



DESIGN FOR THE CONSTRUCTION  
OF  
SINGLE STOREY PRE-FABRICATED COMBINED WASH BLOCK AT CHAR AREA

## CASE-03

UNDER  
4TH PRIMARY EDUCATION DEVELOPMENT PROGRAM (PEDP-4)

**Note:**

**Foundation : Single Storey**  
**Structure : Single Storied Pre-Fabricated WB**  
**Foundation Type : Isolated Footing**

## STRUCTURAL DESIGN CRITERIA & MINIMUM REQUIREMENTS

### 1. GENERAL

- DESIGN METHOD USED IS USD ACCORDING TO BANGLADESH NATIONAL BUILDING CODE (BNBC) 2012, UBC 1997 AND ACI 1995.
- ALL STRUCTURAL DRAWINGS SHALL BE READ IN CONJUNCTION WITH RELEVANT ARCHITECTURAL DRAWINGS IF ANY.
- FOLLOW BNBC-2012 FOR SPECIFICATIONS / STRUCTURAL REQUIREMENTS NOT MENTIONED IN THE DRAWINGS OR IN THIS NOTE SHEET.
- ANY DETAILS NOT SHOWN IN THE DRAWING SHOULD BE DONE ACCORDING TO ACI DETAILING MANUAL - 1994
- BASIC WIND SPEED = 210 km/hr
- SEISMIC ZONE - 2
- OTHER LOADS AS PER BNBC 2012

### 2. FOUNDATION

- THE WASH BLOCK HAS BEEN DESIGNED FOR SINGLE-STORIED STRUCTURE TO BE CONSTRUCTED AT THE PRIMARY SCHOOLS LOCATED IN THE CHAR AREA OF BANGLADESH.
- IN CASE OF BLACK/SWAMPY SOIL FOUND DURING EXCAVATION, THESE BLACK/SWAMPY SOIL REQUIRES TO BE REMOVED.  
FOUNDATION TYPE IS - ISOLATED FOOTING AS DEEMED SUITABLE  
DESIGN SHOULD BE MODIFIED BASED ON ANY CHANGE IN SOIL BEARING CAPACITY

### 3. CONCRETE

- TYPE :  
CONCRETE COMPRESSIVE STRENGTH CONSIDERED AS FOLLOWS :  
1) CONCRETE FOR FOOTING, GRADE BEAM, COLUMN = 19 MPa  
2) CONCRETE FOR FLOOR BEAM, SLAB & OTHER ELEMENT = 19 MPa  
3) MIX PROPORTION : CEMENT: SAND: BRICK CHIPS (1:2:4)
- MINIMUM CYLINDER STRENGTH :  
BASED ON CYLINDER TEST OF DIAMETER  $D = 150\text{mm}$  & HEIGHT = 300mm  
1) 28TH DAYS STRENGTH FOR FOUNDATION, GRADE BEAM, COLUMN = 19 MPa  
FOR FLOOR BEAM, SLAB & OTHER R.C.C MEMBERS = 19 MPa
- CURING OF R.C.C WORK :  
1) CURING TIME MINIMUM 28 DAYS  
2) METHOD OF CURING :  
\* HORIZONTAL SURFACE - BY PONDING OF WATER  
\* OTHER SURFACES - BY WRAPPING MOIST JUTE FABRIC AND SPRINKLING WATER BY HOSE PIPE FREQUENTLY.

### 4. CEMENT

PORTRAND CEMENT CONFORMING TO BDS EN-197-1- CEM1, 52.5N (52.5MPa) / ASTM-C 150 TYPE – I

### 5. CONCRETE AGGREGATE

- FINE AGGREGATES : 50% MIXTURE OF FINE SAND OF F.M 1.20 AND COARSE SAND OF F.M 2.20 (Min.)
- COARSE AGGREGATES : 20 MM DOWNGRADED PICKED JHAMA BRICK CHIPS

### 6. WATER

POTABLE WATER TO BE USED IN CONCRETE MIX

### 7. STEEL REINFORCEMENT

- COLUMN & BEAM REINFORCEMENTS ARE OF 400 MPa DEFORMED BAR MADE FROM STANDARD BILLET STEEL.
- SLAB & STAIR REINFORCEMENTS ARE OF 400 MPa DEFORMED BAR
- MINIMUM YIELD STRENGTH OF STEEL  $f_y = 400\text{ MPa}$  BUT NOT GREATER THAN 450 MPa SHALL CONFORM TO ONE OF THE FOLLOWING SPECIFICATIONS: i) BDS 1313:1991, ii) ASTM A615M
- THE FOLLOWING TESTS FOR REINFORCING BARS FROM RANDOM SAMPLES SHALL BE CONDUCTED AT BUET/OTHERS AS PER BDS 1313:1991 AND TEST RESULT SHOULD BE SUBMITTED TO THE OFFICE OF THE EXECUTIVE ENGINEER & PROJECT OFFICE FOR CHECKING AND RECORD:
  - TENSILE STRENGTH TEST
  - PERCENTAGE ELONGATION TEST
  - BEND/REBEND TEST
- REBAR TEST RESULT SHOULD CONTAIN THE FOLLOWING INFORMATION UNLESS NOTED OTHERWISE
  - YIELD STRENGTH ( $f_y$ ), TENSILE STRENGTH ( $f_t$ ) & RATIO OF  $f_t$  AND  $f_y$
  - MINIMUM ELONGATION AFTER FRACTURE
  - MINIMUM TOTAL ELONGATION AT MAXIMUM FORCE

### 8. LAP LENGTH

UNLESS OTHERWISE MENTIONED IN THE DRAWINGS, LAP LENGTH OF BARS SHALL BE :

BAR DIA (mm)	TENSION (INCH)	COMPRESSION (INCH)
10Ø	375 (15")	300 (12")
12Ø	400 (18")	375 (15")
16Ø	600 (24")	450 (18")
20Ø	750 (30")	600 (24")
22Ø	825 (33")	675 (27")
25Ø	900 (36")	750 (30")

### 9. HOOKS OF REBAR

- FOR ALL REBAR : PROVIDE 90° STANDARD HOOKS (L-BENT) IF NOT SHOWN IN THE DRAWINGS.

### 10. SPACER BARS

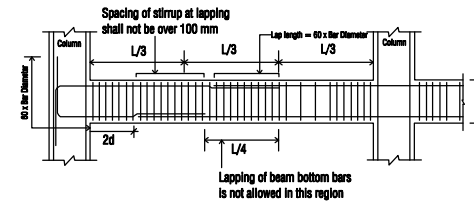
TO SUPPORT SECOND LAYER BARS IN BEAMS USE 16Ø SPACER BARS @ 3'-0" C/C WHERE REQUIRED.

### 11. CHAIRS

USE CHAIRS OF NECESSARY DIMENSION MADE OF 10Ø/12Ø BAR TO SUPPORT TOP BARS OF SLAB OR FOOTING @ 3'-0" C/C.

### 12. LAP LOCATION

- FOR BEAM BOTTOM BAR, LAP SHOULD NOT BE PROVIDED AT MIDDLE THIRD ZONE OF THE SPAN
- FOR BEAM TOP BAR, LAP SHOULD BE PROVIDED AT MIDDLE THIRD ZONE OF THE SPAN
- NOT MORE THAN 50% OF THE BARS SHALL BE SPLICED AT ONE PLACE
- LAP SPLICES ARE TO BE CONFINED BY HOOPS WITH MAXIMUM SPACING OR PITCH OF  $d/4$  OR 4" WHERE  $d$  IS THE EFFECTIVE DEPTH OF BEAM



### 13. DEVELOPMENT LENGTH

ALL BEAM AND SLAB REBARS SHOULD BE EXTENDED INTO THE SUPPORT UPTO DEVELOPMENT LENGTH.

### 14. ADMIXTURE

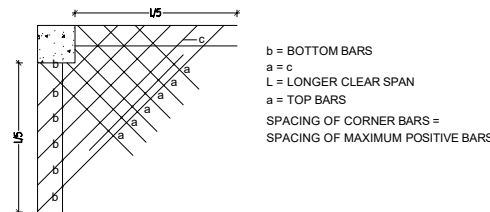
AS PER DIRECTION & APPROVAL OF THE ENGINEER IN CHARGE

### 15. WATER STOPPER

9" WIDE PVC WATER STOPPER TO BE USED AT ALL CONSTRUCTION JOINTS BELOW GROUND IN WATER TANK WALL IF NEEDED

### 16. CORNER REINFORCEMENT (CR)

CORNER REINFORCEMENT FOR BEAM SUPPORTED 2-WAY SLABS ARE AS FOLLOWS:



### 17. CONCRETE CLEAR COVER FOR REINFORCING BARS

Member	Location/Condition	Clear Cover	Sketch
Foundation	Side	2.0"	
	Bottom	2.0"	
Column	Above F.G.L	* 2.0"	
	Below F.G.L	* 2.0"	
Grade Beam	top	** 1.5"	
	bottom, side	** 2.0"	
Floor Beam	top, side	** 1.5"	
	bottom	** 1.5"	
Slab and Stair	Top and bottom	1.0"	
Wall	Exterior	2.0"	
	Interior	1.5"	
Water tank	Water face	2.0"	
	Other face	2.0"	

\* From tie  
\*\* From stirrups

### 18. MAXIMUM BARS IN BEAMS IN SINGLE LAYER

MAXIMUM NUMBER OF BARS AS A SINGLE LAYER IN BEAM STEM SHALL BE AS PER ACI DETAILING MANUAL 1994.

### 19. MINIMUM BAR SPACING OF COLUMN

#### LONGITUDINAL BARS:

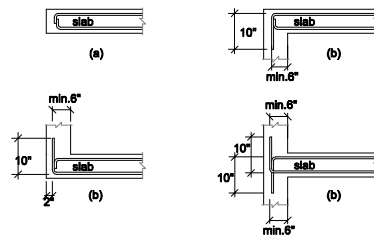
CLEAR DISTANCE BETWEEN LONGITUDINAL BARS SHALL NOT BE LESS THAN 1.5 TIMES BAR DIAMETER, 1.5 TIMES OF THE MAXIMUM SIZE OF COARSE AGGREGATE NOR 1.5".

## STRUCTURAL DESIGN CRITERIA & MINIMUM REQUIREMENT

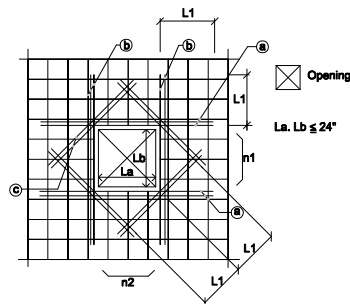
### 20. SLAB END REINFORCING DETAILS

a) FREE END OF SLAB INCAPABLE OF EMBEDDING STEEL BAR IN BEAM/WALL SHOULD HAVE REBAR BENDED

b) OTHERS



### 21. REINFORCEMENT DETAILS FOR SLAB OPENINGS



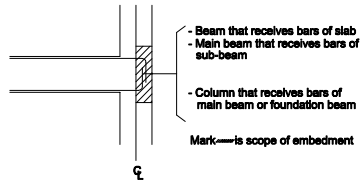
n1, n2 : The number of bars which are cut off for opening

- Ⓐ The number of extra bars > n1/2 (top and bottom bars)
- Ⓑ The number of extra bars > n2/2 (top and bottom bars)
- Ⓒ The number of extra bars = 2-D12 (top and bottom bars)

### 22. RECOMMENDED END HOOKS

Bar hook	Form and Extension	Bend Angle (degree)	Bend Radius (r)	Used Bar	Location
Primary reinf.		180°	$r = 2db$	6 to 25	Lap splice end of anchorage
Ties Stirrups		135°	$r = 1.25db$	6 to 12	Stirrups fastening bar diagonal hoop
Primary reinf.		90°	$r = 2.5db$	6 to 32	Bend-up for embedment
Slab		45°	$r = 5db$	8 to 20	Bend bar in slab

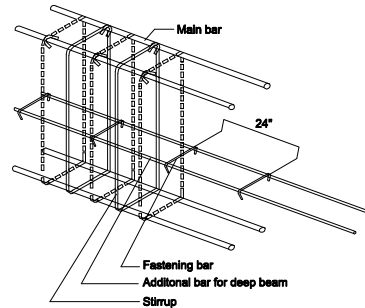
### 23. SCOPE OF EMBEDMENT



### 24. OPENING IN R.C.C. WALLS

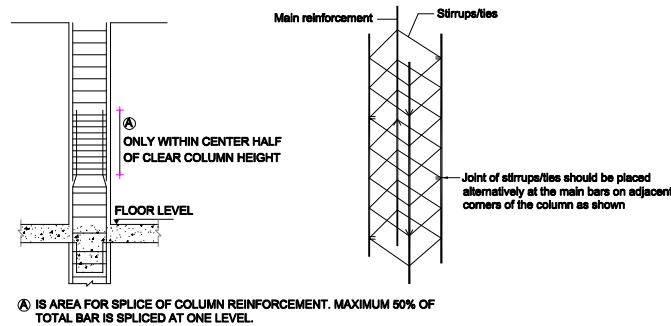
NOT LESS THAN THREE NO.20Ø BARS SHALL BE PROVIDED AROUND ALL DOOR AND WINDOW OPENINGS IN R.C.C. WALLS. THE BAR SHALL BE EXTENDED BEYOND THE CORNERS OF THE OPENINGS TO A DISTANCE EQUAL TO THE DEVELOPMENT LENGTH BUT NOT LESS THAN 24".

### 25. END HOOK OF STIRRUPS



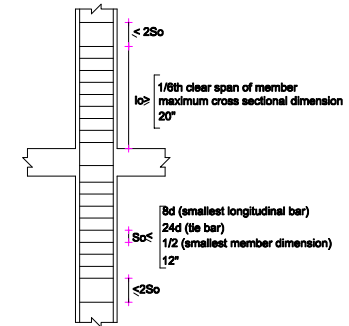
END HOOKS OF STIRRUPS ARE LOCATED ALTERNATELY AT TOP CORNER BAR OF THE SECTION.

### 26. COLUMN SPLICE LOCATION

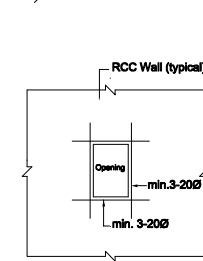
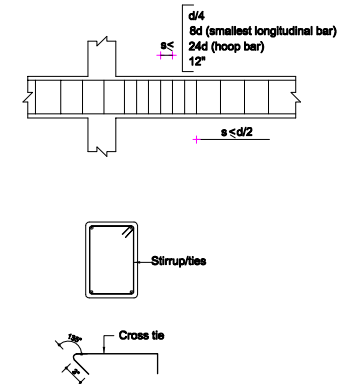


Ⓐ IS AREA FOR SPLICE OF COLUMN REINFORCEMENT. MAXIMUM 50% OF TOTAL BAR IS SPLICED AT ONE LEVEL.

### 27. CONFINEMENT REQUIREMENTS OF COLUMN AT JOINTS FOR EARTHQUAKE LOADING



### 28. CONFINEMENT REQUIREMENTS OF BEAM AT JOINTS FOR EARTHQUAKE LOADING



4TH PRIMARY EDUCATION  
DEVELOPMENT PROGRAM  
PEDP-4

GENERAL INSTRUCTIONS-2

Focal Point, PEDP-4  
Dr. Engr. Sushanta Roy  
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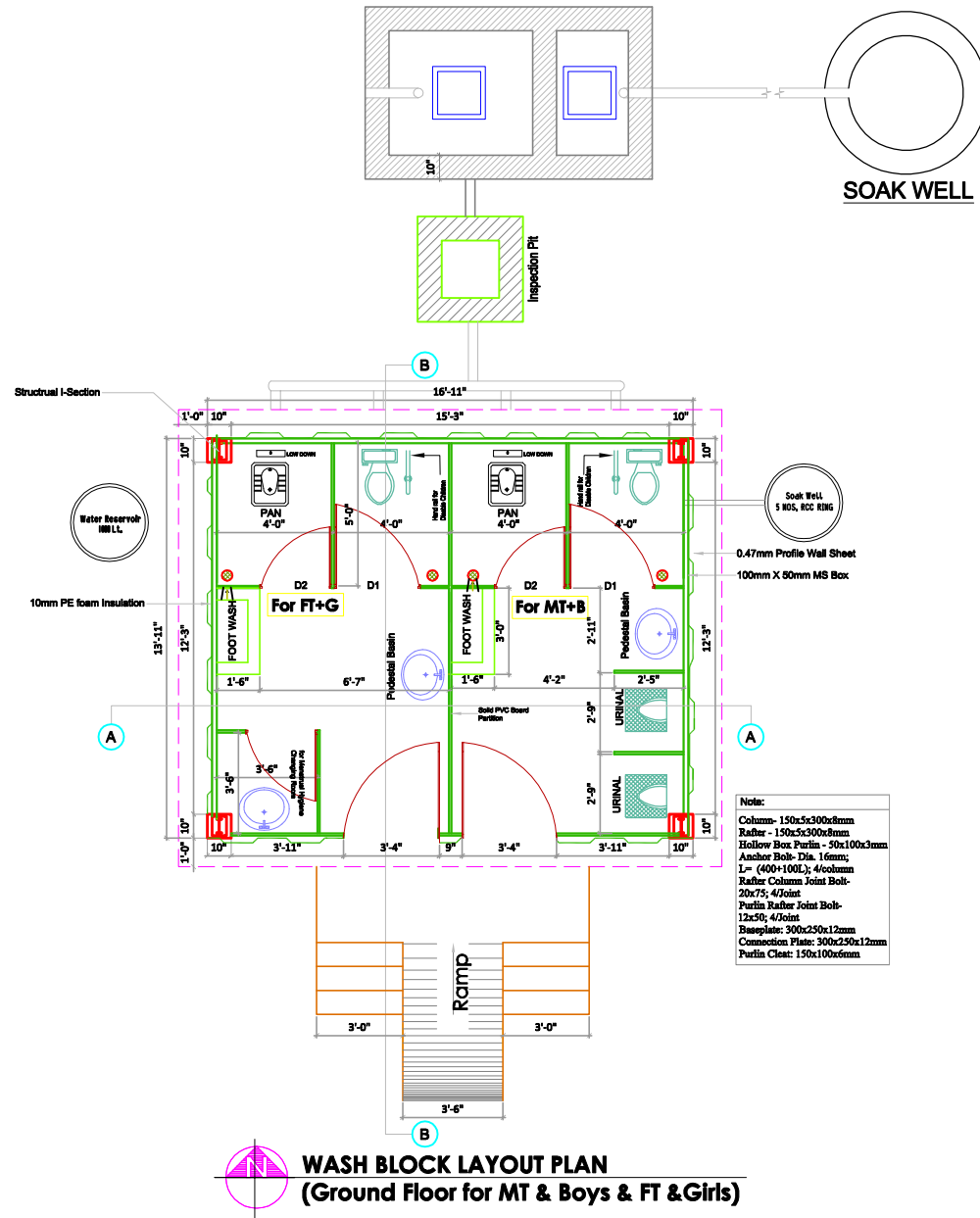
Focal Point, PEU  
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**PEDP-4**

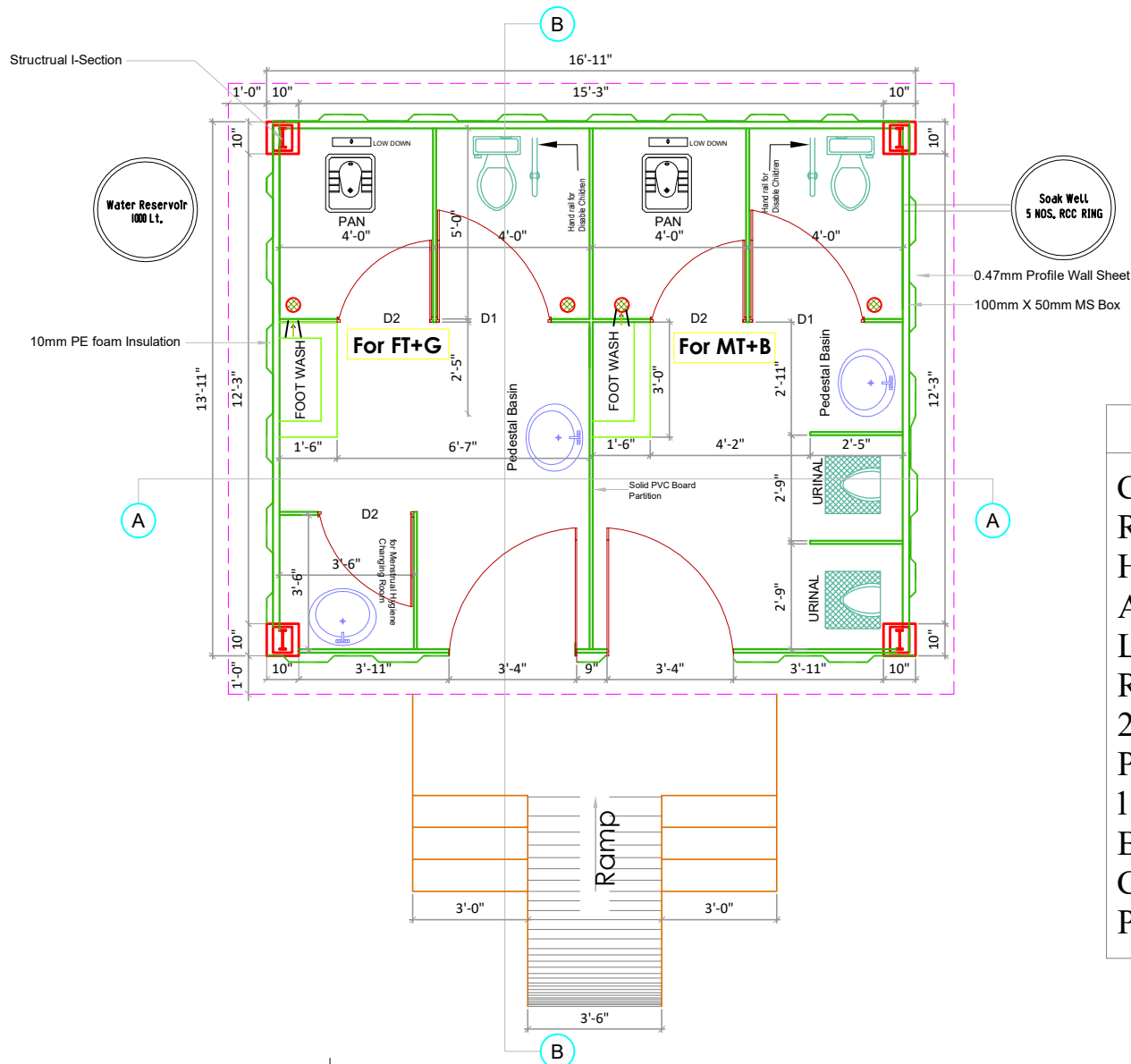
GROUND FLOOR LAYOUT PLAN

Focal Point, PEDP-4  
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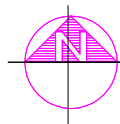
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Chief Engineer, DPHE  
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### Note:

Column- 150x5x300x8mm  
 Rafter - 150x5x300x8mm  
 Hollow Box Purlin - 50x100x3mm  
 Anchor Bolt- Dia. 16mm;  
 L= (400+100L); 4/column  
 Rafter Column Joint Bolt-  
 20x75; 4/Joint  
 Purlin Rafter Joint Bolt-  
 12x50; 4/Joint  
 Baseplate: 300x250x12mm  
 Connection Plate: 300x250x12mm  
 Purlin Cleat: 150x100x6mm



**WASH BLOCK LAYOUT PLAN**  
**(Ground Floor for MT & Boys & FT & Girls)**



4TH PRIMARY EDUCATION  
 DEVELOPMENT PROGRAM  
**PEDP-4**

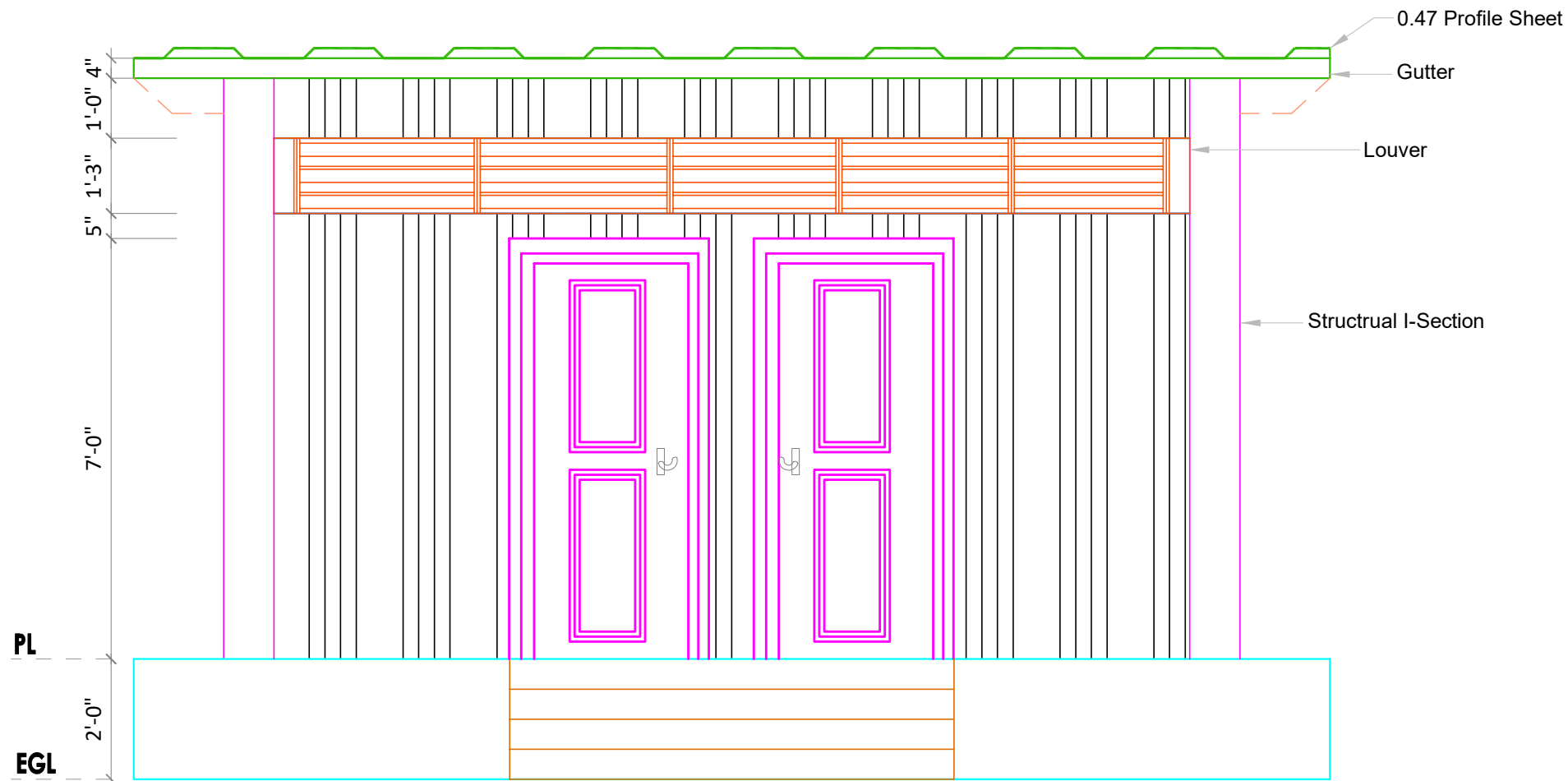
GROUND FLOOR LAYOUT PLAN  
 WITH SEPTIC TANK

Focal Point, PEDP-4  
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Note:	
LOUVER	15'-3" x 1'-3"
DOOR	3'-4" x 7'-0"



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DEVELOPMENT PROGRAM  
**PEDP-4**

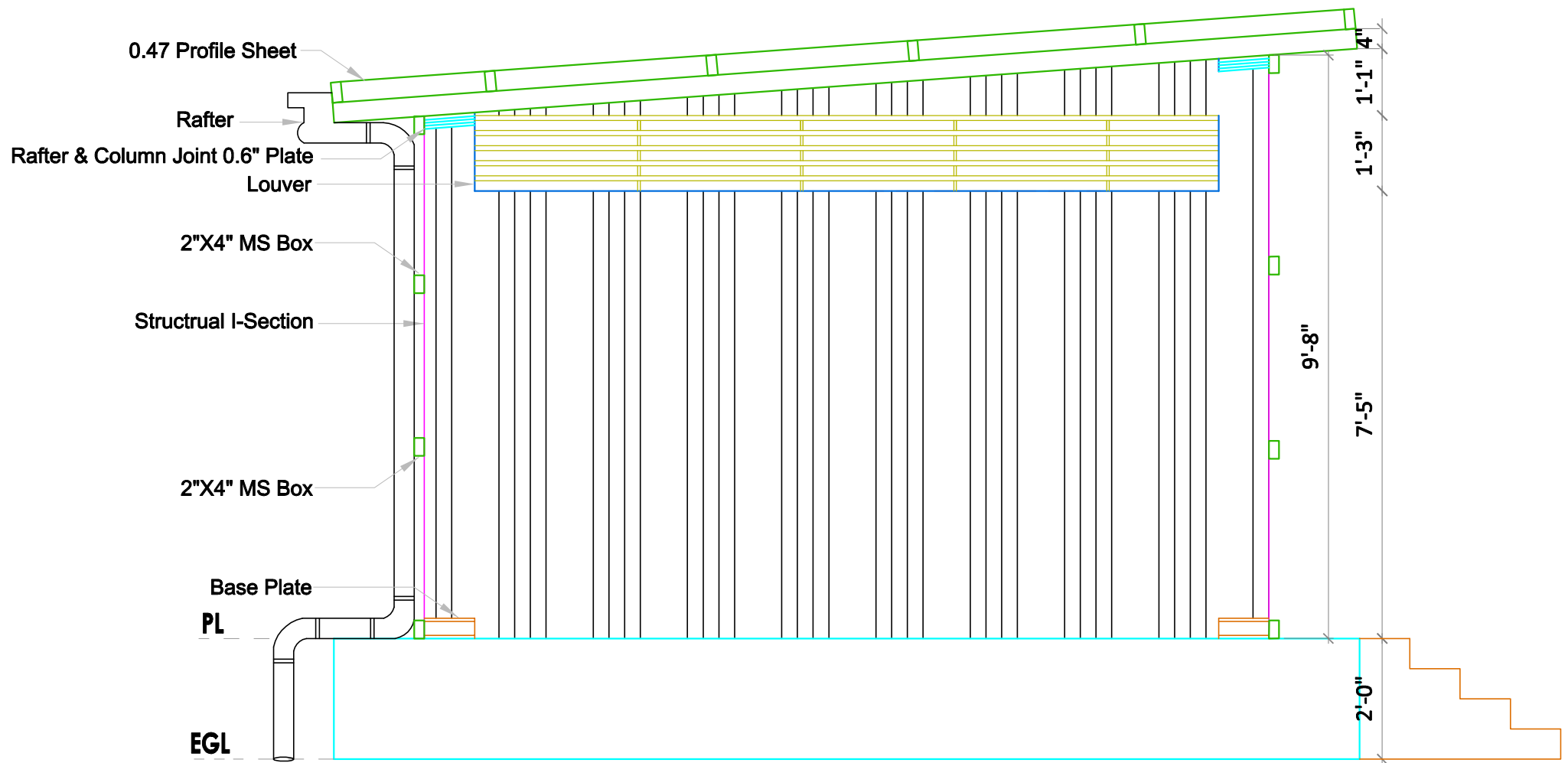
ENTRY SIDE ELEVATION

Focal Point, PEDP-4  
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**RIGHT ELEVATION**



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DEVELOPMENT PROGRAM  
**PEDP-4**

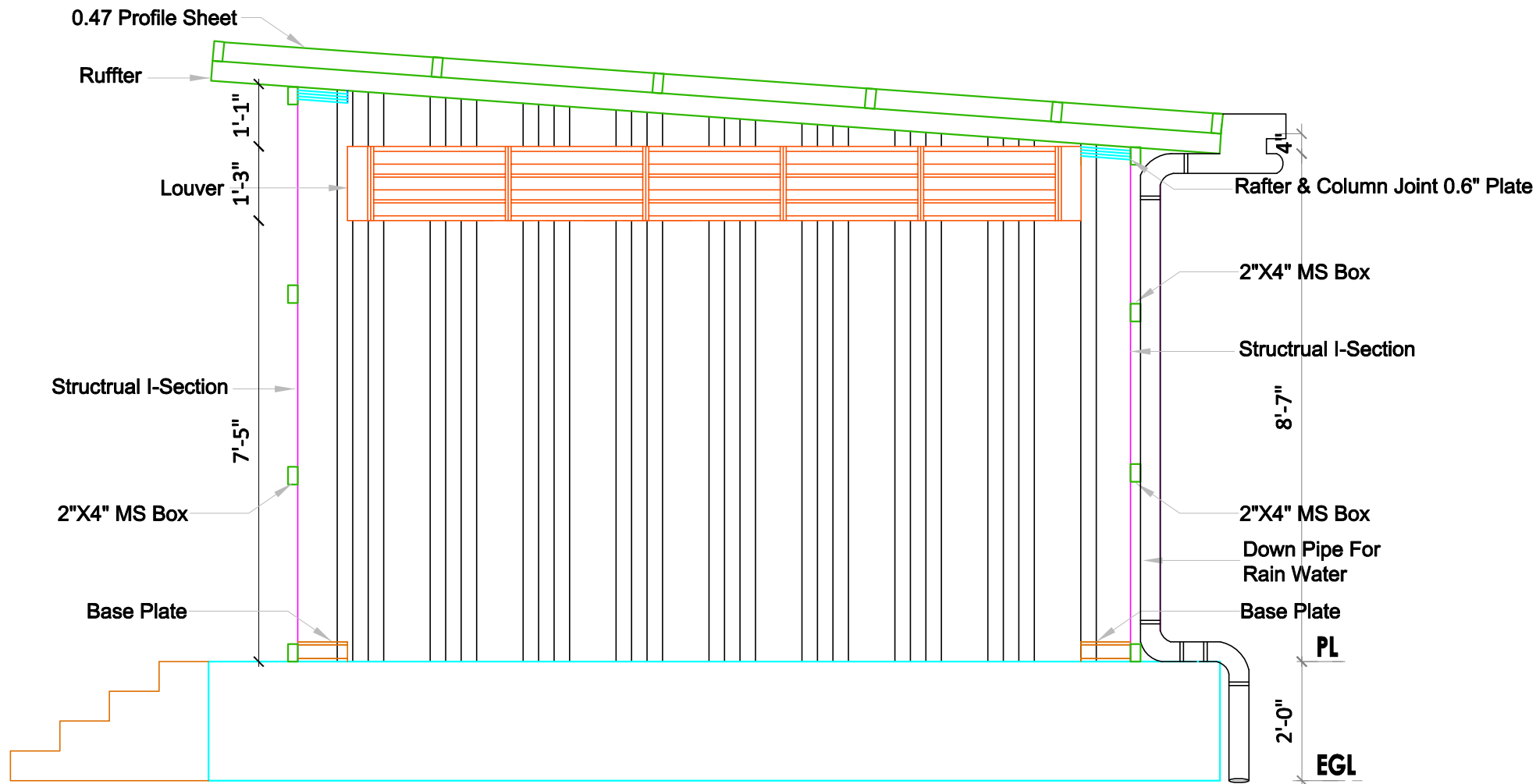
RIGHT SIDE ELEVATION

Focal Point, PEDP-4  
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**LEFT SIDE ELEVATION**



4TH PRIMARY EDUCATION  
DEVELOPMENT PROGRAM  
**PEDP-4**

LEFT SIDE ELEVATION

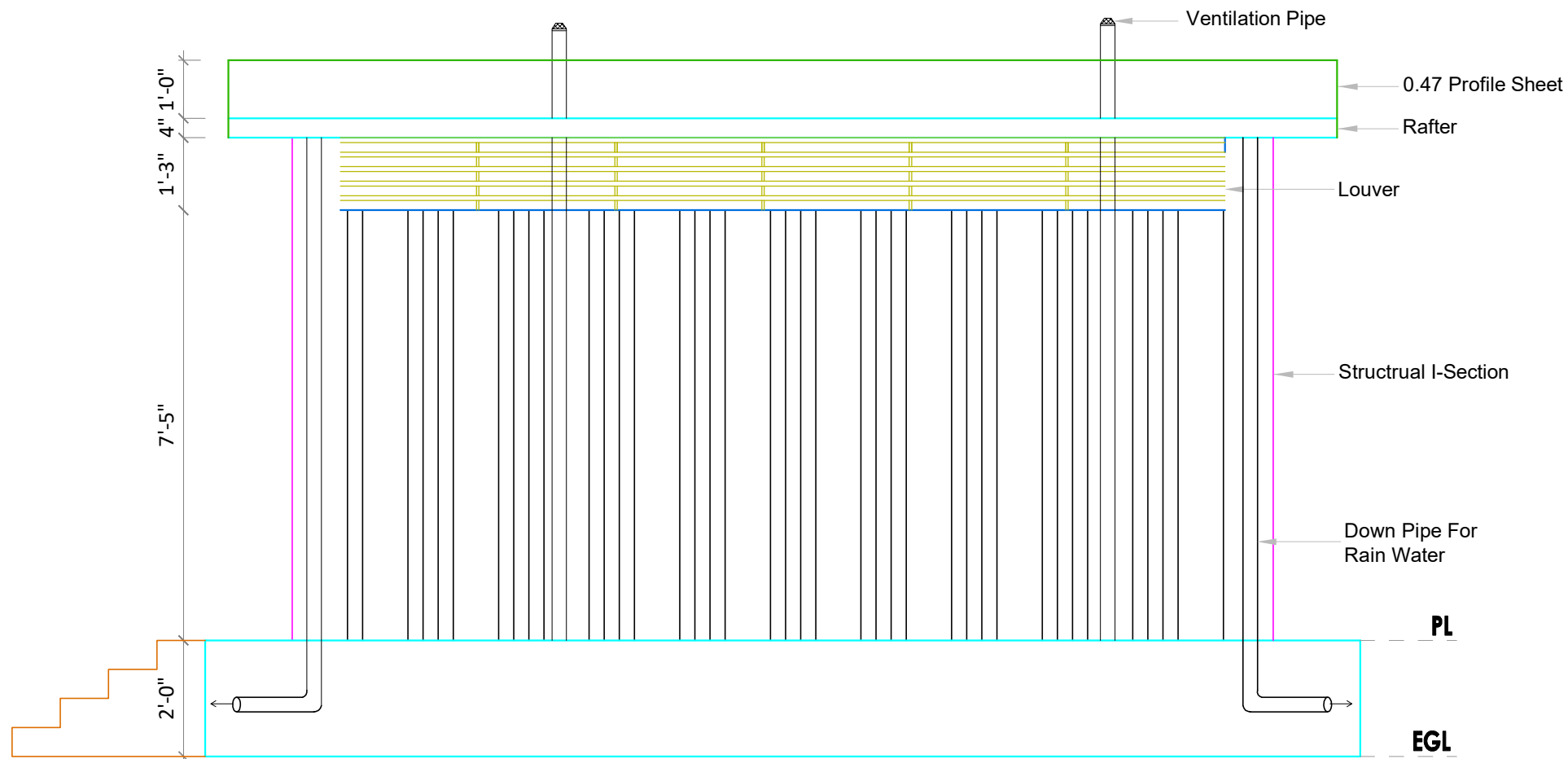
Focal Point, PEDP-4  
Dr. Engr. Sushanta Roy  
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**BACK ELEVATION**



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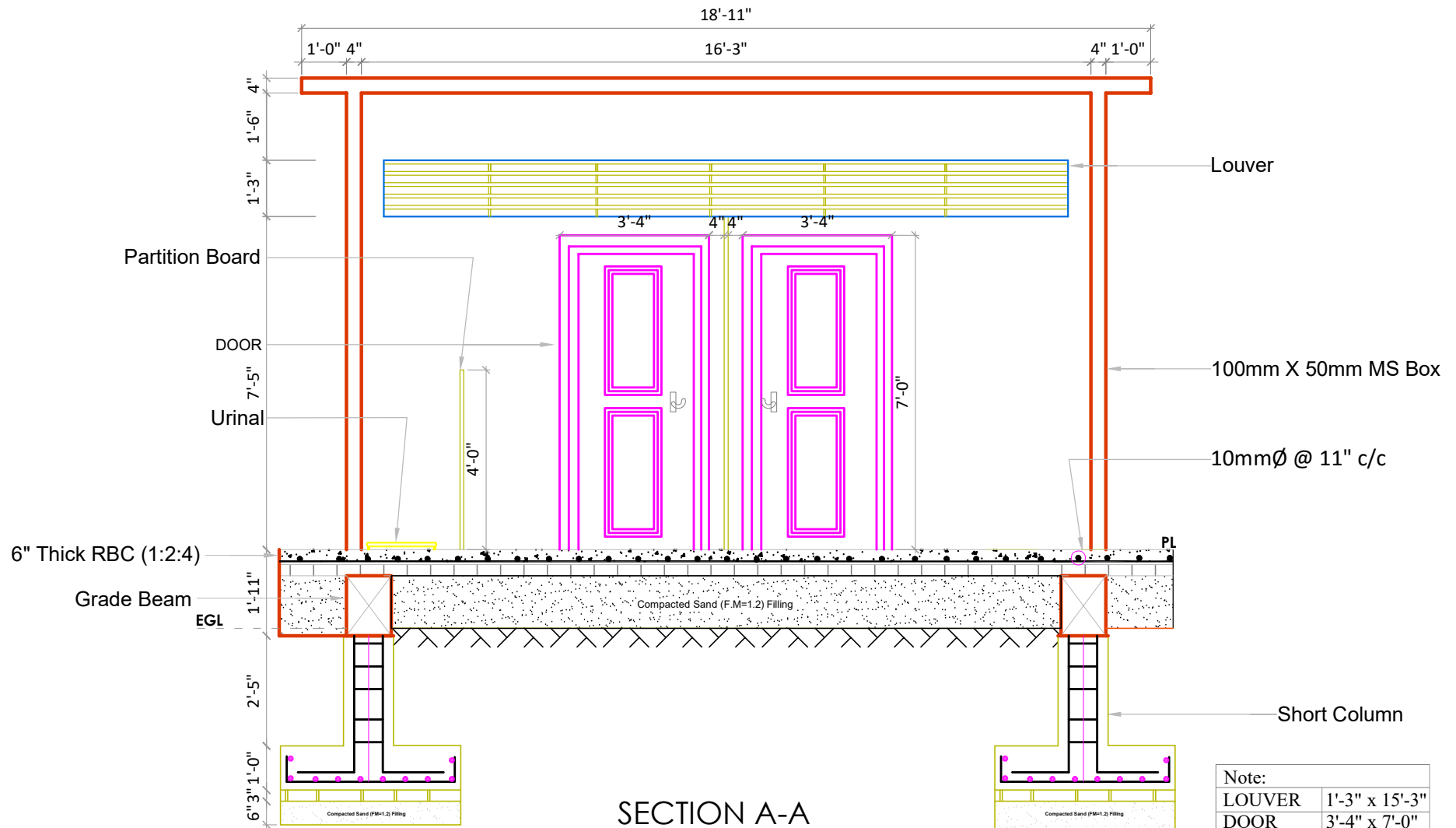
BACK SIDE ELEVATION

Focal Point, PEDP-4  
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4TH PRIMARY EDUCATION  
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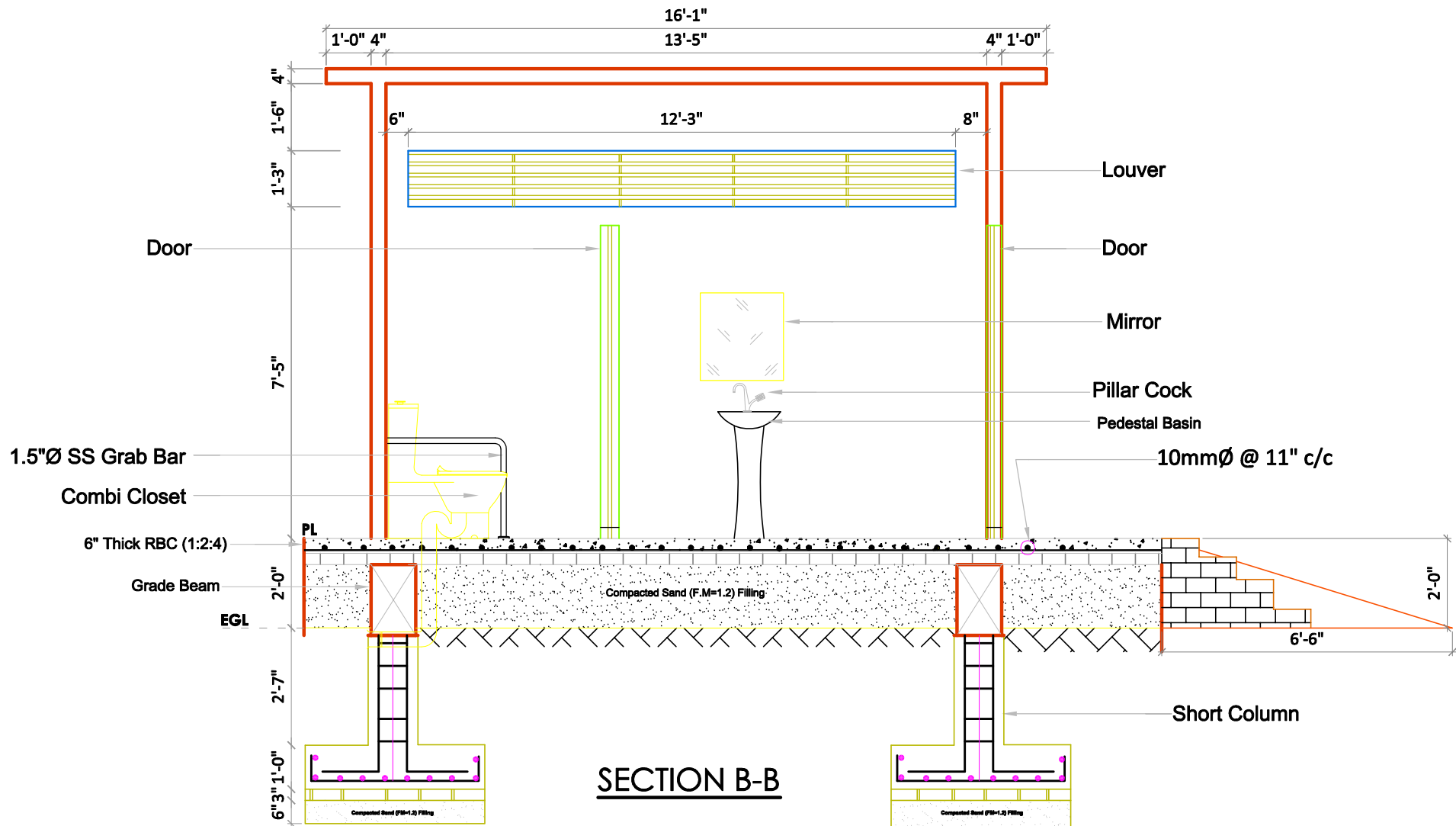
SECTION A-A

Focal Point, PEDP-4  
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4TH PRIMARY EDUCATION  
DEVELOPMENT PROGRAM  
PEDP-4

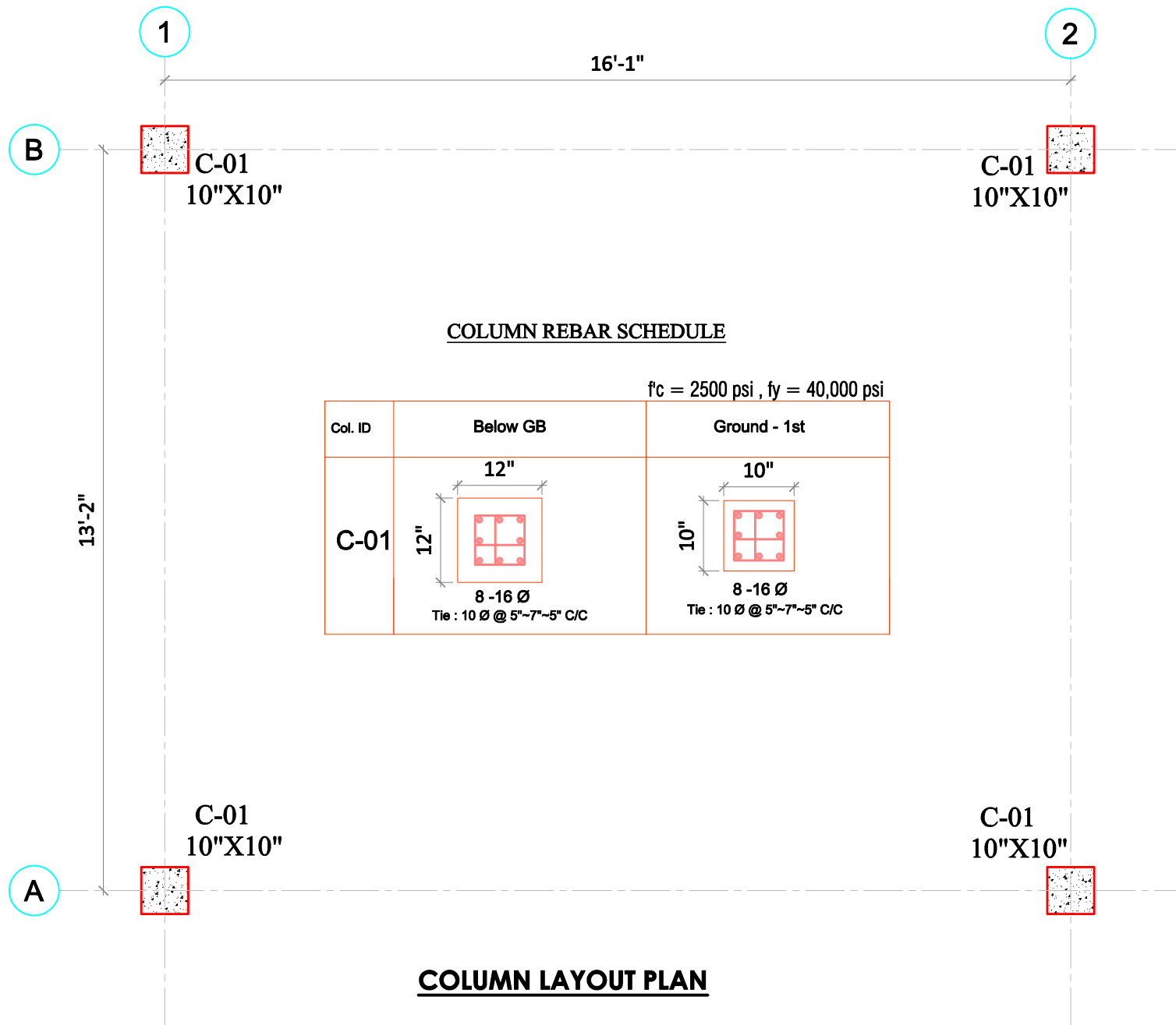
SECTION B-B

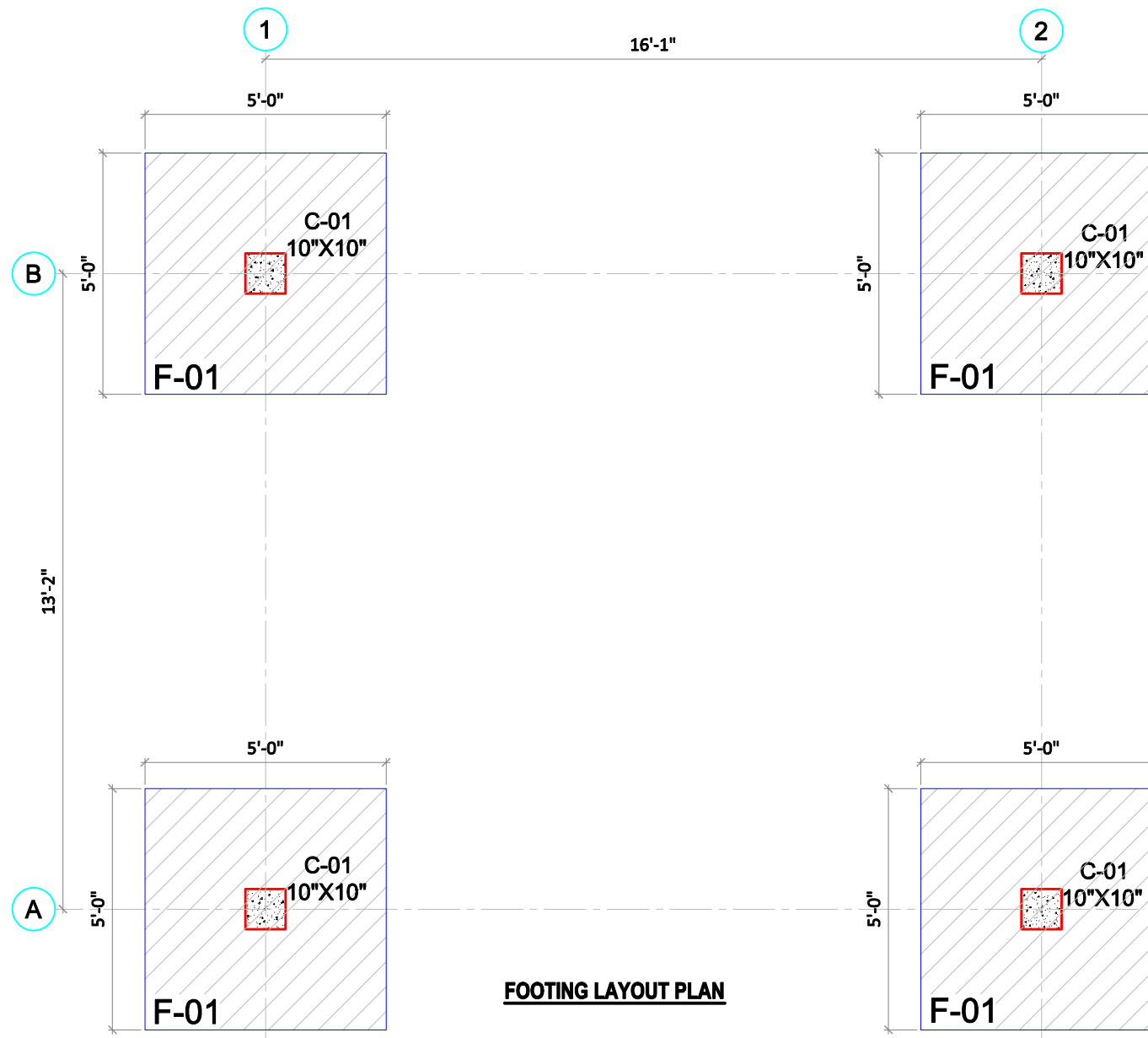
Focal Point, PEDP-4  
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**FOOTING LAYOUT PLAN**



4TH PRIMARY EDUCATION  
DEVELOPMENT PROGRAM  
**PEDP-4**

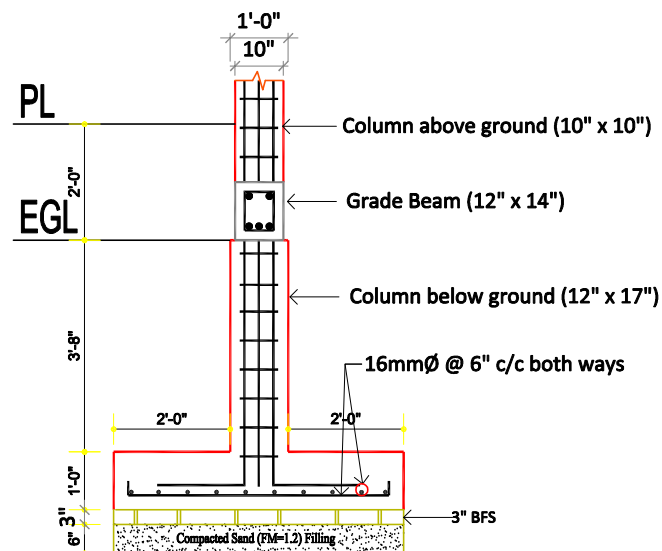
FOOTING LAYOUT PLAN

Focal Point, PEDP-4  
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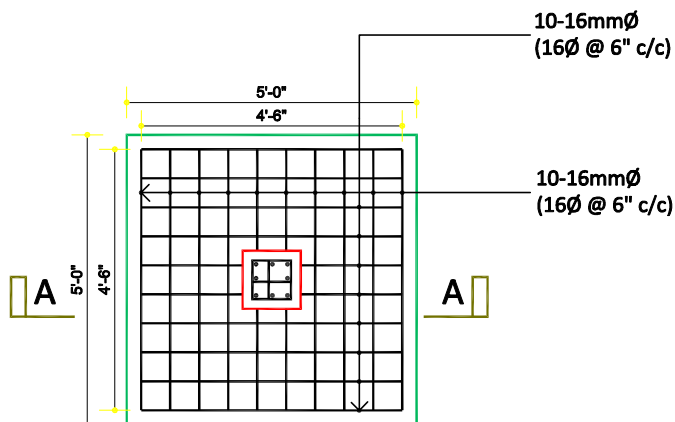
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**Section A-A**



**Reinforcement arrangement of footing F-01**

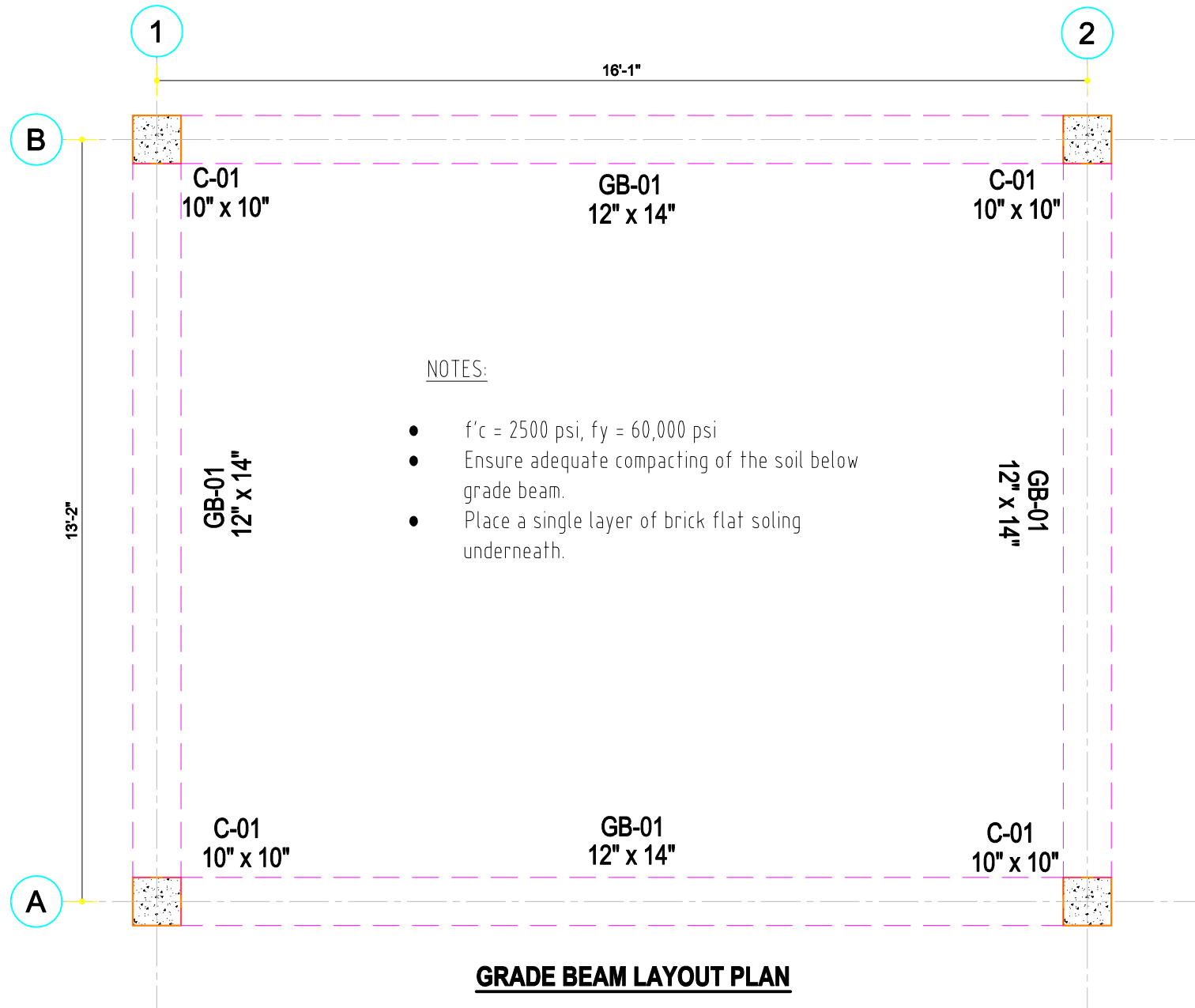
### NOTES

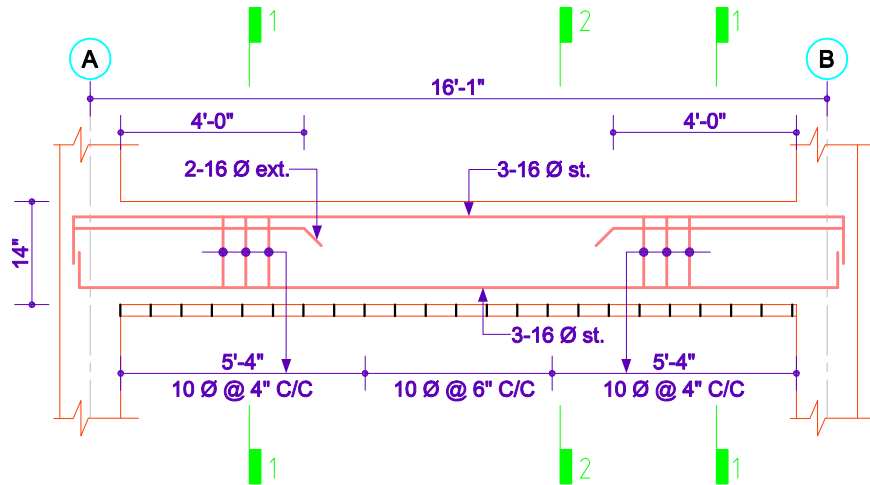
1. In case of Black/Swampy soil found during excavation, these black/swampy soil requires to be removed.
2. Design compressive strength of concrete to be utilized in footing is 19 MPa .
3. In order to ensure that the desired compressive strength is achieved mix ratio of 1:2:4 should be used unless noted otherwise.
4. Concrete should be produced by using best quality cement conforming to BDS EN-197-1- CEM1, 52.5N (52.5MPa) / ASTM-C 150 Type – I along with the blend of local (50%) [F.M. 1.2] and sylhet sand (50%) [F.M 2.2] and 20mm downgraded picked jhama brick chips.
5. Water to cement ratio for producing the desired concrete should be 0.45.
7. Rebar of designed diamter should be of minimum grade of 400 to be confirmed by testing.
8. Clear cover for footing should be 2"(50mm) in all sides
9. Steel shutter is mandatory to be used.
10. Sample concrete cylinders should be prepared during casting which should be tested after a curing age of 28 days for compressive strength.

a b a

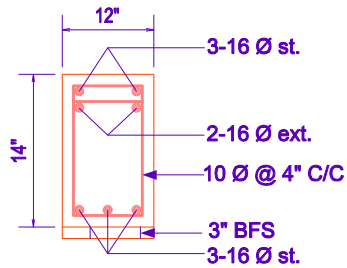
### Rebar Schedule

Legend	Direction	a (mm)	b (mm)
F-01	Short	6"	4'-6"
F-01	Long	5"	4'-6"

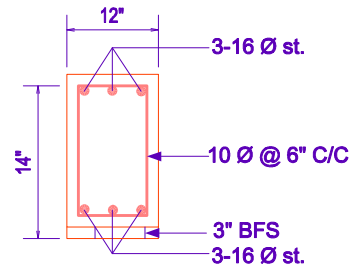




**Long Section of GB-01(12" X 14")**



**Section 1-1**



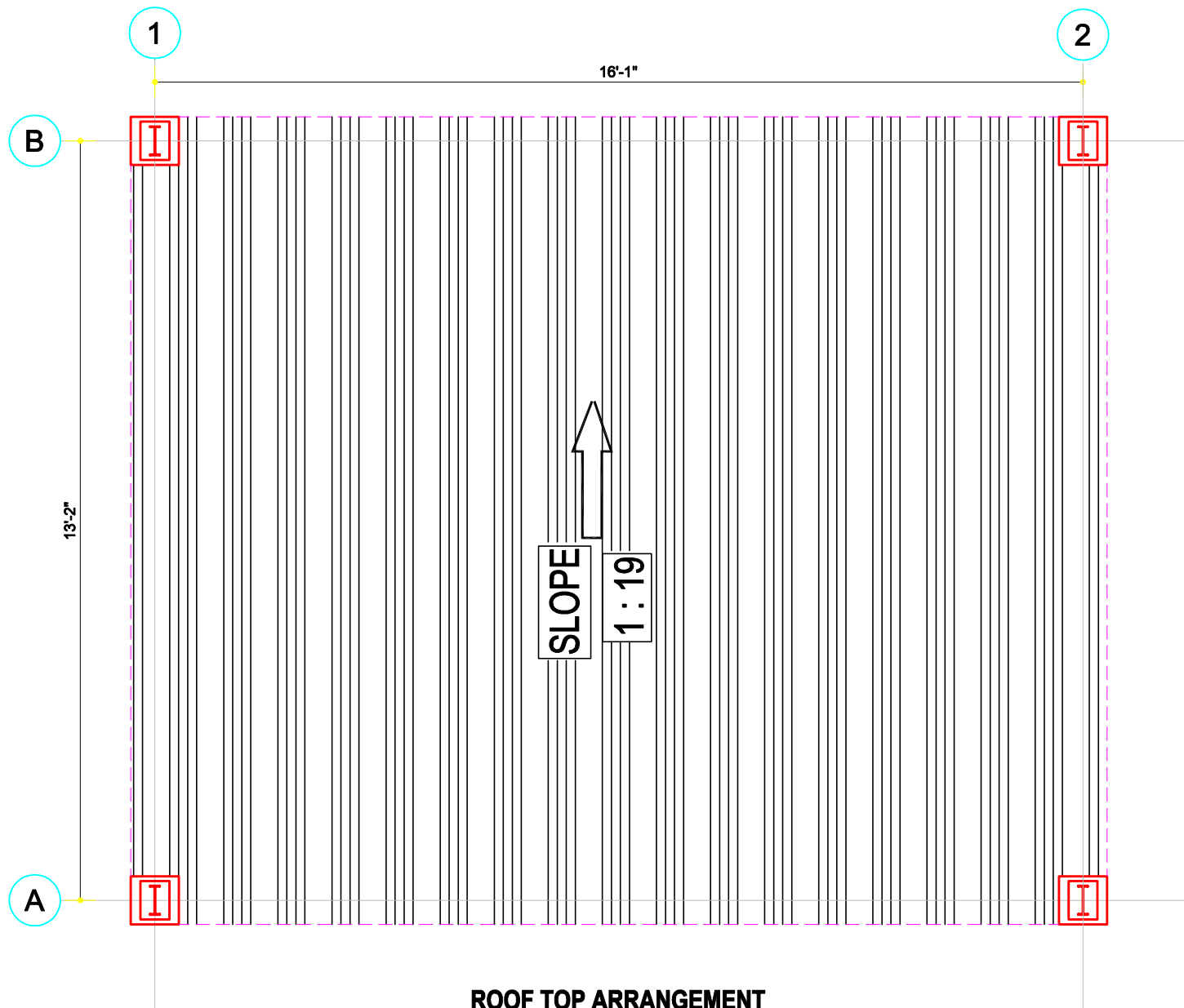
**Section 2-2**

**NOTES**

1. Design compressive strength of concrete to be utilized in grade beam is 19 MPa .
2. In order to ensure that the desired compressive strength is achieved mix ratio of 1:2:4 should be used unless noted otherwise.
3. Concrete should be produced by using best quality cement conforming to BDS EN-197-1- CEM1, 52.5N (52.5MPa) / ASTM-C 150 Type – I along with the blend of local (50%) [F.M. 1.2] and sylhet sand (50%) [F.M 2.2] and 20mm downgraded picked jhama brick chips.
4. Water to cement ratio for producing the desired concrete should be 0.45.
5. Rebar of designed diameter should be of minimum grade of 400 to be confirmed by testing.
6. Lapping of rebar in grade beam should be in the zone as designated in sheet -1 and minimum lap length should be 60D, where, D is the diameter of rebar.
7. Clear cover for grade beam should be 2"(50mm) at bottom and 1.5" (37.5mm) at top.
8. Steel shutter is mandatory to be used.
9. Sample concrete cylinders should be prepared during casting which should be tested after a curing age of 28 days for compressive strength.







4TH PRIMARY EDUCATION  
DEVELOPMENT PROGRAM  
**PEDP-4**

### ROOF TOP LAYOUT PLAN

Focal Point, PEDP-4  
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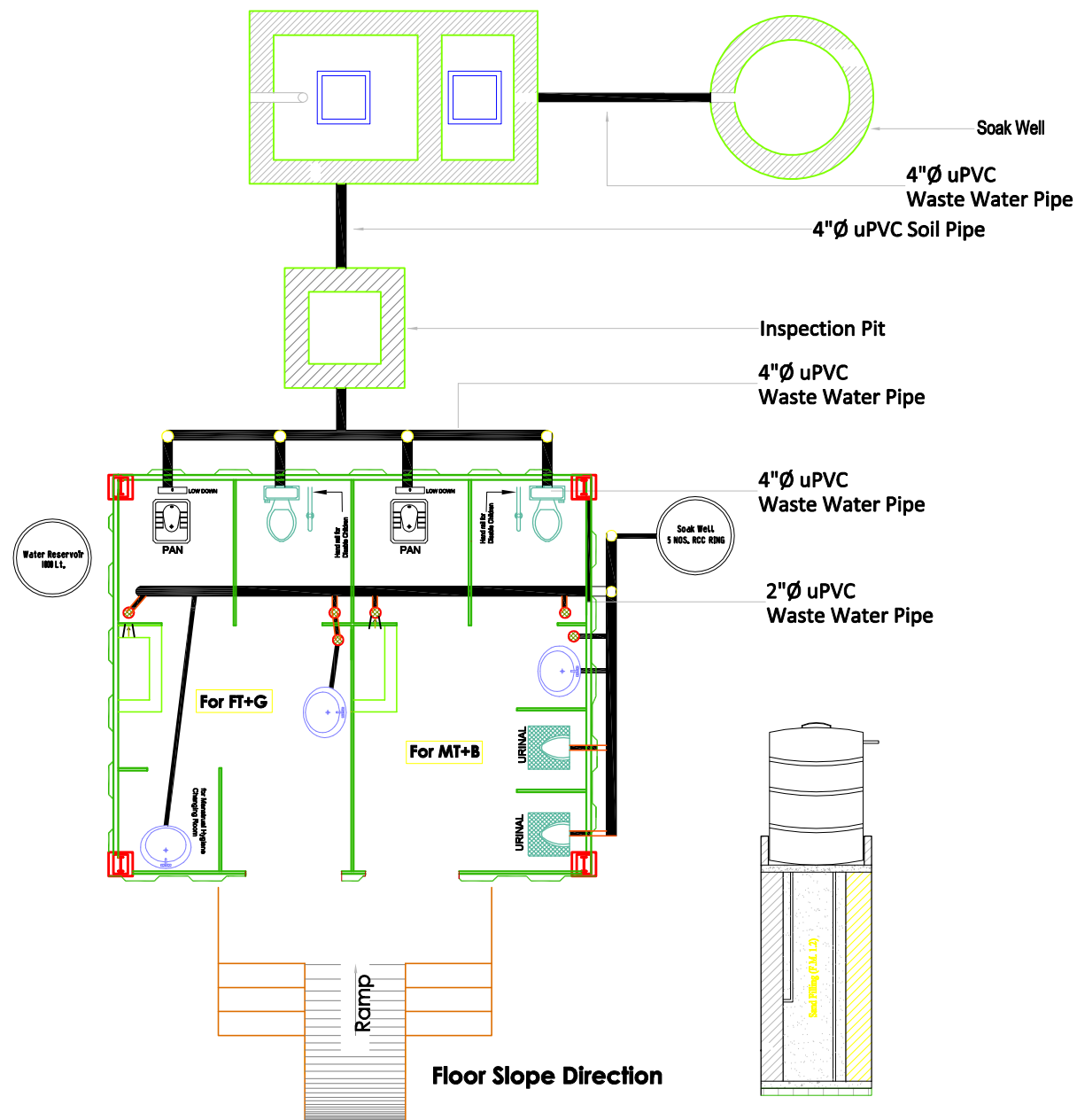
Focal Point, PEU  
Mir Abdus Shahid  
Addl. Chief Engineer, DPHE

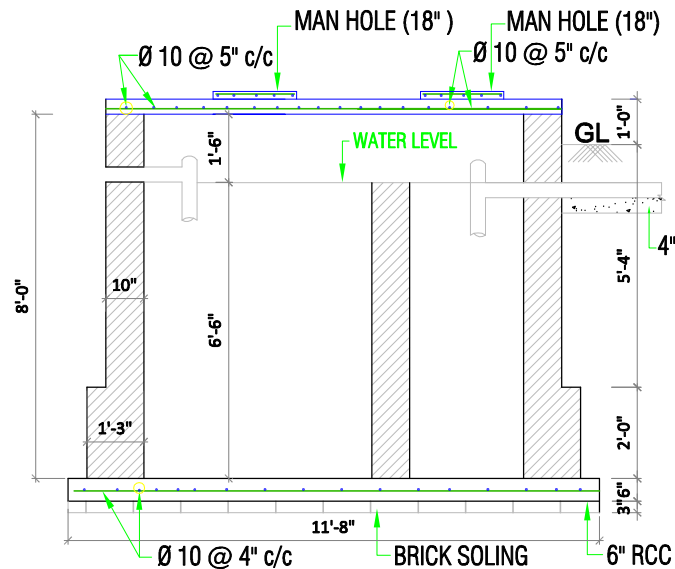
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Md. Sarwar Hossain  
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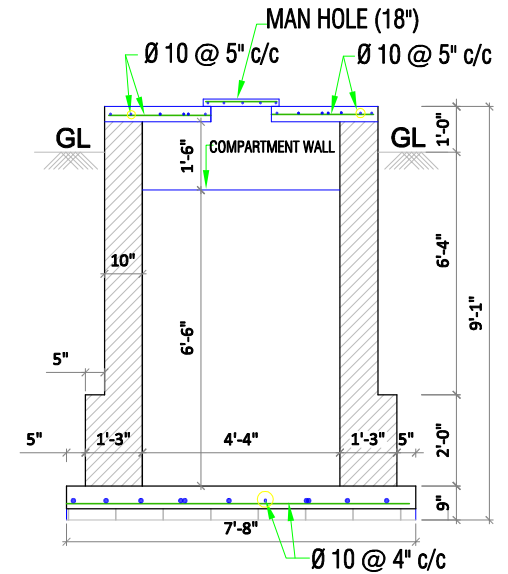
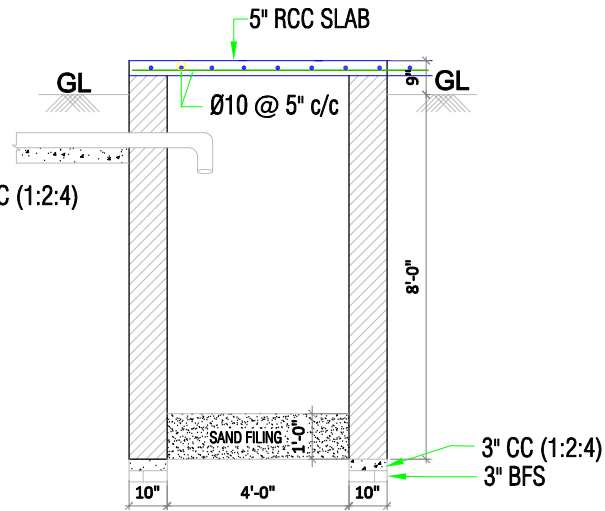
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Date:28/05/23

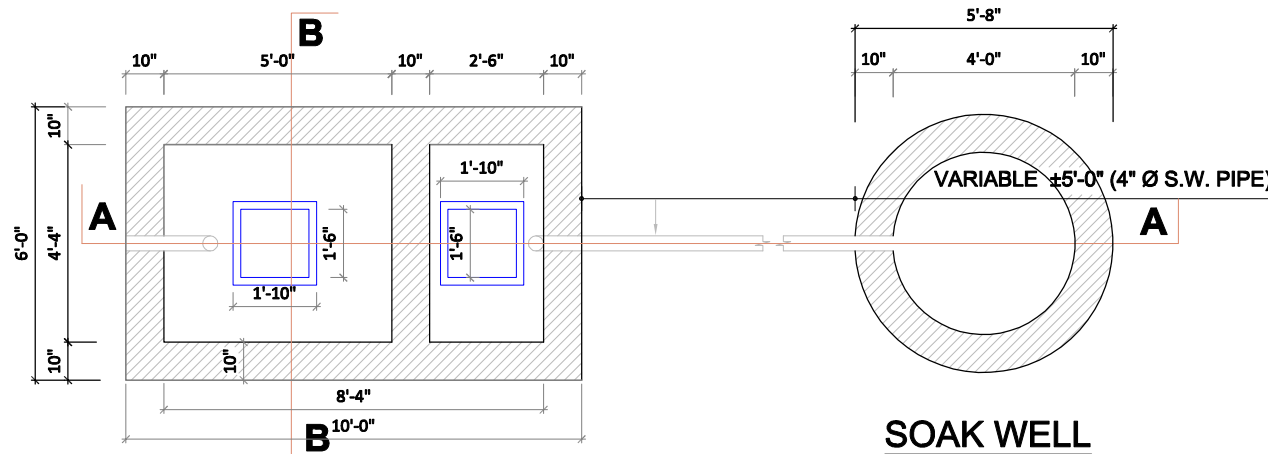




**SECTION :A-A**

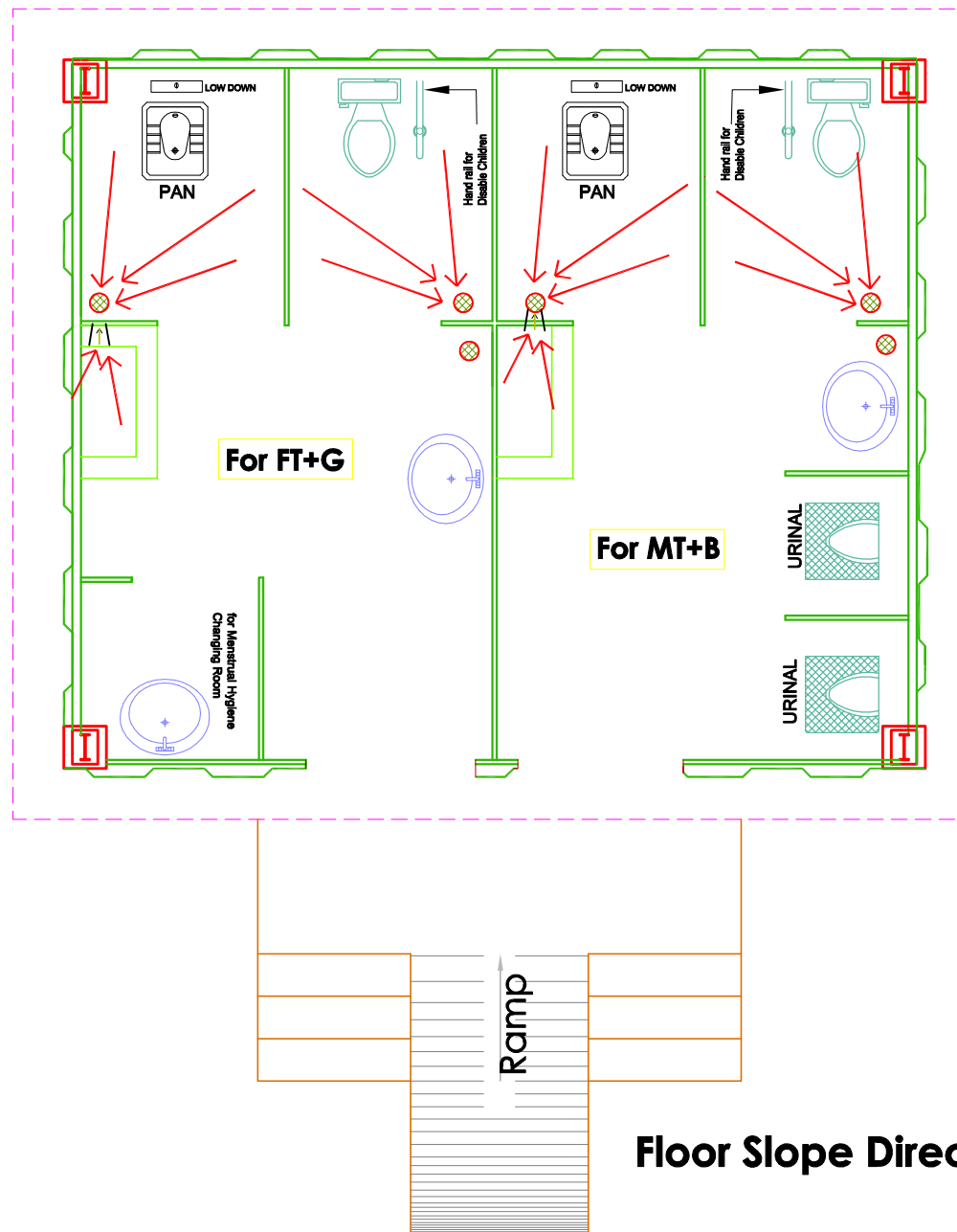


**SECTION :B-B**



**SOAK WELL**

**PLAN OF SEPTIC TANK (Option-03)**



**Floor Slope Direction**