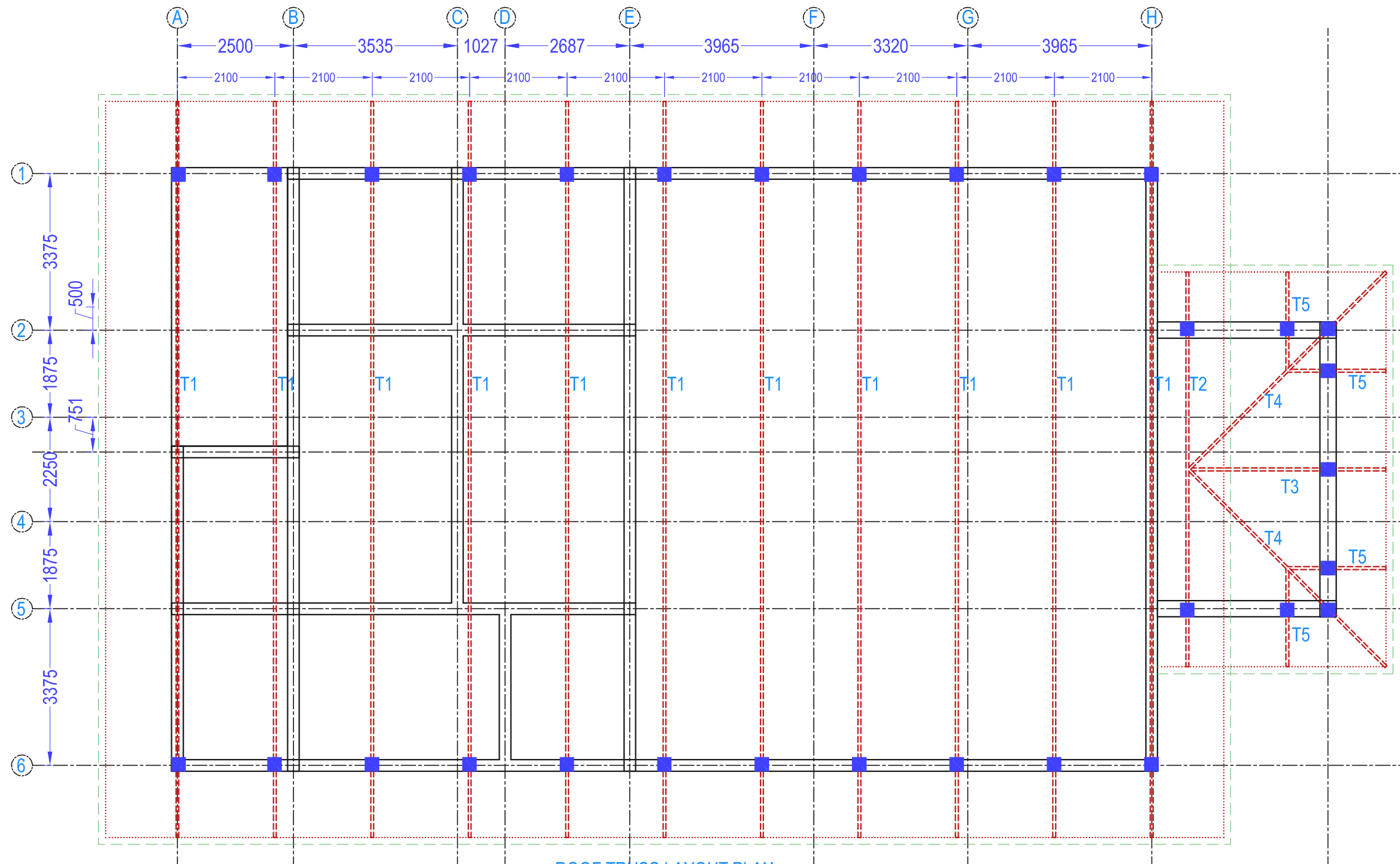
STR - 500

LEAPP Project Code

12246

Rev No.

R0



ROOF TRUSS LAYOUT PLAN
SCALE 1 : 100



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DEPARTMENT OF CIVIL AVIATION

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Project Title

BHUTAN DOMESTIC AIRPORT DESIGN & SUPERVISION
GELEPHU AIRPORT SECURITY QUATERS

No. Revision

No.	Revision	Date	By

Drawing Title

Plan Showing Roof Truss Layout Plan

Scale 1 : 100 @ A3

Date December 2016

Drawn By S Tobgay, P Dorji & A Pradhan

Drawing Number

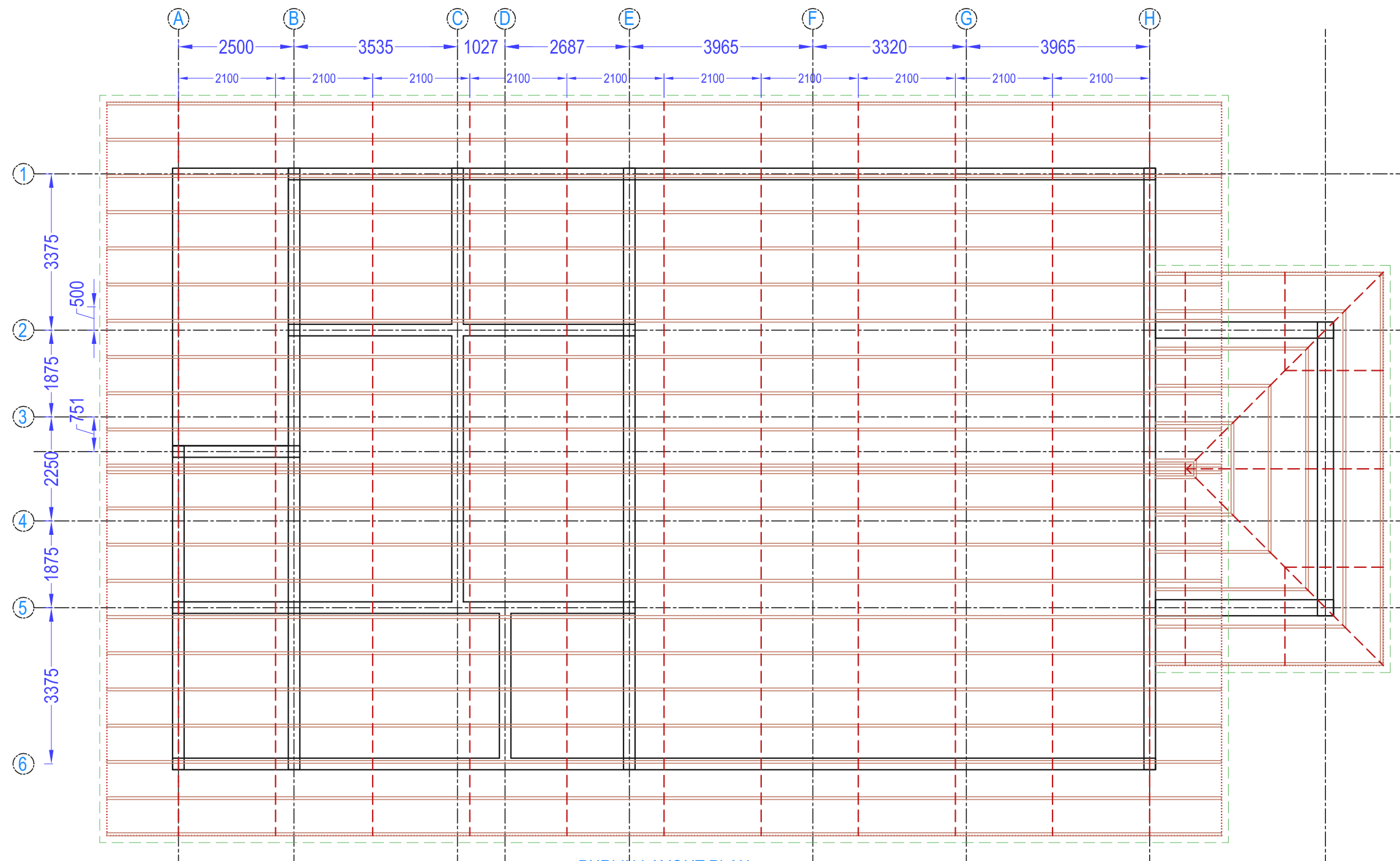
STR - 600

LEAPP Project Code

12246

Rev No.

R0



PURLIN LAYOUT PLAN
SCALE 1 : 100



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GELEPHU AIRPORT SECURITY QUATERS

No. Revision

No.	Revision	Date	By

Drawing Title

Plan Showing Purlin Layout Plan

Scale 1 : 100 @ A3

Date December 2016

Drawn By S Tobgay, P Dorji & A Pradhan

Drawing Number

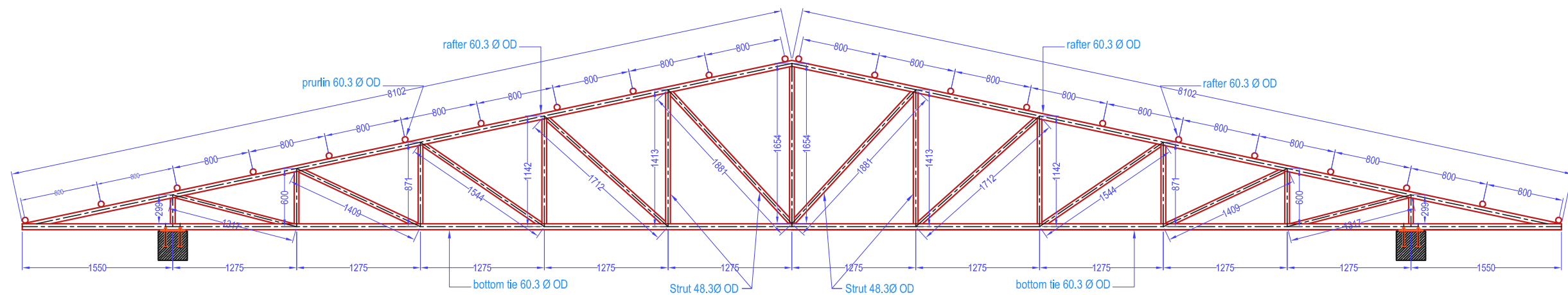
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LEAPP Project Code

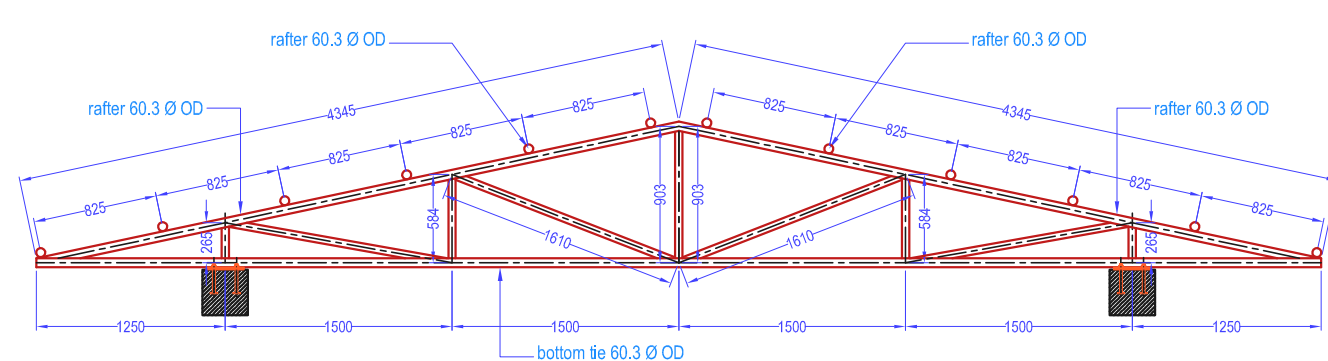
12246

Rev No.

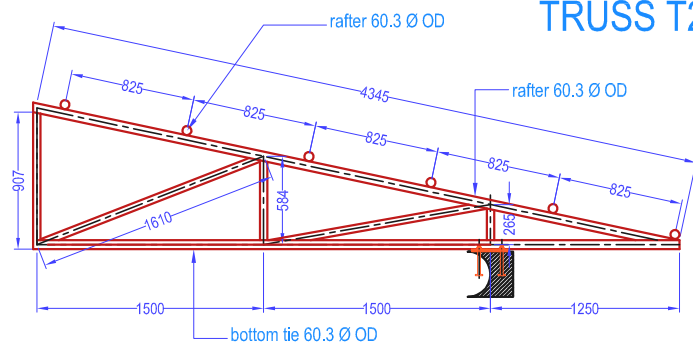
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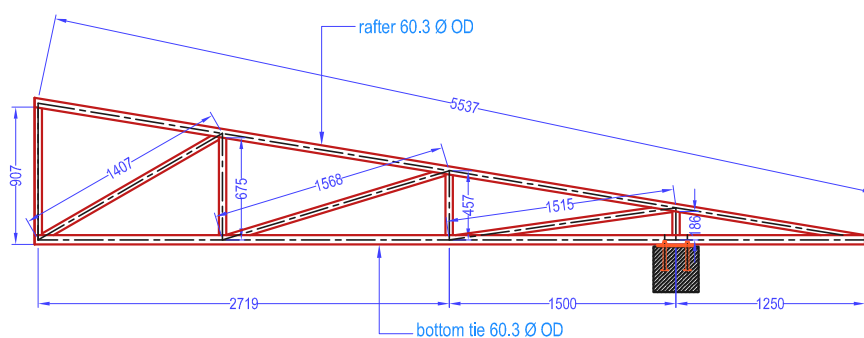
TRUSS T1



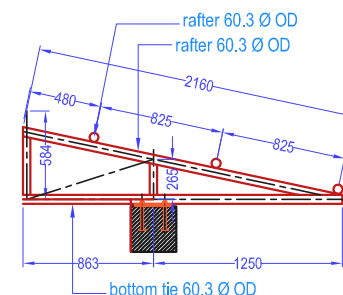
TRUSS T2



TRUSS T3



TRUSS T4



TRUSS T5

SCHEDULE OF TRUSS MEMBERS

SL.No	MEMBER	NOMINAL BORE (mm)	OUTSIDE DIAMETER (mm)	THICKNESS (mm)	CLASS	WEIGHT (Kg/m)
1	MAIN TIE	50	60.3	3.6	MEDIUM	5.07
2	RAFTER	50	60.3	3.6	MEDIUM	5.07
3	STRUT	40	48.3	3.2	MEDIUM	3.59
4	PURLIN	40	48.3	3.2	MEDIUM	3.59

PURLINS SHALL BE PROVIDED @ 850 MM C/C

NOTE

1. REFER ARCHITECTURAL DRAWINGS FOR RCC PROP HEIGHT.
2. FABRICATION OF TRUSS MUST BE DONE AT SITE.
3. WELDING SHALL CONFIRM TO IS 816-1989 AND THICKNESS SHALL BE 3 MM.
4. ALL STEEL TUBE SECTIONS AND PLATES SHALL CONFIRM TO IS 1161-1968 & IS 2062-1984.
5. MS NUTS & BOLTS SHALL CONFIRM TO IS 1363-1984 AND WASHERS SHALL CONFIRM TO IS 5374-1975.



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BHUTAN DOMESTIC AIRPORT DESIGN & SUPERVISION
GELEPHU AIRPORT SECURITY QUATERS

No./Revision

No./Revision	Date	By

Drawing Title

Roof Truss Details

Scale 1 : 50 @ A3

Date December 2016

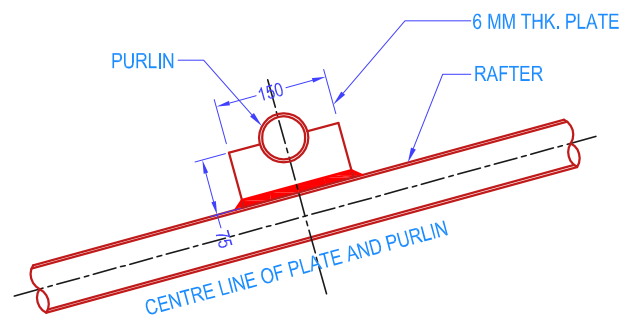
Drawn By S Tobgay, P Dorji & A Pradhan

Drawing Number

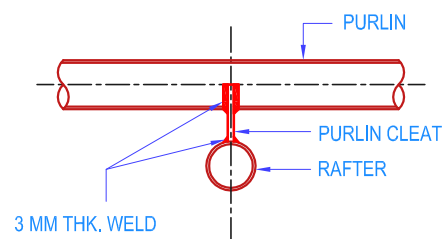
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LEAPP Project Code
12246

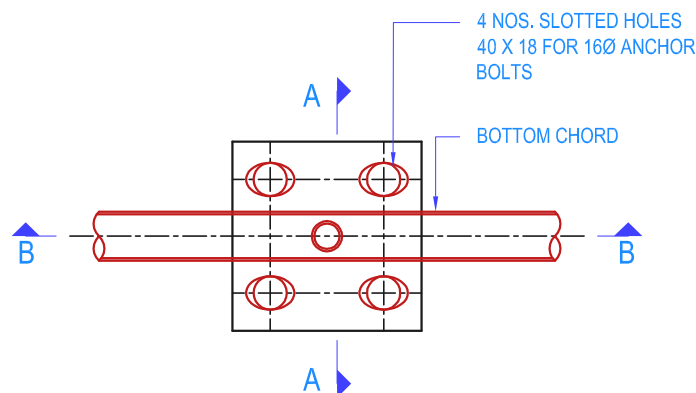
Rev No.
R0



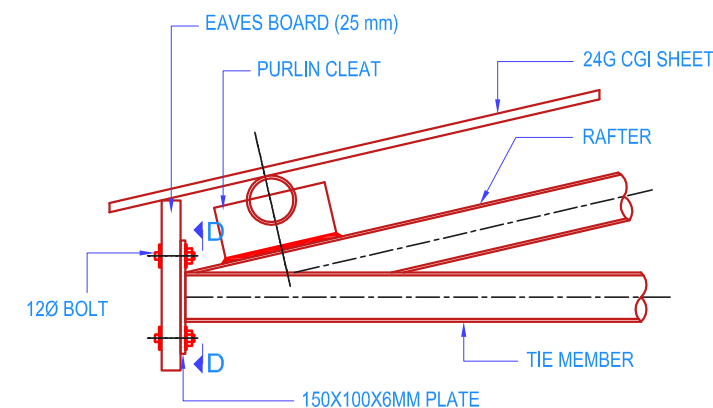
PURLIN CLEAT FIXING DETAILS



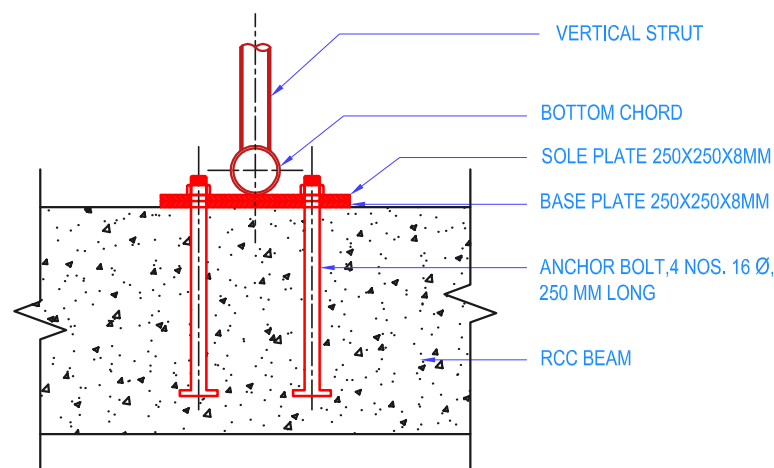
CONNECTION OF PURLIN TO RAFTER



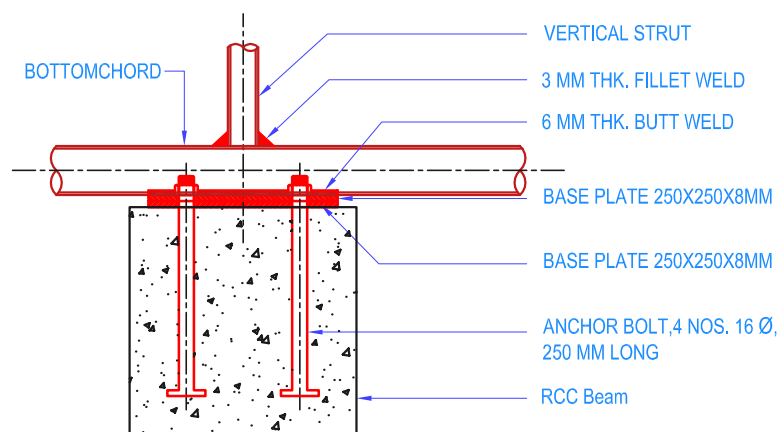
TRUSS HOLD-DOWN DETAIL



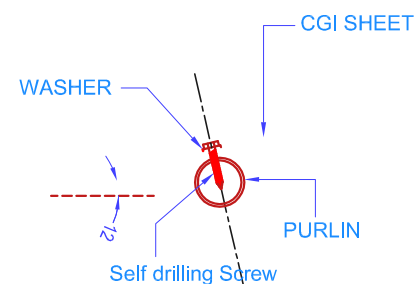
EAVES BOARD CONNECTION DETAILS



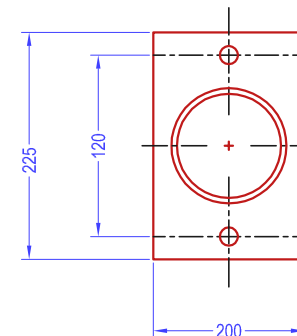
SECTION A-A



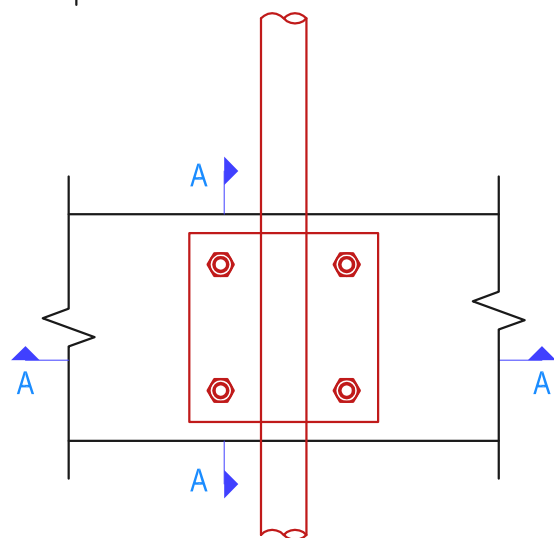
SECTION B-B



CONNECTION OF CGI SHEET TO PURLIN



SECTION D-D



PLAN OF TRUSS CONNECTION WITH BASE PLATE

NOTE:-

1. All members of truss joint shall be in welding.
2. Fabrication of truss must be done at site.
3. Welding shall confirm to IS 816-1989 and thickness shall be 6mm.
4. All Steel Tube Sections and Plates shall confirm to IS 1161-1968 & IS 2062-1984.
5. All MS Nuts & Bolts shall confirm to IS 1363-1984 and Washers shall confirm to IS 5374-1975.
6. All the trusses will be supported on the RCC beam.
7. Brick wall will be laid above the peripheral roof beam enclosed between the RCC columns upto roof truss band.



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Project Title

BHUTAN DOMESTIC AIRPORT DESIGN & SUPERVISION
GELEPHU AIRPORT SECURITY QUATERS

No. Revision

No.	Revision	Date	By

Drawing Title

Roof Truss Connection Details

Scale 1 : 10 @ A3

Date December 2016

Drawn By S Tobgay, P Dorji & A Pradhan

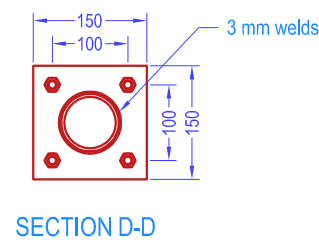
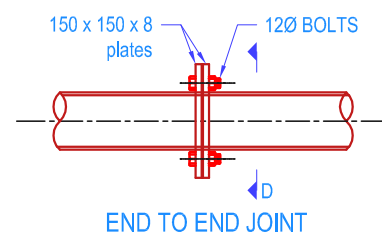
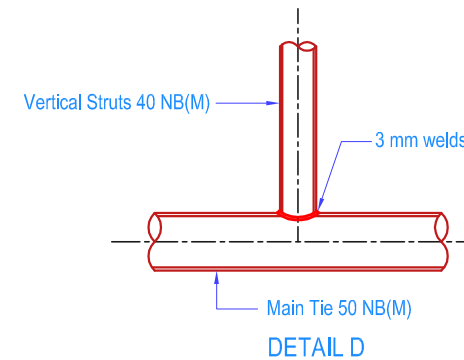
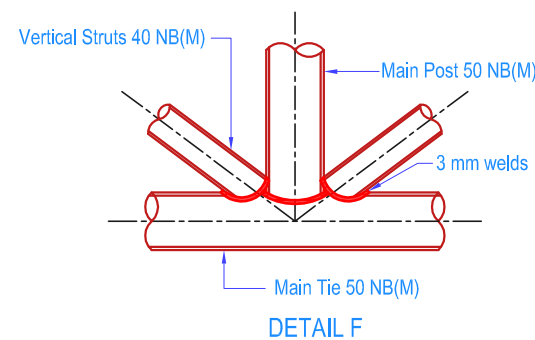
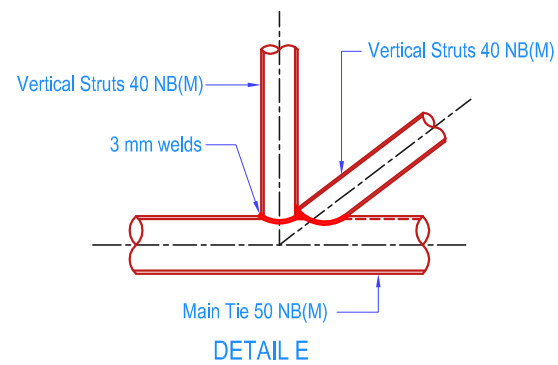
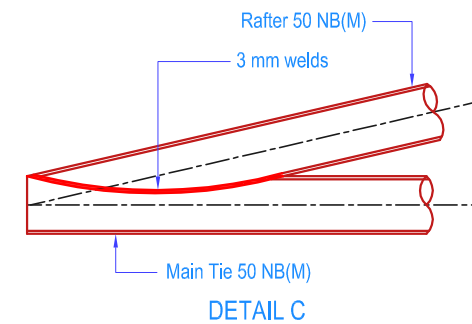
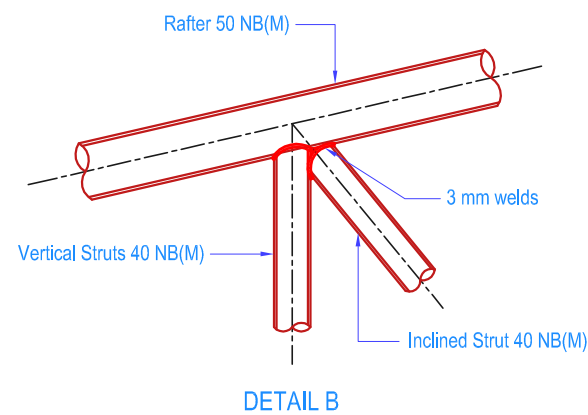
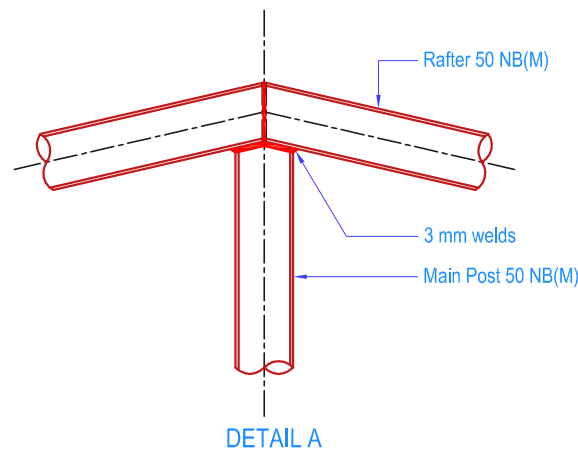
Drawing Number

STR - 603

LEAPP Project Code
12246

Rev No.

R0



NOTE:

1. All dimensions are in mm unless stated otherwise.
2. Connection details shown are for different types of joints and to be taken same for similar joints.
3. All members of truss joint shall be in welding.
4. Fabrication of truss must be done at site.
5. Welding shall confirm to IS 816-1989 and thickness shall be 6mm.
6. All Steel Tube Sections and Plates shall confirm to IS 1161-1968 & IS 2062-1984.
7. All MS Nuts & Bolts shall confirm to IS 1363-1984 and Washers shall confirm to IS 5374-1975.



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GELEPHU AIRPORT SECURITY QUATERS

No. Revision

No.	Revision	Date	By

Drawing Title

Roof Truss Connection Details

Scale 1 : 10 @ A3

Date December 2016

Drawn By S Tobgay, P Dorji & A Pradhan

Drawing Number

STR - 604

LEAPP Project Code
12246

Rev No.

R0