Basic Civil Engineering

PRACTICAL

INDEX

INTRODUCTION

A building is a living place surrounded by walls and covered by roof for the purpose of keeping out rain, sun, wind and snow. It may be a bungalow, apartment, school, hospital, shopping complex, industry, residential building etc. Any building essentially comprises of three parts namely foundation, super structure and roof. Before construction the civil engineer has to plan and prepare the building drawing with all details.

The main aim of building drawing is to give sufficient informations by the designer to the construction engineer. In order to give sufficient information about the building the following views are generally drawn:

A. Plan
B. Elevation
C. Section

A. PLAN

The building is imagined to be cut by a horizontal plane at the sill level of the window. The upper portion is removed. Now building is seen from top. A projection of the remaining portion of the building on a horizontal plane is known as the plan.

B. ELEVATION

It is the front view of a building. Imagine to stand in front of it. Whatever the portion of the building is visible above the ground level, take its first angle projection on a vertical plane behind the building known as the elevation.

C. SECTION

The building is imagined to be cut by a vertical plane in order to show the internal details such as details of foundation, flooring, doors, windows, ventilators, thickness of walls, lintels, roof, parapet wall, sunshade, etc. Arrows at the extreme ends of the section plane or planes show the directions in which these details are required. The details drawn and marked on a vertical plane, after removing the part of the building behind the cut section is known as the section.

TERMINOLOGY

BUILDING MATERIALS

1. **MASONRY:** According to the type of material used for construction, it is called as stone masonry, brick masonry or concrete masonry.
2. **CEMENT MORTAR (C.M):** It is a substance produced from prescribed proportions of cement, sand and water which generally sets hard after mixing and binds the building materials together.
3. **CEMENT CONCRETE (C.C):** It is mixture of cement, sand (Fine aggregate), jelly (coarse aggregate) and water. Concrete mix of 1:1½:3 means 1 part by weight of cement, 1½ parts of sand and 3 parts of jelly are used to form the Mix.
4. **PLAIN CEMENT CONCRETE (PCC):** A plain cement concrete is the concrete without any reinforcement. It is usually referred as cement concrete.
5. **REINFORCED CEMENT CONCRETE (RCC):** It is the concrete reinforced by mild steel or twisted bars.

BUILDING COMPONENTS:

1. **FOUNDATION:** It is the portion of a building below the ground level (G.L). It transmits the load coming from the superstructure to the ground.
2. **FOOTINGS:** Footings are stepped courses in foundation. These are

constructed in brick masonry or stone masonry or concrete under the walls of columns for distributing the load of the superstructure on to a larger area of subsoil.

3. **BASEMENT:** It is the lower storey of a building, below or partly below the ground level.
4. **SUPER STRUCTURE:** It is the portion of the building above the ground level.
5. **PLINTH:** It is the portion of the structure between the ground level and the floor level. The level of the floor is usually known as the plinth level. Plinth height may be 300mm to 600mm, but 450mm is more common. For water logging prone areas, the plinth height will be 600mm.
6. **FLOORING:** The flooring will be generally in plain cement concrete (P.C.C) 1:4:8 of about 130mm thick, plastered smooth with cement mortar 1:3 of 20mm thick. This may be finished with tiles, marbles etc.
7. **DAM PROOF COURSE (DPC):** It is a continuous layer of an impervious material such as bitumen, slate or rich concrete provided at the plinth level beneath the walls to prevent the entry of moisture into the building through basement.
8. **MASONRY WALLS:** Masonry walls may be of either brick or stone. Actual size of Modular brick is 190 x 90 x 90mm. The thickness of a single brick wall including plastering is 200mm and of 1 ½ brick wall is 300mm.
9. **DOORS, WINDOWS AND VENTILATORS:** The size of door to be adopted for a room depends basically upon the functional requirement of the room. Commonly adopted sizes of doors for different types of buildings are given below.
10. **SILL:** It is the bottom horizontal frame of a window.
11. **LINTEL:** It is defined as a horizontal member provided on the top of door and window openings to support the brick work over door and window opening.
12. **SUNSHADE:** It is a projection from the wall, provided above the door or window for the protection against the sunrays and rain.
13. **ROOF:** It is a flat or inclined structural member provided as a cover to the building. It is used to protect the building from weathering actions namely rain, sun, wind, etc. Generally it is constructed of RCC of about 125mm thick.
14. **CEILING:** The lower level of the roof slab exposed to the room is known as ceiling. Sometimes, special materials will be used below the concrete roof to improve the appearance of the ceiling, which is known as false ceiling.

Sl. No.	TYPES OF BUILDINGS	SIZE OF DOORS in 'mm'
1	Public buildings like office, school, hospital, library, etc.	1200 x 2100, 1500x2100, etc.
2	Residential buildings	1100x2100, 900x200, etc.
3	Door for bath and water closet	800x200, etc.

15. **WEATHERING COURSE:** It is about 100mm thick brick jelly lime concrete, provided at the top of the roof slab to protect the slab from weathering actions sunshine, rain, etc.

16. **PARAPET WALL:** It is a short wall of about 450 to 900mm built over the roof all round the building.

17. **COPING:** It is a projection on the top of the parapet wall on outside or both sides to throw off rainwater.

18. **STEPS:** Steps are generally in brick work in cement mortar 1:5 laid on PCC base. Rise and Tread of a step are 150 to 200mm and 230 to 300mm respectively.

I. BUILDING DRAWINGS (MANUAL)

1) A SINGLE ROOM BUILDING

The following line sketch shows the internal dimensions of A SINGLE ROOM BUILDING. Draw to a scale of 1:50, 1:00 the following views:

A) Plan

B) Section on AB

C) Elevation

	SPECIFICATIONS
a) FOUNDATION	Depth of foundation is 1 m below natural ground level. The concrete base course is 1 m wide and 0.3 m thick in PCC of 1:4:8 mix.
b) FOOTING	A footing of RR masonry in CM 1:5 having width 0.6m and depth 0.7m will be provided over the base course layer.
c) BASEMENT	The basement will be of RR masonry in CM 1:5 and of height 0.45m above the natural ground level. The thickness of plinth wall is 0.45m and a damp proof course 0.02m thick in CM 1:3 will be provided around the building.
d) FLOORING	Over 0.340m depth of sand filling, flooring of 0.110m thick in CC 1:4:8 finished with granite tiles is provided.
e) SUPERSTRUCTURE	The thickness of walls above plinth level is 0.23 m in brick work using CM 1:5. The height of the parapet wall is 0.6m above the roof top level. Lintel – cum – sunshade will be provided over the door and window openings. Thickness and bearing of RCC lintel in CC 1:1.5:3 will be 0.15m. The projection of sunshade will be 0.45m from the wall. The thickness is 0.08m at support and 0.05m at free end. Ceiling height will be 3m above the floor level.
f) ROOFING	Roofing will be of flat RCC in CC 1:1.5:3, 0.12m thick. A weathering course of 0.1m thick is provided over the roof slab with sufficient slope to drain rainwater.
g) STEPS	Tread = 0.3m. Rise = 0.15m.

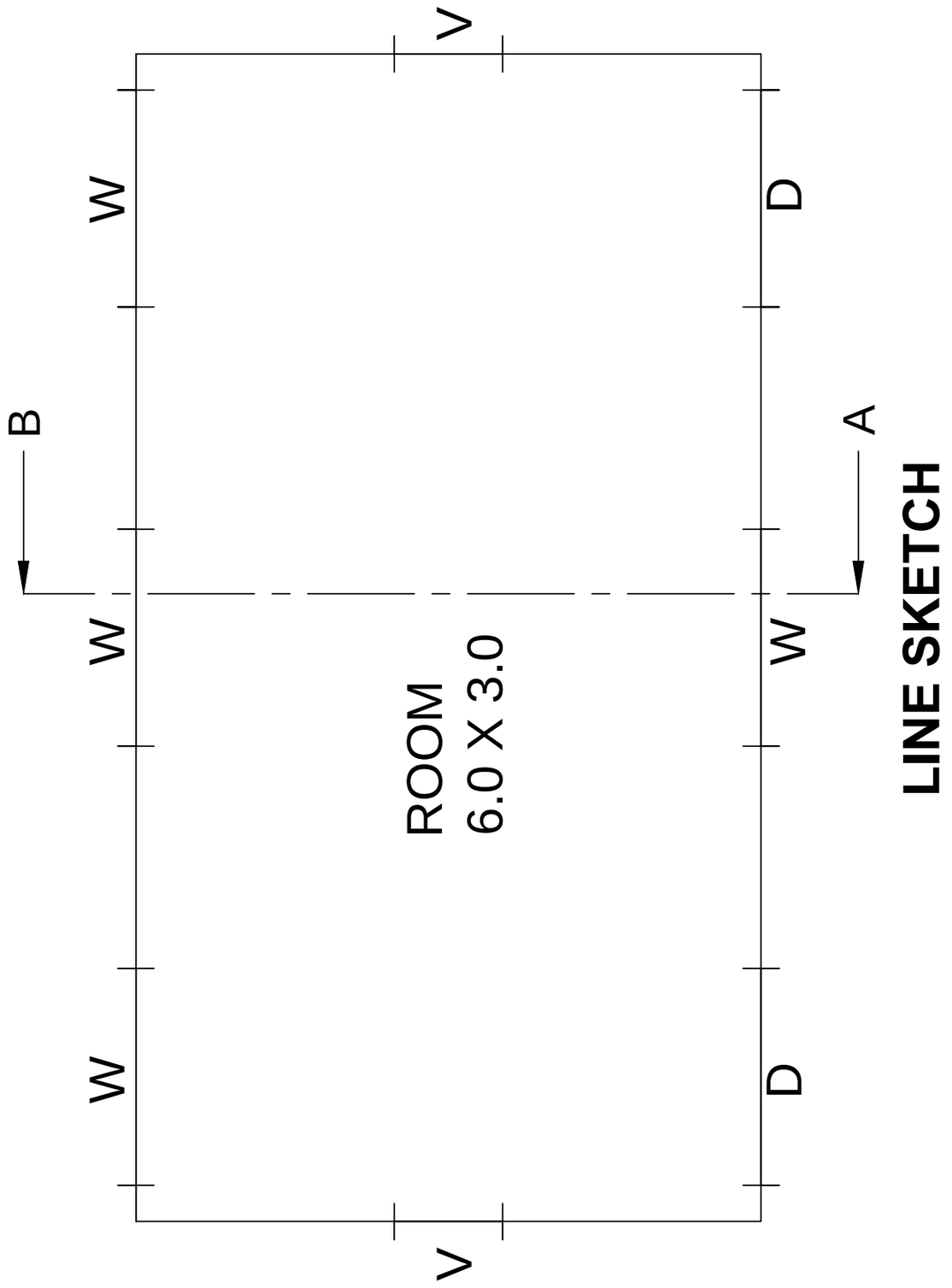
REFERENCE

D - Panelled Wooden Door - 1.2 m x 2.10 m

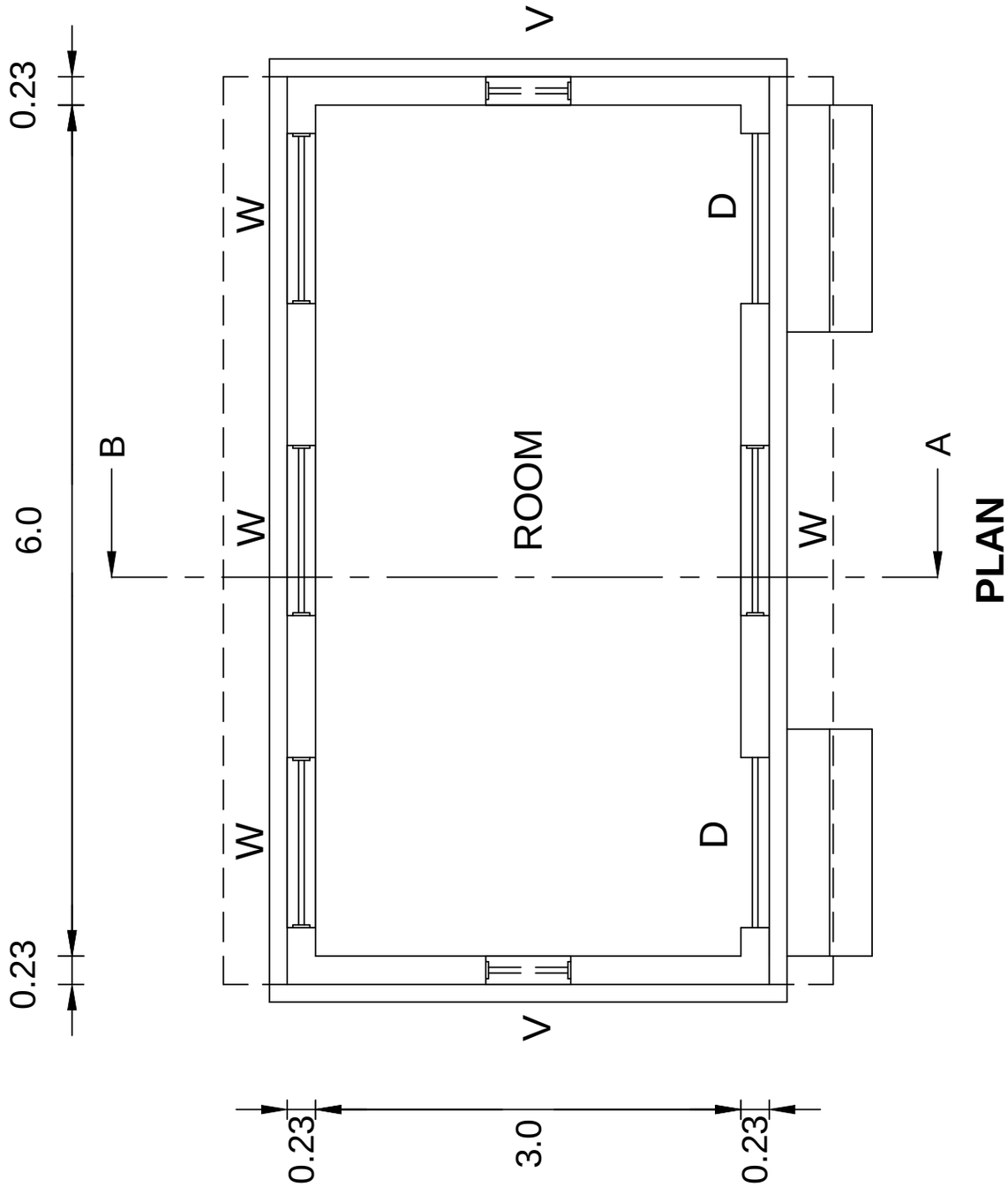
W - Panelled Wooden Window - 1.2 m x 1.40 m

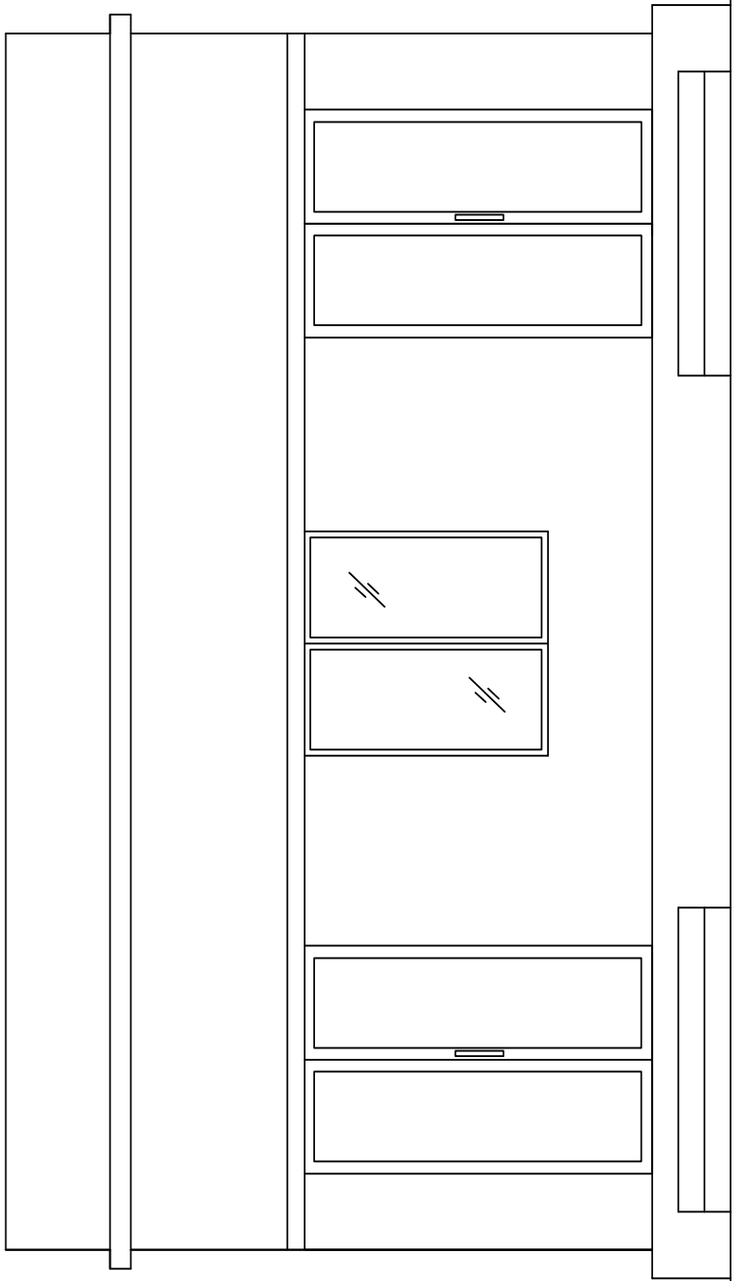
V - Glazed Ventilator - 0.6 mx0.45m

Assume any other data suitably, if necessary.

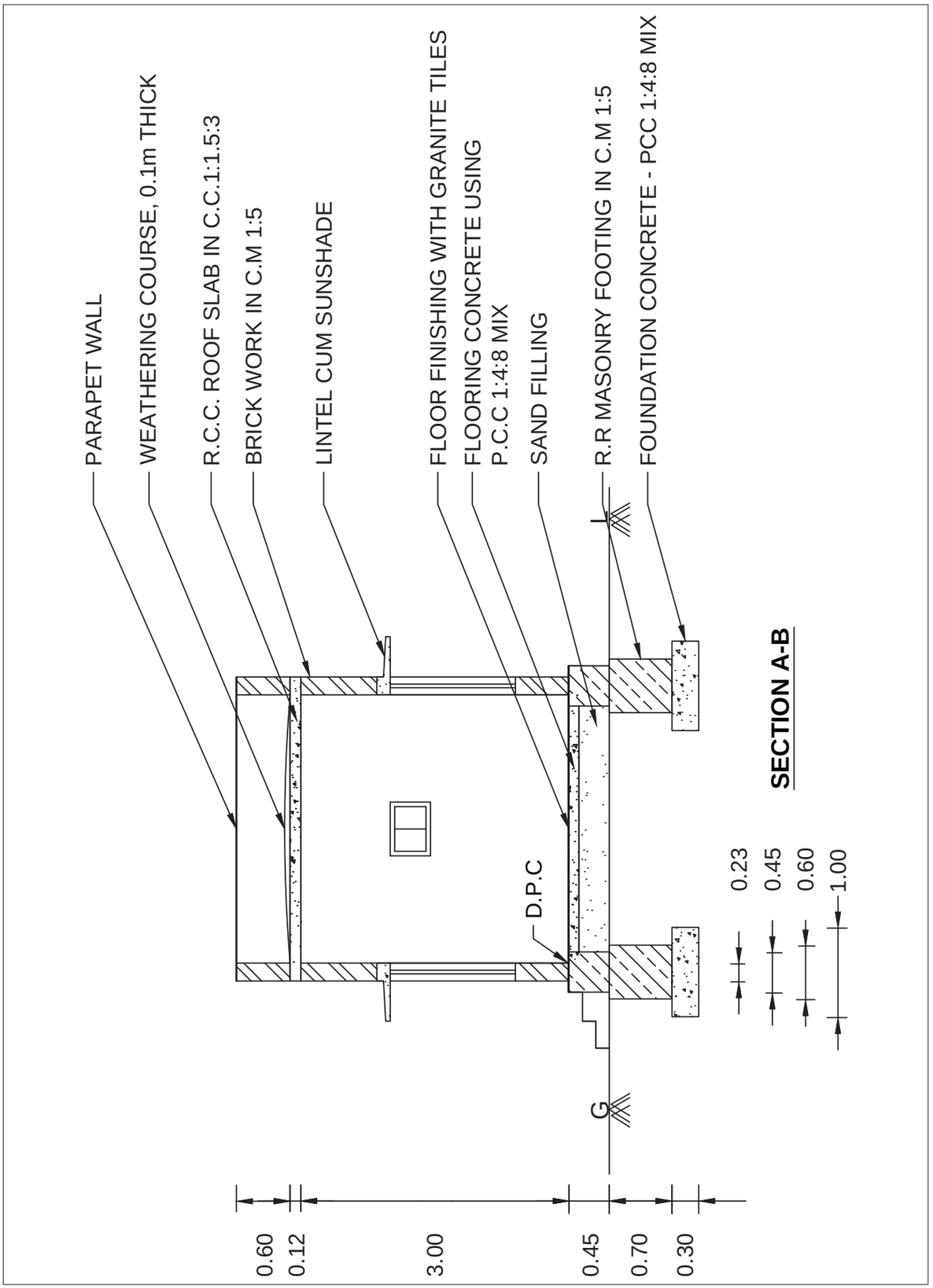


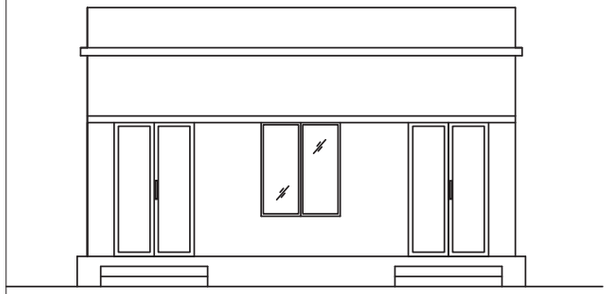
LINE SKETCH



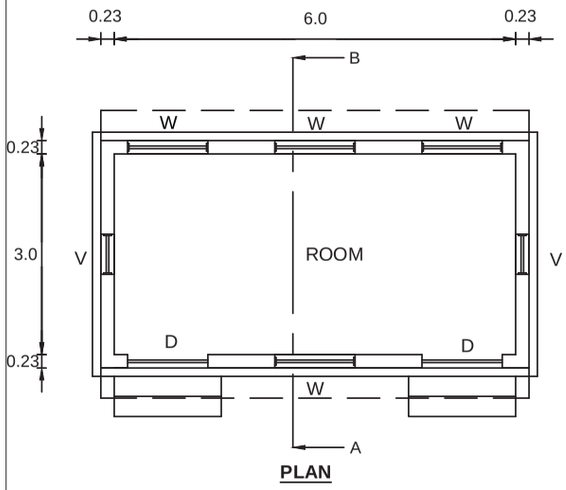


ELEVATION

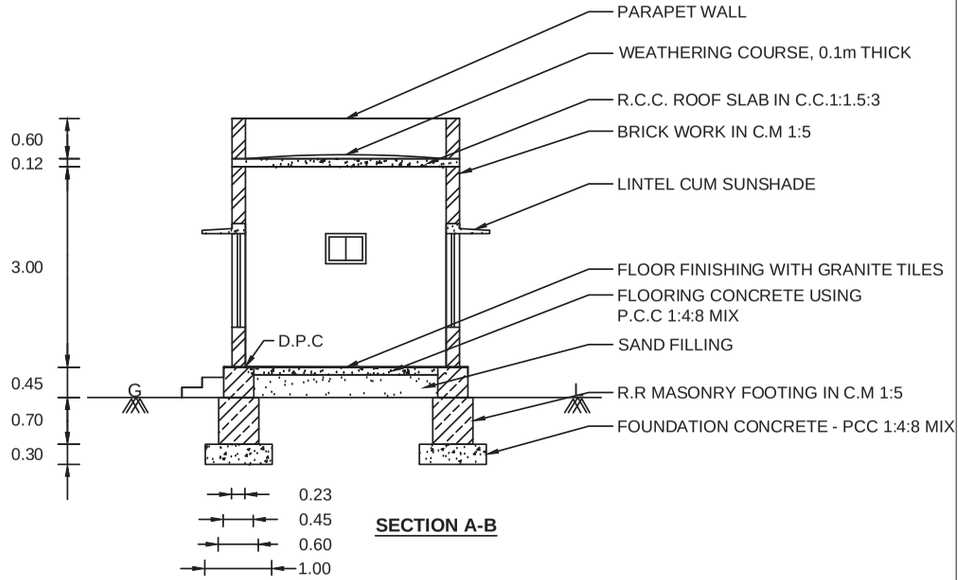




ELEVATION



PLAN



SECTION A-B

A SINGLE ROOM BUILDING

ALL DIMENSIONS ARE IN 'm'

SCALE 1:50

REFERENCE	
D - PANELLED WOODEN DOOR	1.20 X 2.00
W - PANELLED WOODEN WINDOW	1.30 X 1.40
V - VENTILATOR	0.60 X 0.45

NAME	
CLASS	
ROLL NO	
PLATE NO	
DATE	

2) A RESIDENTIAL BUILDING

The following line sketch shows the internal dimensions of A RESIDENTIAL BUILDING. Draw to a scale of 1:50 / 1:100, the following views:

A) Plan

B) Section on AB

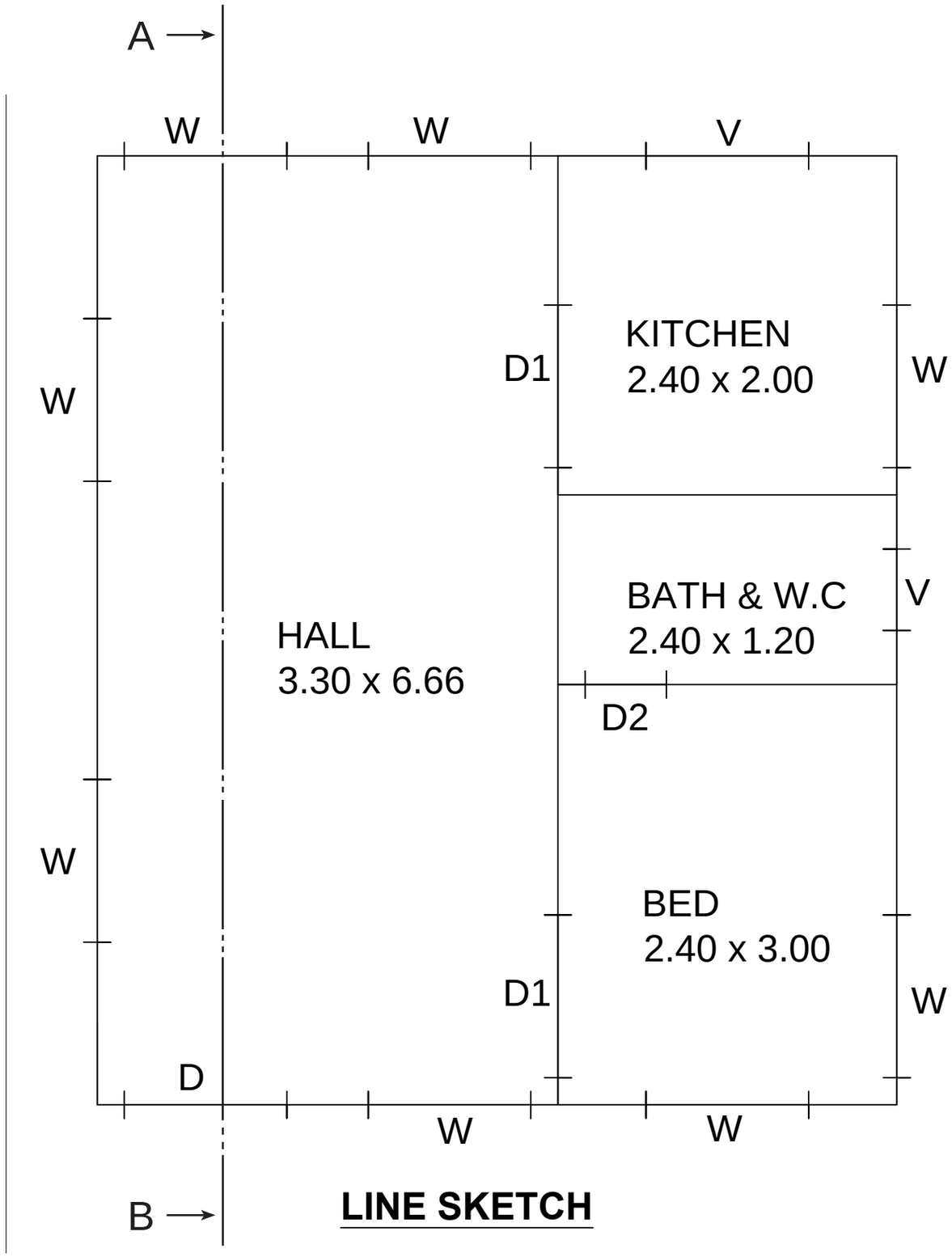
C) Elevation

	SPECIFICATIONS
a) FOUNDATION	Depth of foundation is 1.2 m below natural ground level. The concrete base course is 1.2 m wide and 0.3 m thick in PCC of 1:4:8 mix
b) FOOTING	Isolated footings as per design in RCC 1:1.5:3 will be provided in appropriate places. The breadth and thickness of footing will be 0.90 m and 0.45 m respectively. Over the footing, RCC column 0.23 x 0.23m size are raised up to the grade beam level.
c) GRADE BEAM	A beam of size 0.23 x 0.30 m is provided as per the structural design alround the building up to the ground level.
d) BASEMENT	The basement will be of brick masonry in CM 1:5 and of height 0.6m above the Grade beam. The thickness of plinth wall is 0.23m and a damp proof course 0.02m thick in CM 1:3 which is mixed with 5% crude oil will be provide around the building.
e) FLOORING	Over 0.450m depth of sand filling, flooring of 0.15m thick in CC 1:4:8 mix finished with marble stone is provided.
f) SUPERSTRUCTURE	RCC columns 0.23 x 0.23m are raised above the Grade beam upto roof level in correct sequence. The thickness of walls above plinth level is 0.23 in brick work using CM 1:5. The height of the parapet wall is 0.9 m above the roof top level. Lintel – cum – sunshade will be provided over the door and window openings. Thickness and bearing of RCC lintel in CC 1:1.5:3 will be 0.15m. The projection of sunshade will be 0.45m from the wall. The thickness is 0.08m at support and 0.05m at free end. Ceiling height will be 3m above the floor level.
g) ROOFING	Roofing will be of flat RCC in CC 1:1.5:3, 0.12m thick. A weathering course of 0.1m thick is provided over the roof slab with sufficient slope to drain rainwater.
h) STEPS	Tread = 0.3m. Rise = 0.15m.

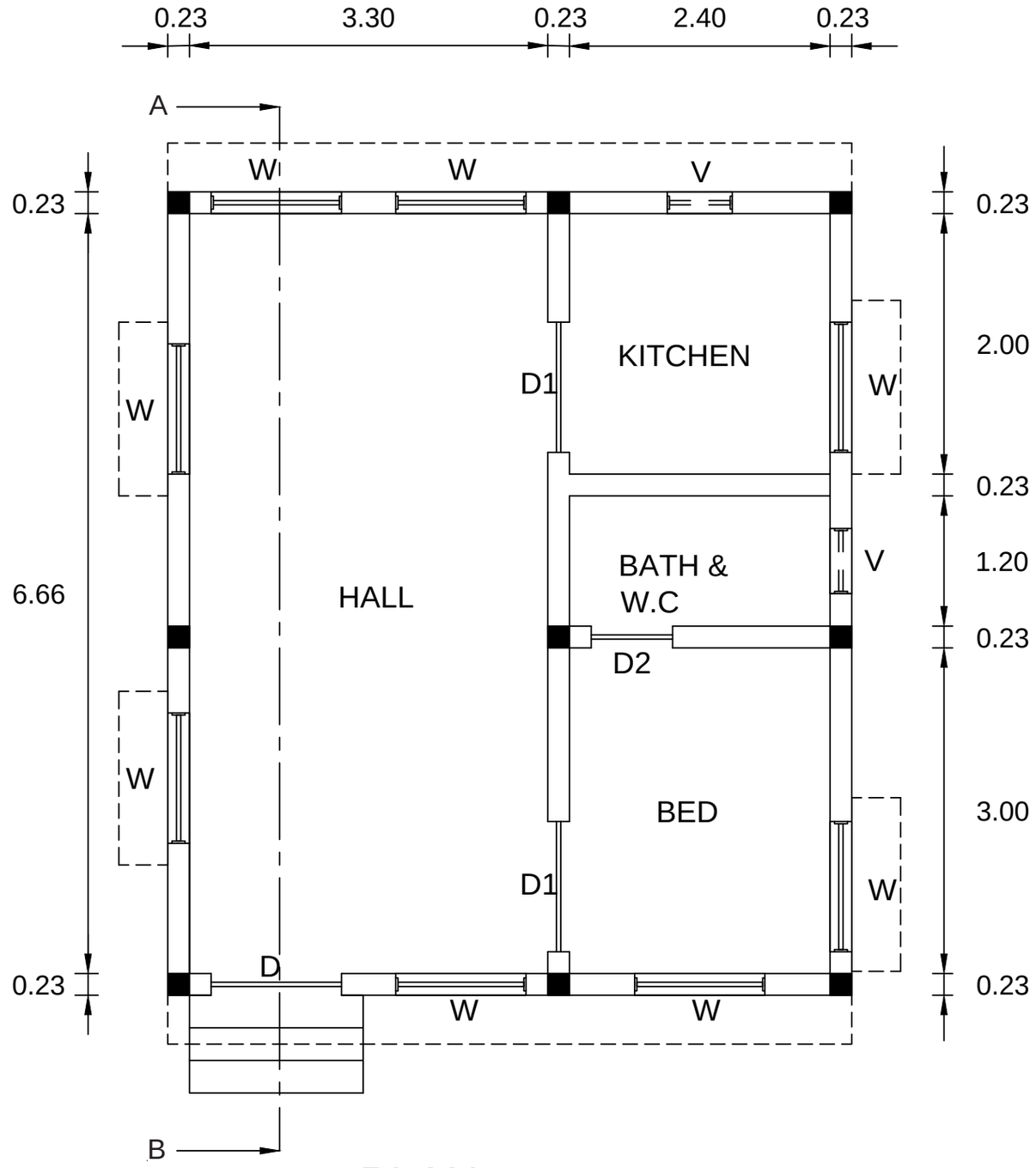
REFERENCE

D -	Panelled Wooden Door	- 1.2 m x 2.10 m
D1	Panelled Wooden Door	- 0.90 m x 2.10m
D2	PVC door	- 0.75 x 2.10 m
W -	Panelled Wooden Window	- 1.2 m x 1.40 m
V -	Glazed Ventilator	- 0.6 mx0.45m

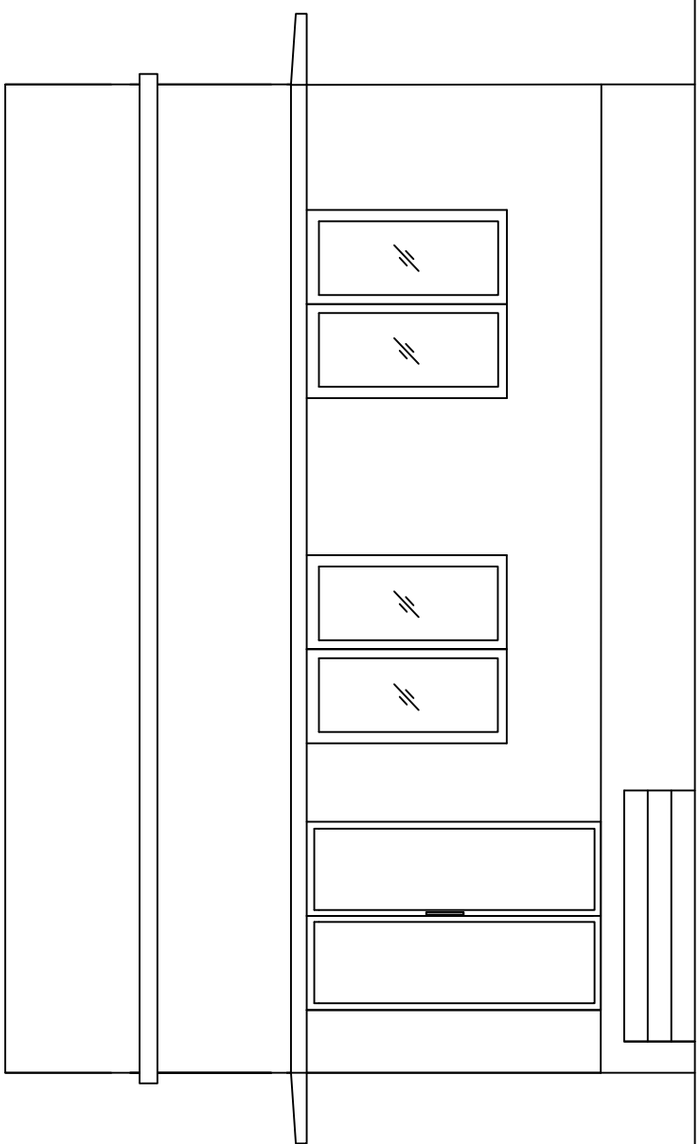
Assume any other data suitably, if necessary.



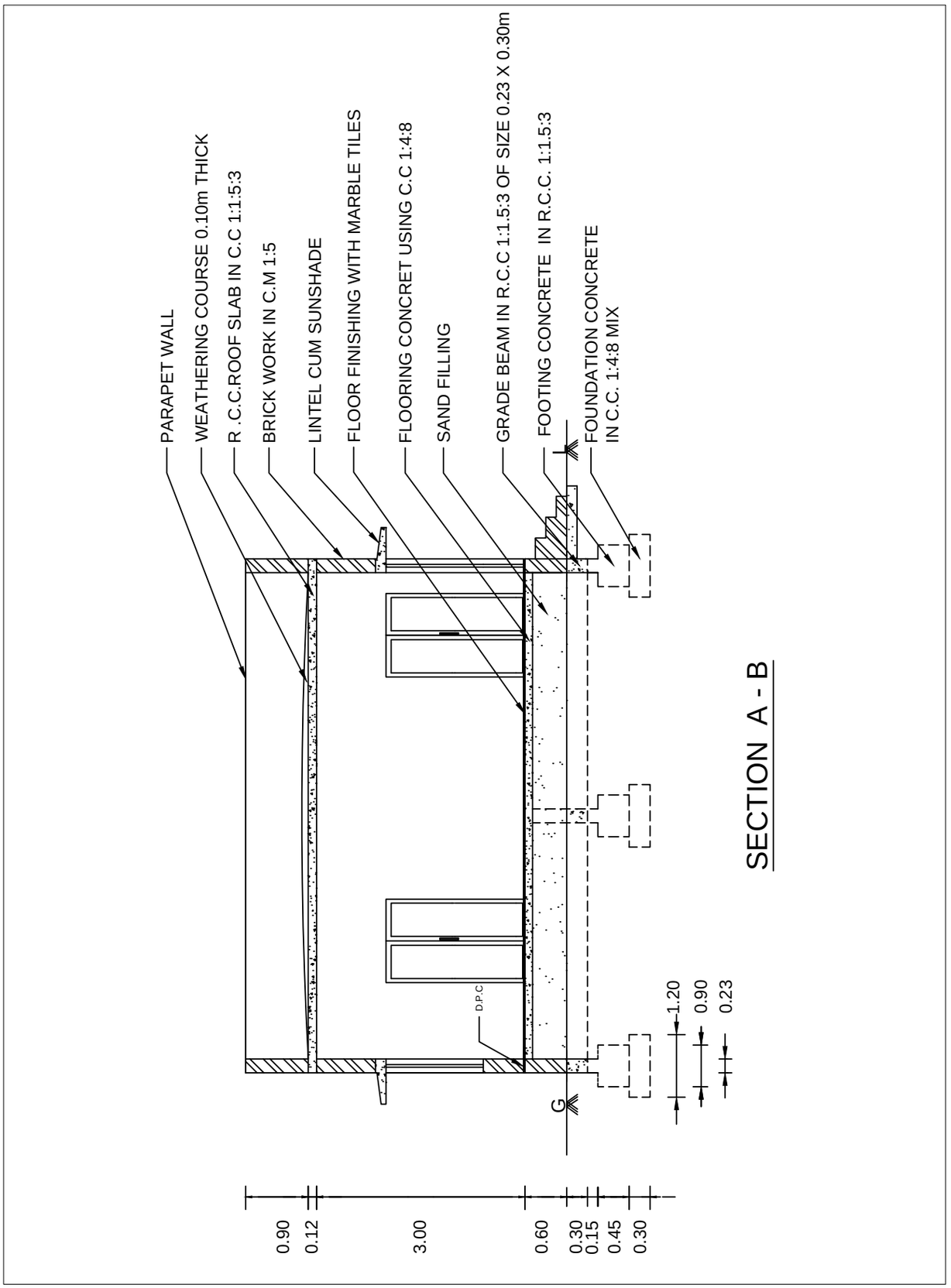
LINE SKETCH

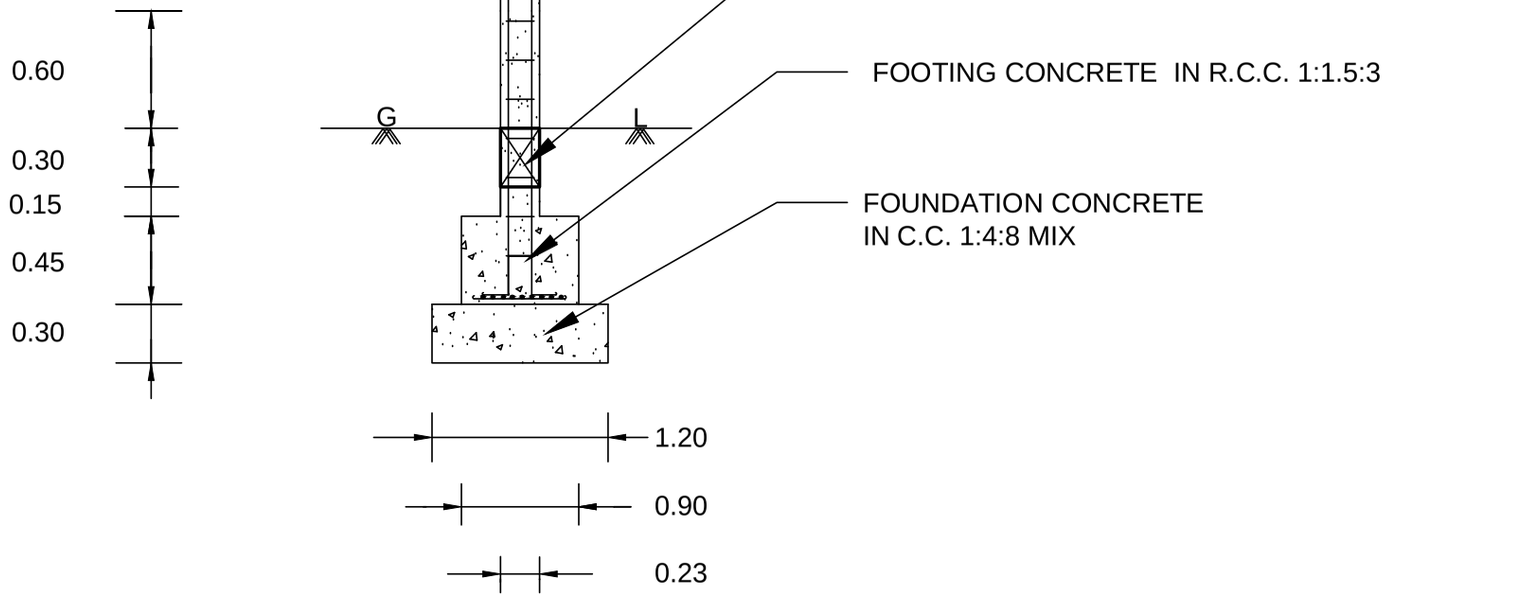


PLAN



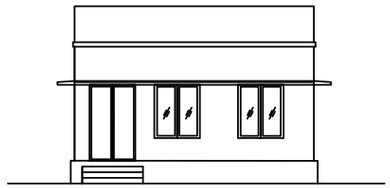
ELEVATION



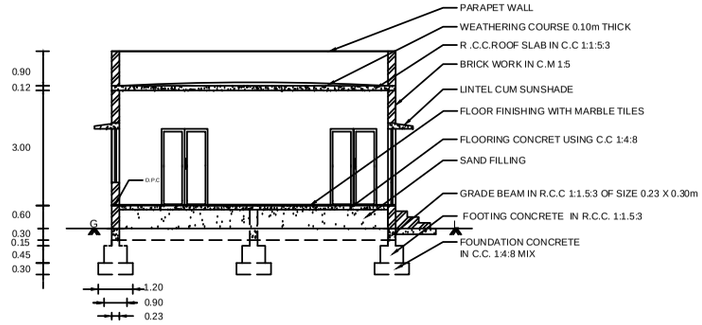


FOUNDATION DETAILS

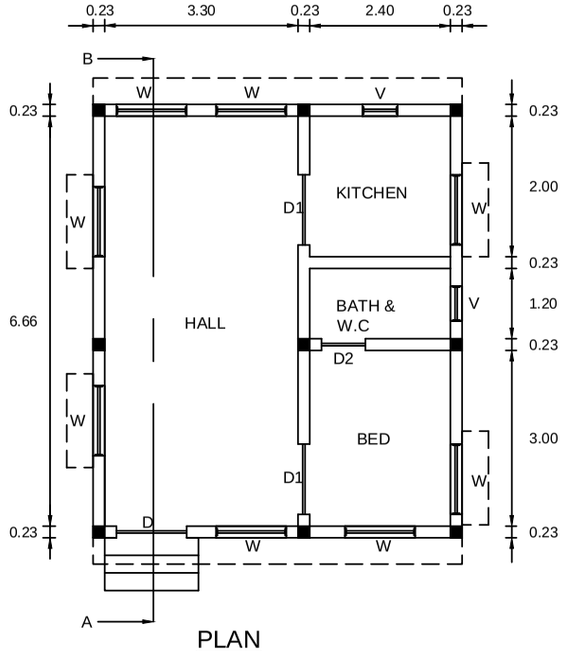
ALL DIMENSIONS ARE IN 'm'



ELEVATION



SECTION A - B



PLAN

A RESIDENTIAL BUILDING

ALL DIMENSIONS ARE IN 'm'

SCALE 1:100

REFERENCE	
D - PANELLED WOODEN DOOR	1.20 X 2.10
D2 - PVC DOOR	0.75 X 2.10
D1 - PANELLED WOODEN DOOR	0.90 X 2.10
W - PANELLED WOODEN WINDOW	1.20 X 1.40
V - VENTILATOR	0.60 X 0.45

NAME	
CLASS	
ROLL NO	
PLATE NO	
DATE	

3) A SCHOOL BUILDING

The following line sketch shows the internal dimensions of A SCHOOL BUILDING. Draw to a scale of 1:50/1:100, the following views:

A) Plan

B) Section on AB

C) Elevation

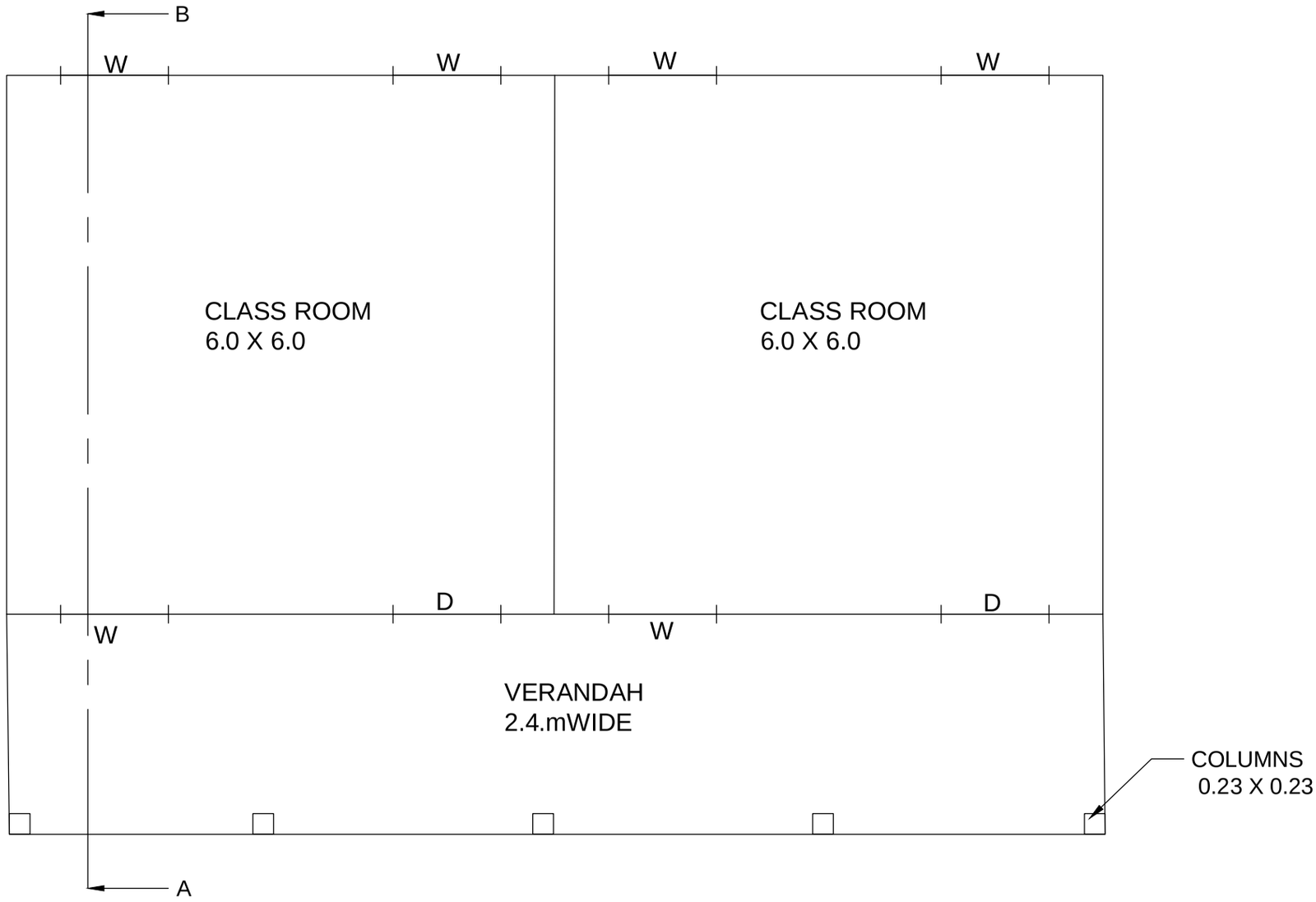
	SPECIFICATIONS
a) FOUNDATION	Depth of foundation is 1.50 m below natural ground level. The concrete base course is 1.2 m wide and 0.3 m thick in PCC of 1:4:8 mix.
b) FOOTING	Isolated footings as per design in RCC 1:1.5:3 will be provided in appropriate places. The breadth and thickness of footing will be 1.00 m and 0.45 m respectively. Over the footing, RCC column 0.23 x 0.23m (or) 0.23 x 0.45 m size are raised upto the grade beam level .
c) GRADE BEAM	A beam of size 0.23 x 0.45 m is provided as per the structural design alround the building up to the ground level.
d) BASEMENT	The basement will be of brick masonry in CM 1:5 and of height 0.45m above the Grade beam. The thickness of plinth wall is 0.23m and a damp proof course 0.02m thick in CM 1:3 which is mixed with 5% crude oil will be provide around the building.
e) FLOORING	Over 0.30m depth of sand filling, flooring of 0.15m thick in CC 1:4:8 finished with tiles is provided.
f) SUPERSTRUCTURE	RCC columns 0.23 x 0.23 m and 0.23 x 0.45 m are raised in right places above the Grade beam upto roof level in correct sequence. The thickness of walls is 0.23 in brick work using CM 1:5. The height of the parapet wall is 0.60 m above the roof top level. Lintel – cum – sunshade will be provided over the door and window openings. Thickness and bearing of RCC lintel in CC 1:1:5:3 will be 0.15m. The projection of sunshade will be 0.45m from the wall. The thickness is 0.08m at support and 0.05m at free end. Ceiling height will be 3m above the floor level.
g) ROOFING	Roofing will be of flat RCC in CC 1:1.5:3, 0.12m thick. A weathering course of 0.1m thick is provided over the roof slab with sufficient slope to drain rainwater.
h) STEPS	Tread = 0.3m. Rise = 0.15m.

REFERENCE

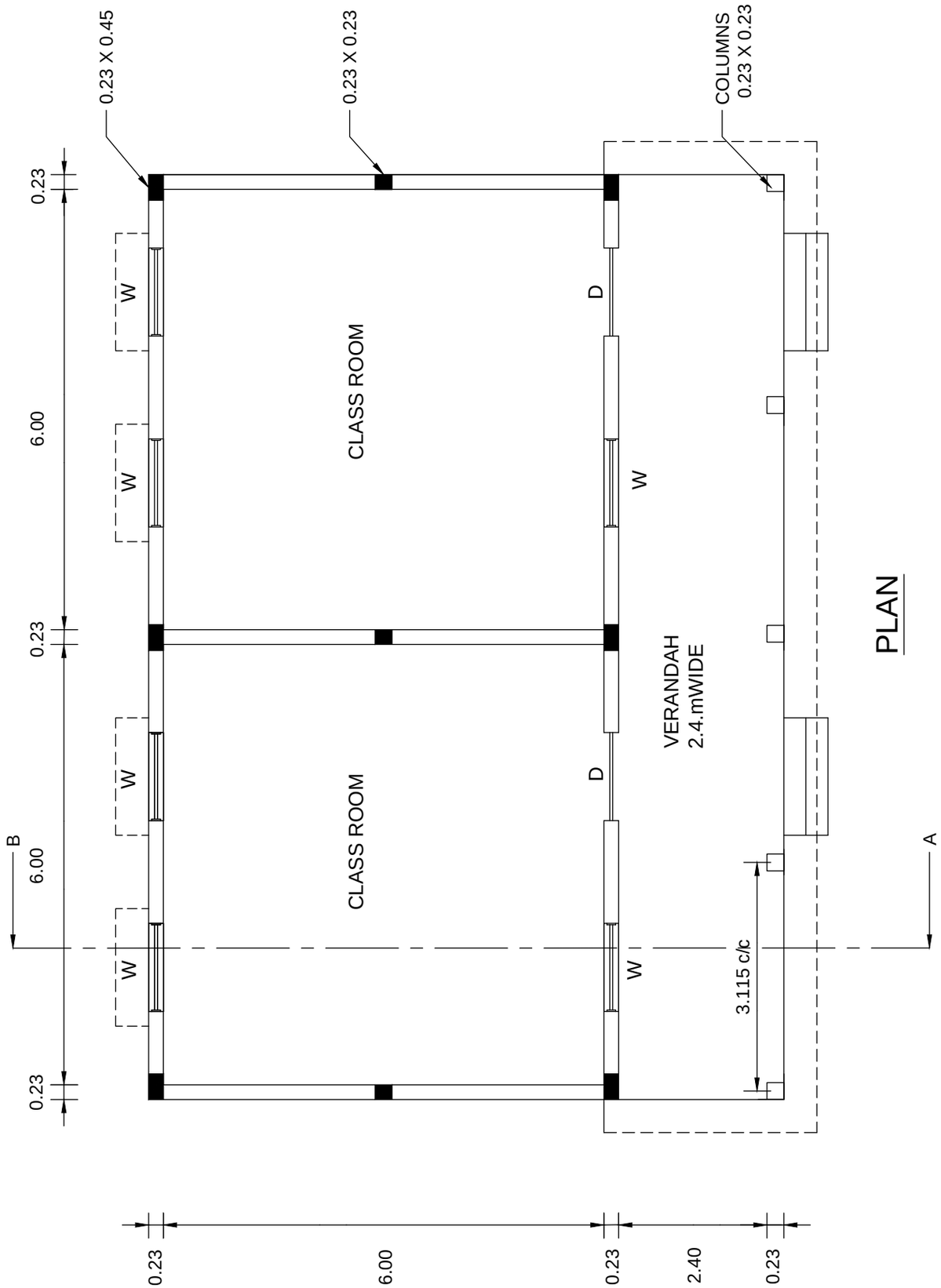
D - Panelled Wooden Door - 1.2 m x 2.10 m

W - Panelled Wooden Window - 1.2 m x 1.40 m

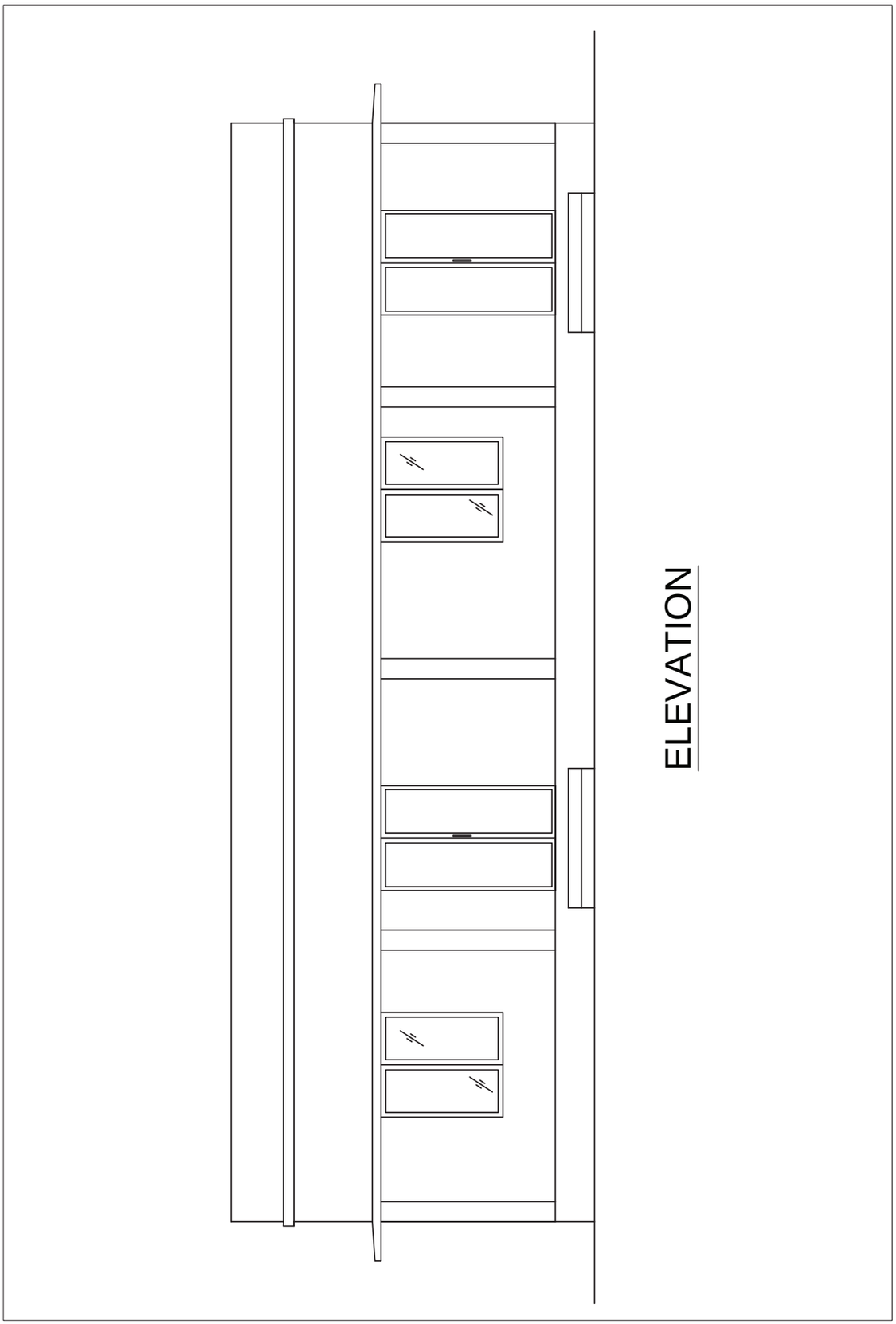
Assume any other data suitably, if necessary.

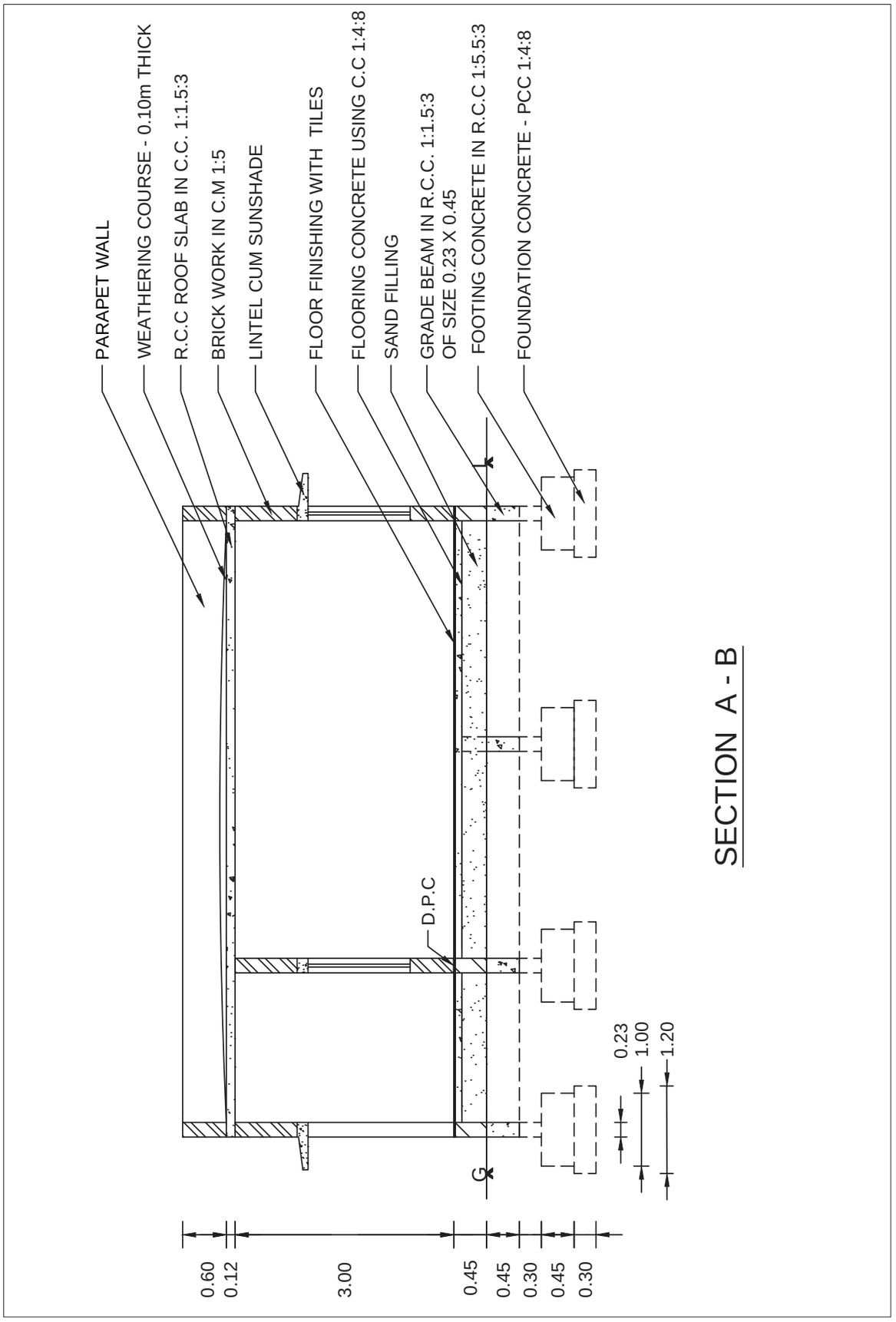


LINE SKTECH

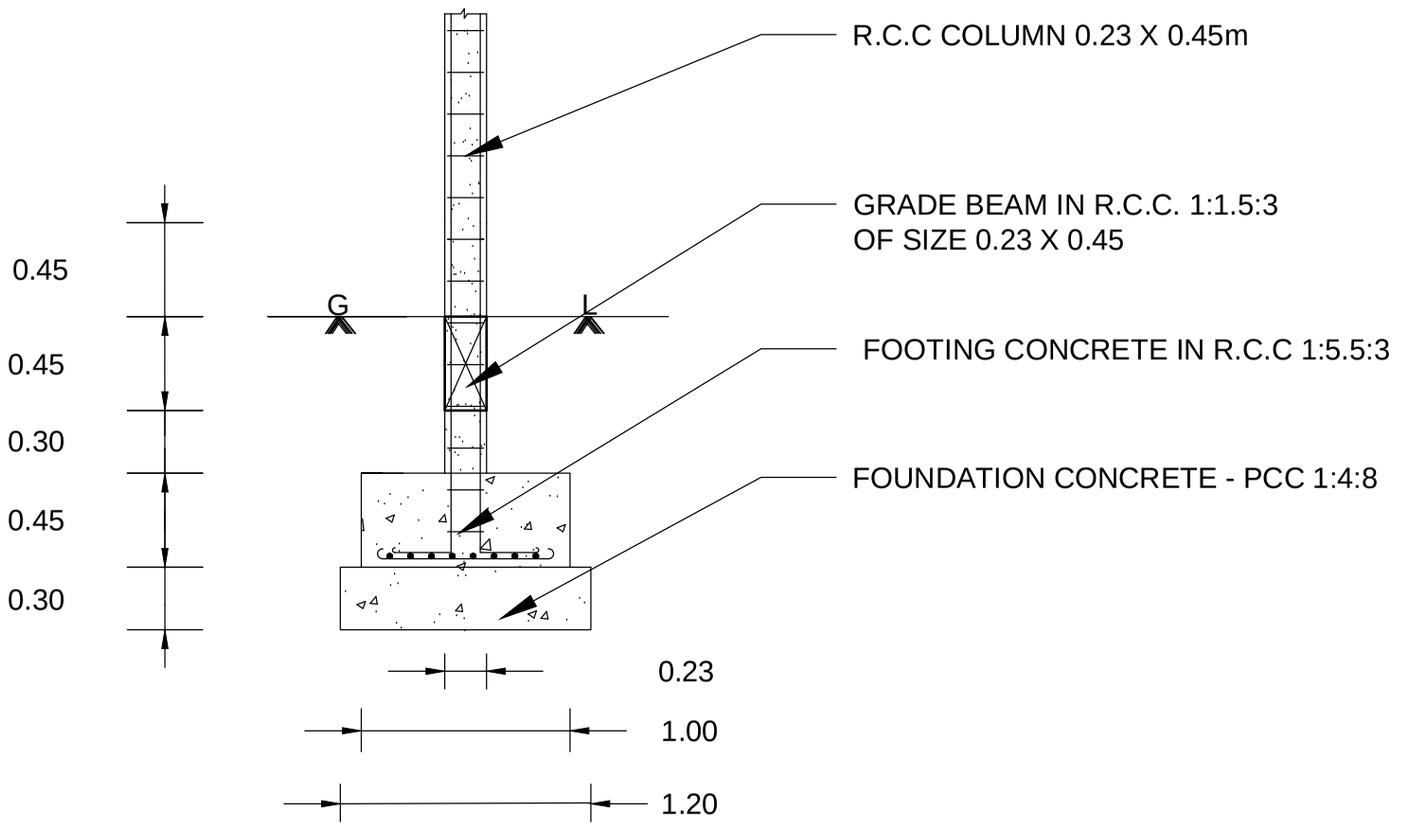


PLAN



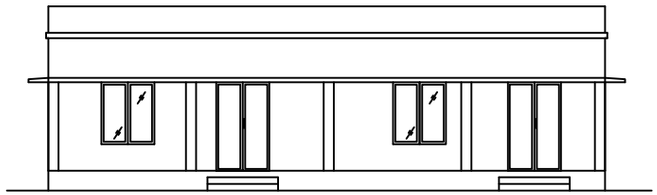


SECTION A - B

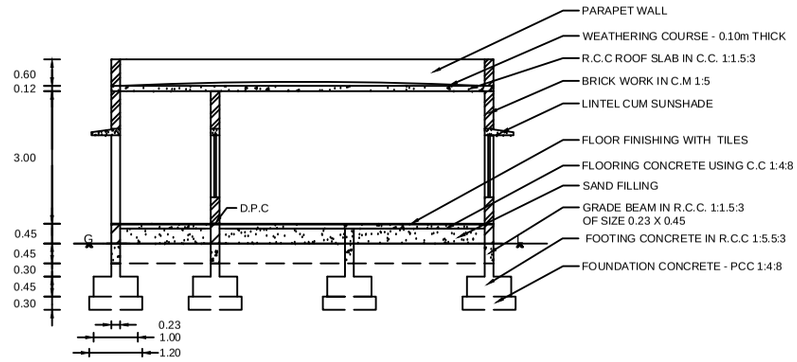


FOUNDATION DETAILS

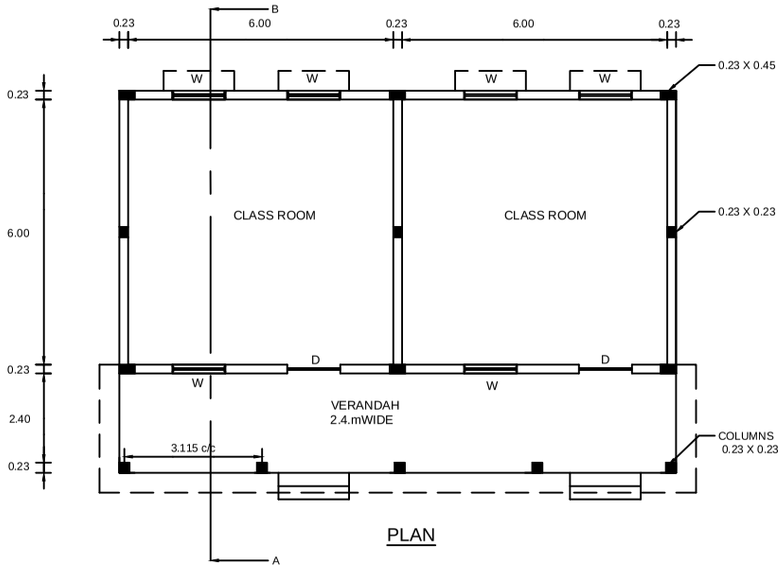
ALL DIMENSION ARE IN 'm'



ELEVATION



SECTION A - B



PLAN

A SCHOOL BUILDING

ALL DIMENSION ARE IN 'm'

SCALE 1:100

REFERENCE	
PANELLED WOODEN DOOR	1.20 X 2.00
PANELLED WOODEN WINDOW	1.20 X 1.40

NAME	
CLASS	
ROLL NO	
PLATE NO	
DATE	

II. BUILDING DRAWINGS (AUTOCAD)

4) A SINGLE ROOM BUILDING – Using AUTO CAD

The following line sketch shows the internal dimensions of A SINGLE ROOM BUILDING. Draw to a scale of 1:50 / 1:100, the following views: using AUTO CAD

A) Plan

B) Section on AB

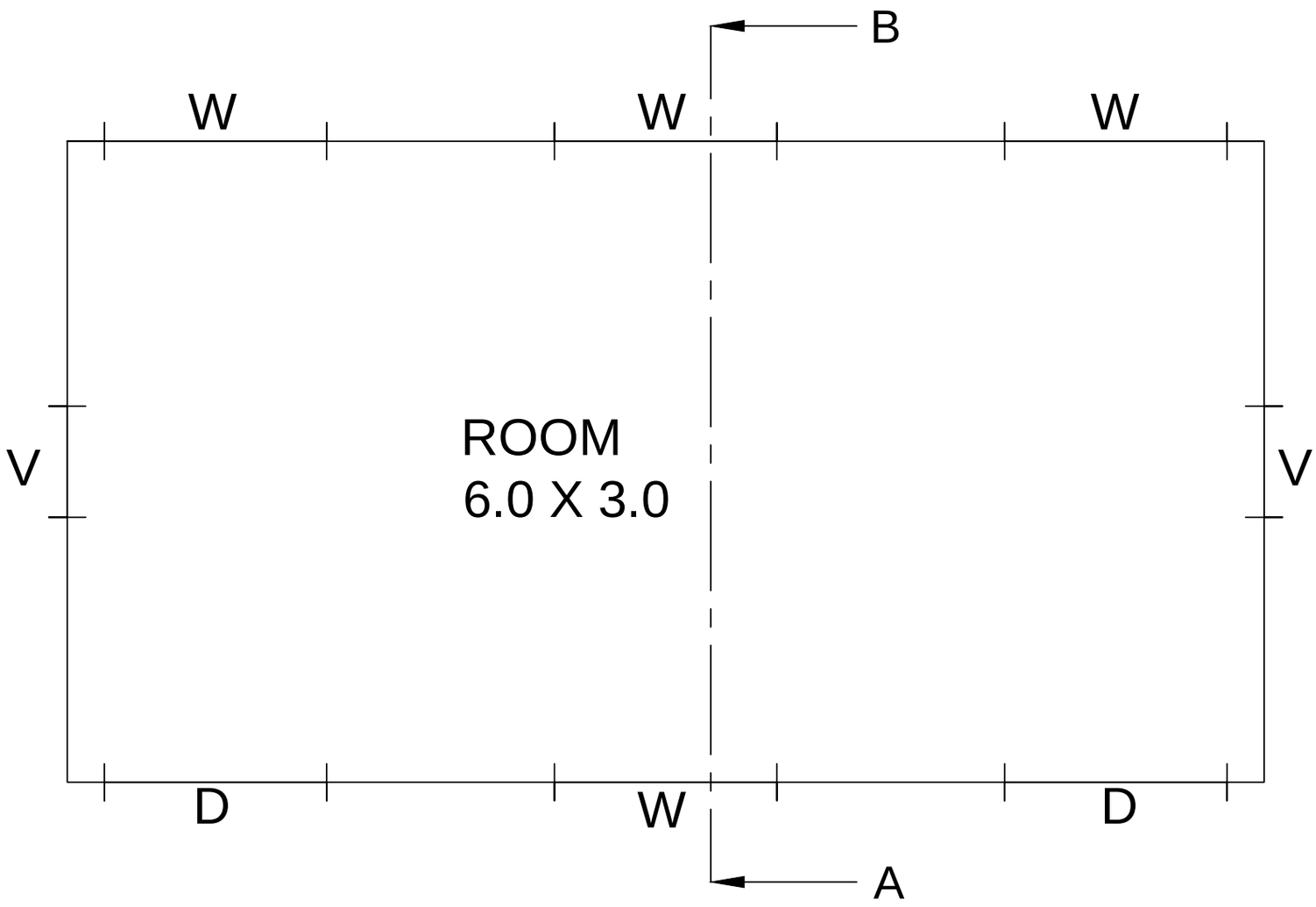
C) Elevation

	SPECIFICATIONS
a) FOUNDATION	Depth of foundation is 1 m below natural ground level. The concrete base course is 1 m wide and 0.3 m thick in PCC of 1:4:8 mix.
b) FOOTING	A footing of RR masonry in CM 1:5 having width 0.6m and depth 0.7m will be provided over the base course layer.
c) BASEMENT	The basement will be of RR masonry in CM 1:5 and of height 0.45m above the natural ground level. The thickness of plinth wall is 0.45m and a damp proof course 0.02m thick in CM 1:3 will be provided around the building.
d) FLOORING	Over 0.340m depth of sand filling, flooring of 0.110m thick in CC 1:4:8 finished with granite tiles is provided.
e) SUPERSTRUCTURE	The thickness of walls above plinth level is 0.23 m in brick work using CM 1:5. The height of the parapet wall is 0.6m above the roof top level. Lintel – cum – sunshade will be provided over the door and window openings. Thickness and bearing of RCC lintel in CC 1:1.5:3 will be 0.15m. The projection of sunshade will be 0.45m from the wall. The thickness is 0.08m at support and 0.05m at free end. Ceiling height will be 3m above the floor level.
f) ROOFING	Roofing will be of flat RCC in CC 1:1.5:3, 0.12m thick. A weathering course of 0.1m thick is provided over the roof slab with sufficient slope to drain rainwater.
g) STEPS	Tread = 0.3m. Rise = 0.15m.

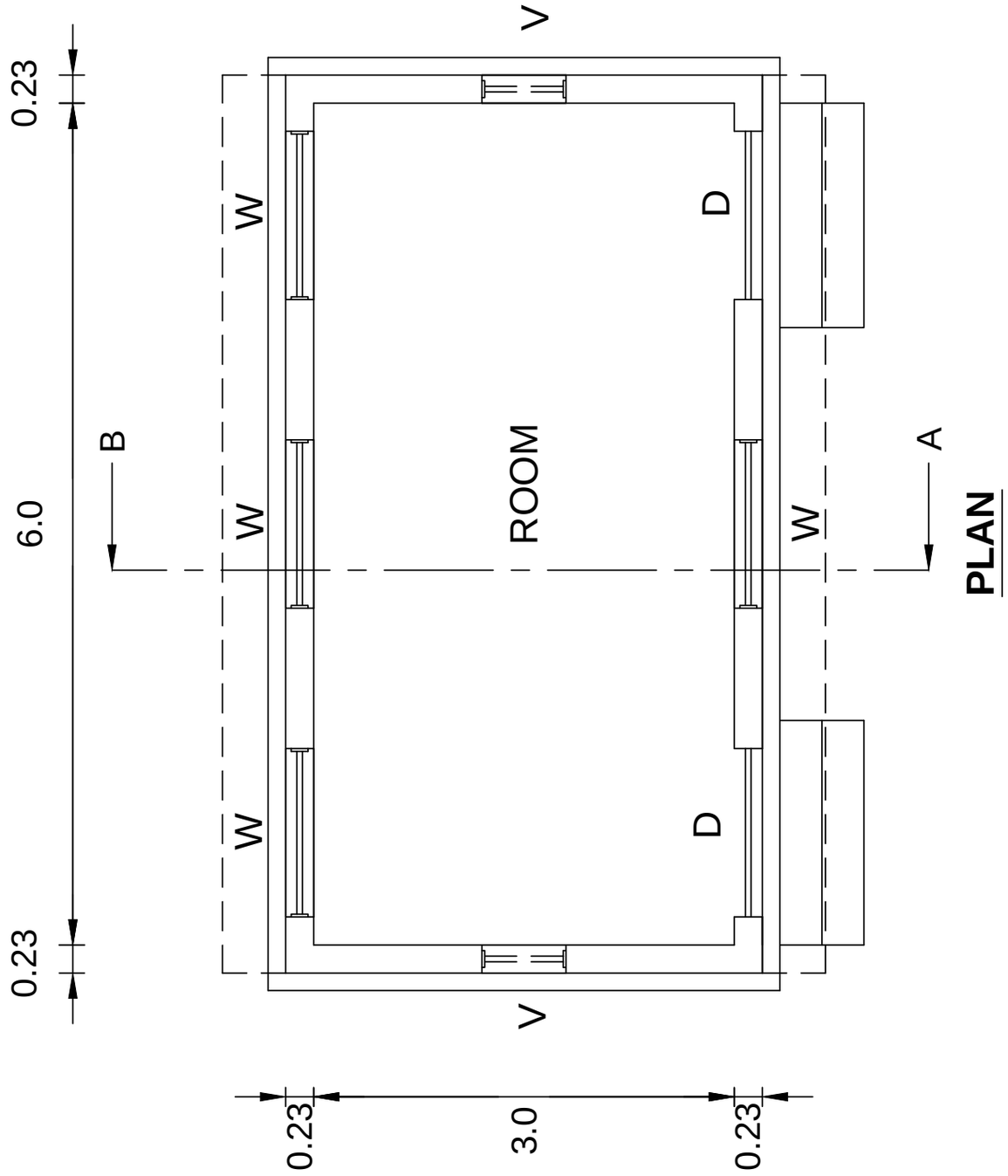
REFERENCE

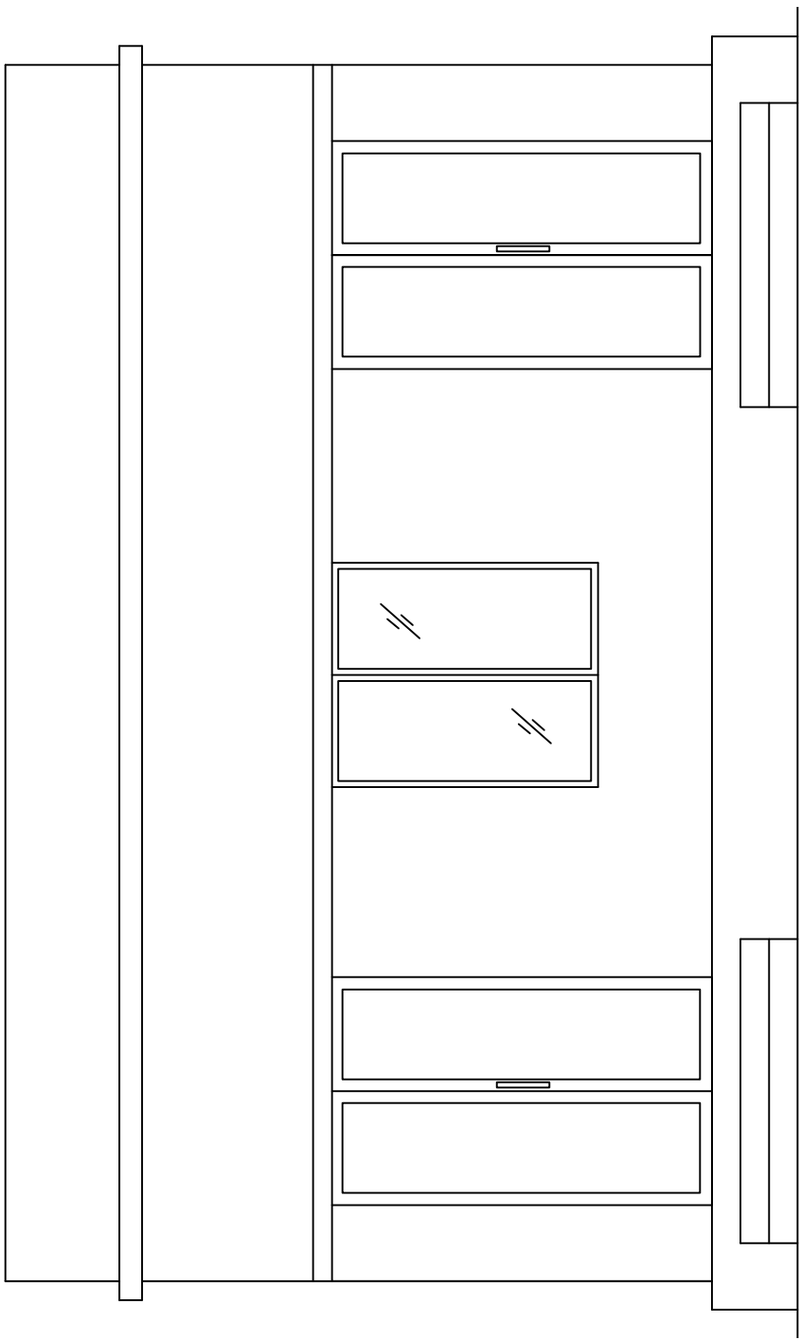
D -	Panelled Wooden Door	- 1.2 m x 2.10 m
W -	Panelled Wooden Window	- 1.2 m x 1.40 m
V -	Glazed Ventilator	- 0.6 mx0.45m

Assume any other data suitably, if necessary.

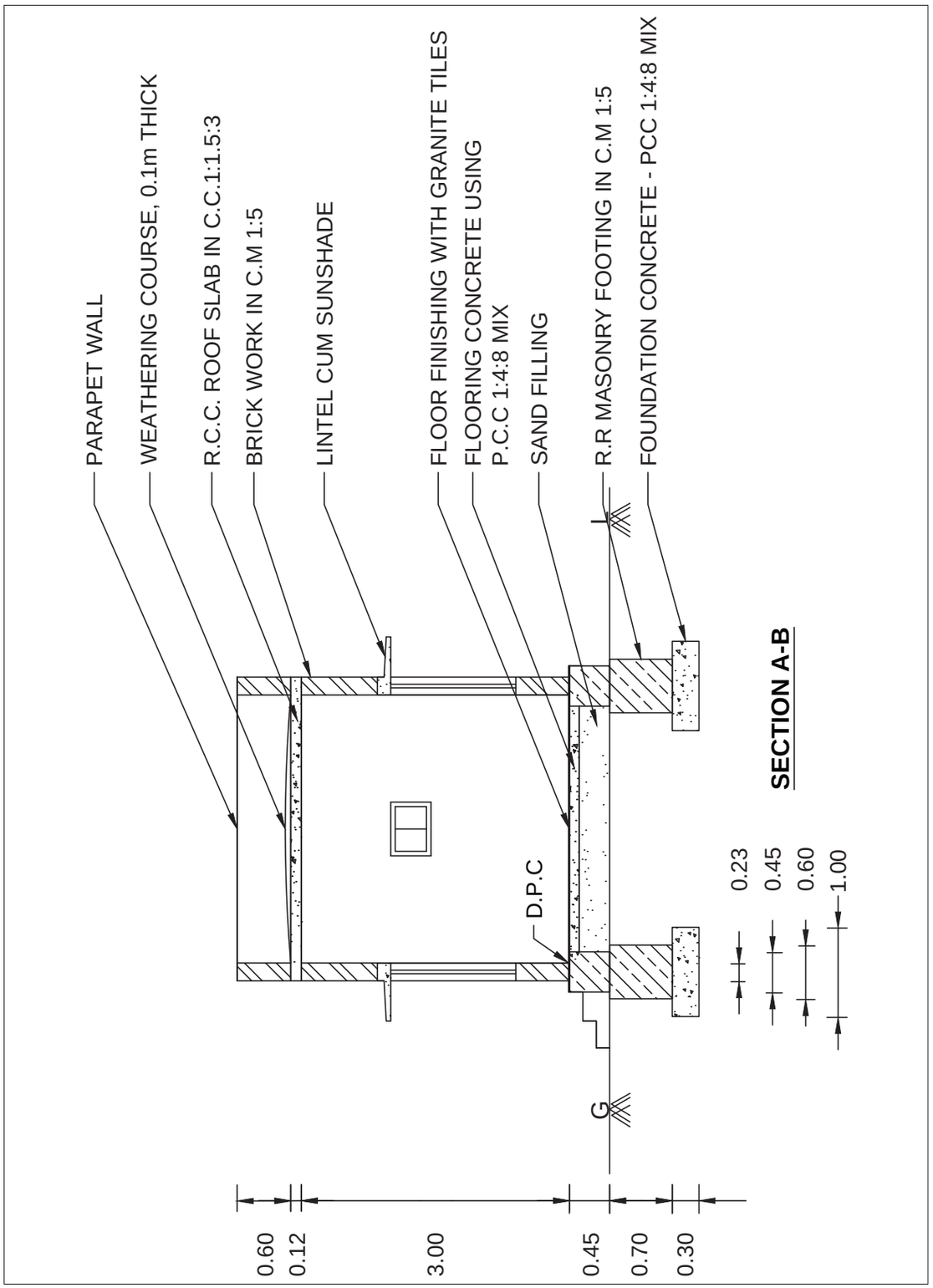


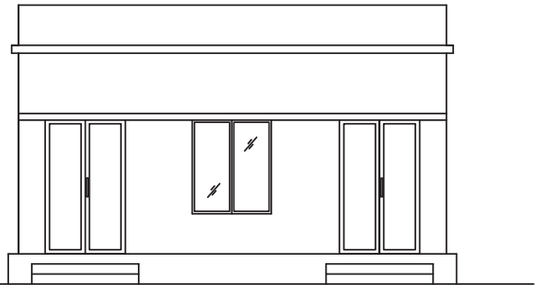
LINE SKETCH



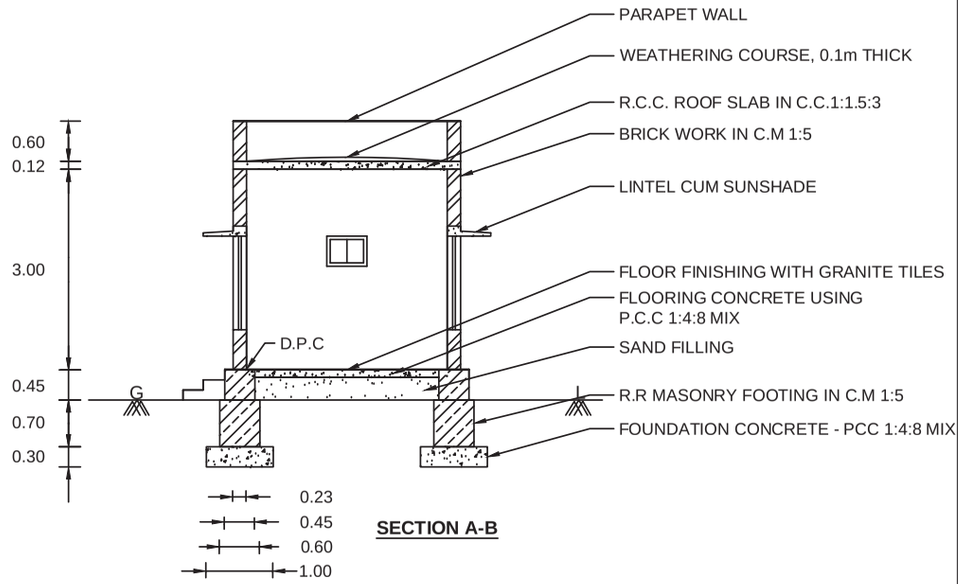


ELEVATION

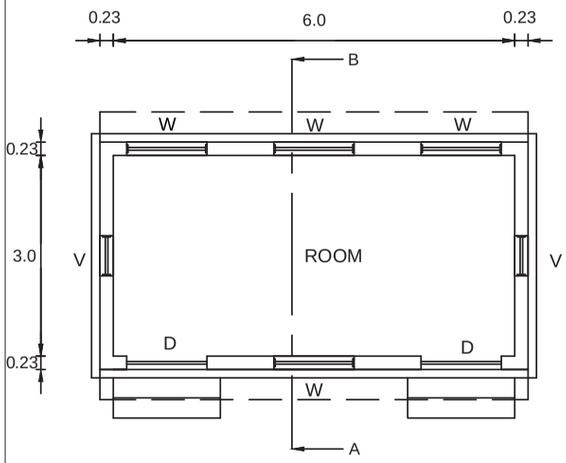




ELEVATION



SECTION A-B



PLAN

A SINGLE ROOM BUILDING

ALL DIMENSIONS ARE IN 'm'

SCALE 1:50

REFERENCE	
D - PANELLED WOODEN DOOR	1.20 X 2.00
W - PANELLED WOODEN WINDOW	1.30 X 1.40
V - VENTILATOR	0.60 X 0.45

NAME	
CLASS	
ROLL NO	
PLATE NO	
DATE	

5) A RESIDENTIAL BUILDING – Using AUTO CAD

The following line sketch shows the internal dimensions of A RESIDENTIAL BUILDING. Draw to a scale of 1:50 / 1:00 the following views: using AUTO CAD

A) Plan

B) Section on AB

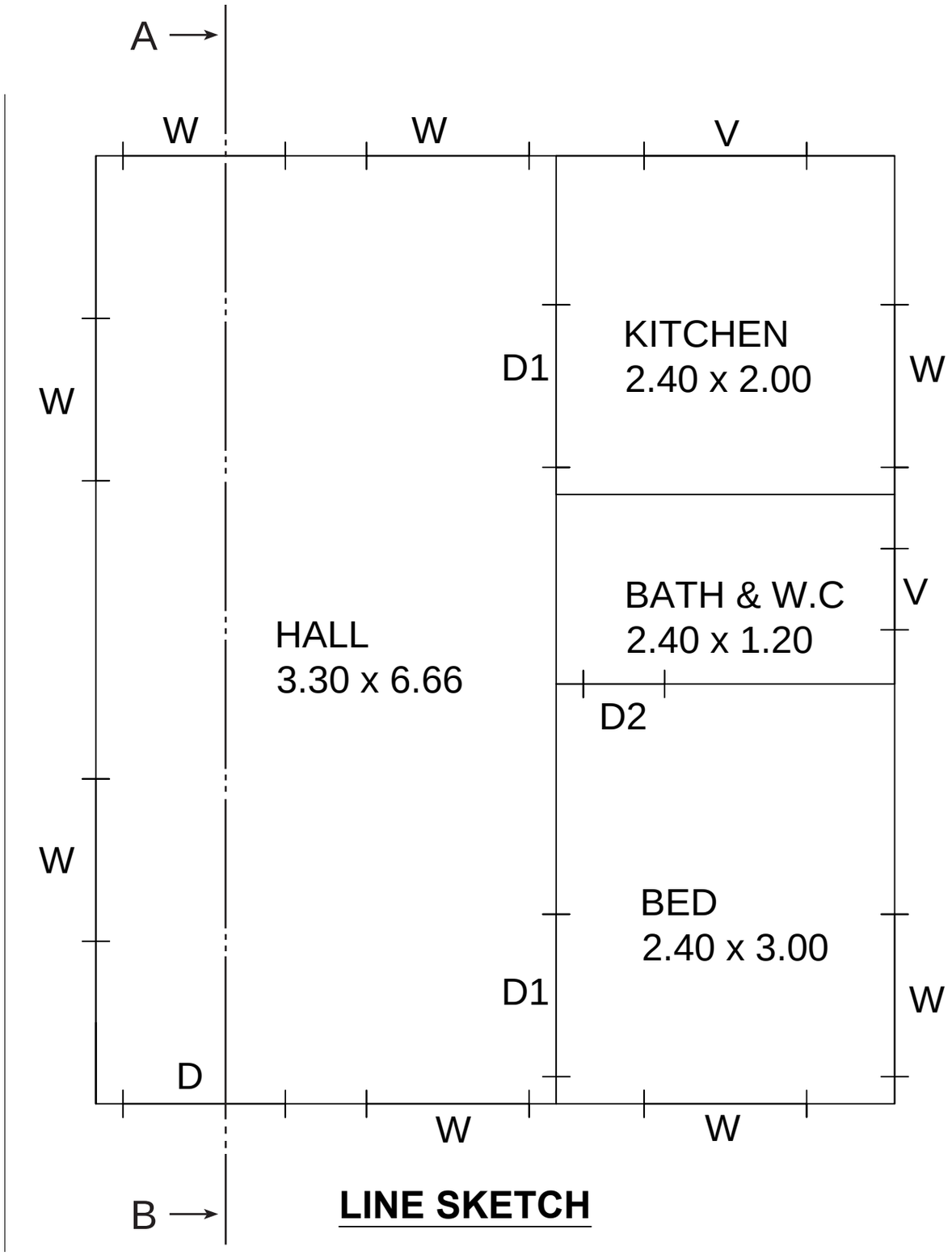
C) Elevation

SPECIFICATIONS	
a) FOUNDATION	Depth of foundation is 1.2 m below natural ground level. The concrete base course is 1.2 m wide and 0.3 m thick in PCC of 1:4:8 mix
b) FOOTING	Isolated footings as per design in RCC 1:1.5:3 will be provided in appropriate places. The breadth and thickness of footing will be 0.90 m and 0.45 m respectively. Over the footing, RCC column 0.23 x 0.23m size are raised up to the grade beam level.
c) GRADE BEAM	A beam of size 0.23 x 0.30 m is provided as per the structural design alround the building up to the ground level.
d) BASEMENT	The basement will be of brick masonry in CM 1:5 and of height 0.6m above the Grade beam. The thickness of plinth wall is 0.23m and a damp proof course 0.02m thick in CM 1:3 which is mixed with 5% crude oil will be provide around the building.
e) FLOORING	Over 0.450m depth of sand filling, flooring of 0.15m thick in CC 1:4:8 mix finished with marble stone is provided.
f) SUPERSTRUCTURE	RCC columns 0.23 x 0.23m are raised above the Grade beam upto roof level in correct sequence. The thickness of walls above plinth level is 0.23 in brick work using CM 1:5. The height of the parapet wall is 0.9 m above the roof top level. Lintel – cum – sunshade will be provided over the door and window openings. Thickness and bearing of RCC lintel in CC 1:1.5:3 will be 0.15m. The projection of sunshade will be 0.45m from the wall. The thickness is 0.08m at support and 0.05m at free end. Ceiling height will be 3m above the floor level.
g) ROOFING	Roofing will be of flat RCC in CC 1:1.5:3, 0.12m thick. A weathering course of 0.1m thick is provided over the roof slab with sufficient slope to drain rainwater.
h) STEPS	Tread = 0.3m. Rise = 0.15m.

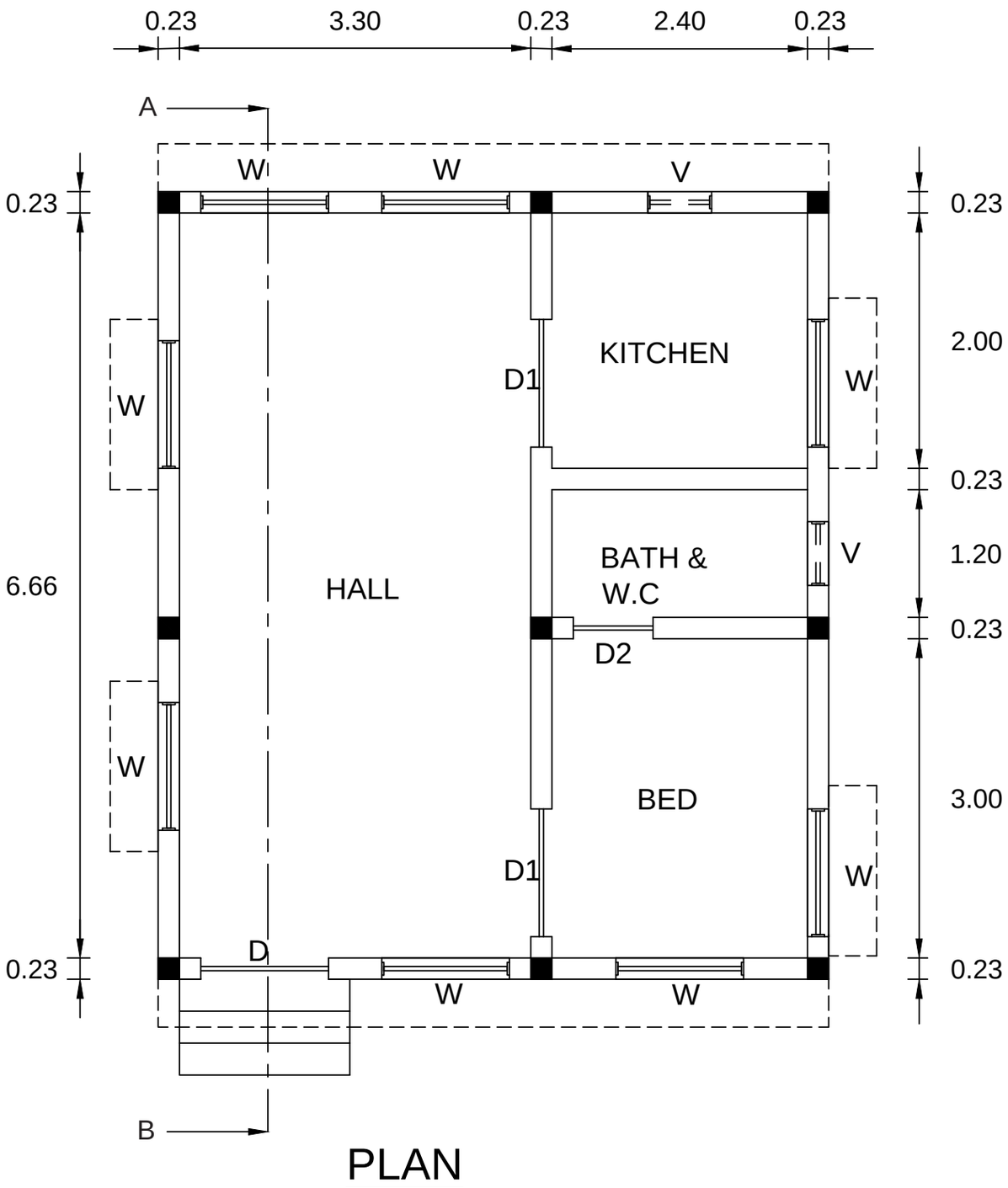
REFERENCE

D -	Panelled Wooden Door	- 1.2 m x 2.10 m
D1	Panelled Wooden Door	- 0.90 m x 2.10m
D2	PVC door	- 0.75 x 2.10 m
W -	Panelled Wooden Window	- 1.2 m x 1.40 m
V -	Glazed Ventilator	- 0.6 mx0.45m

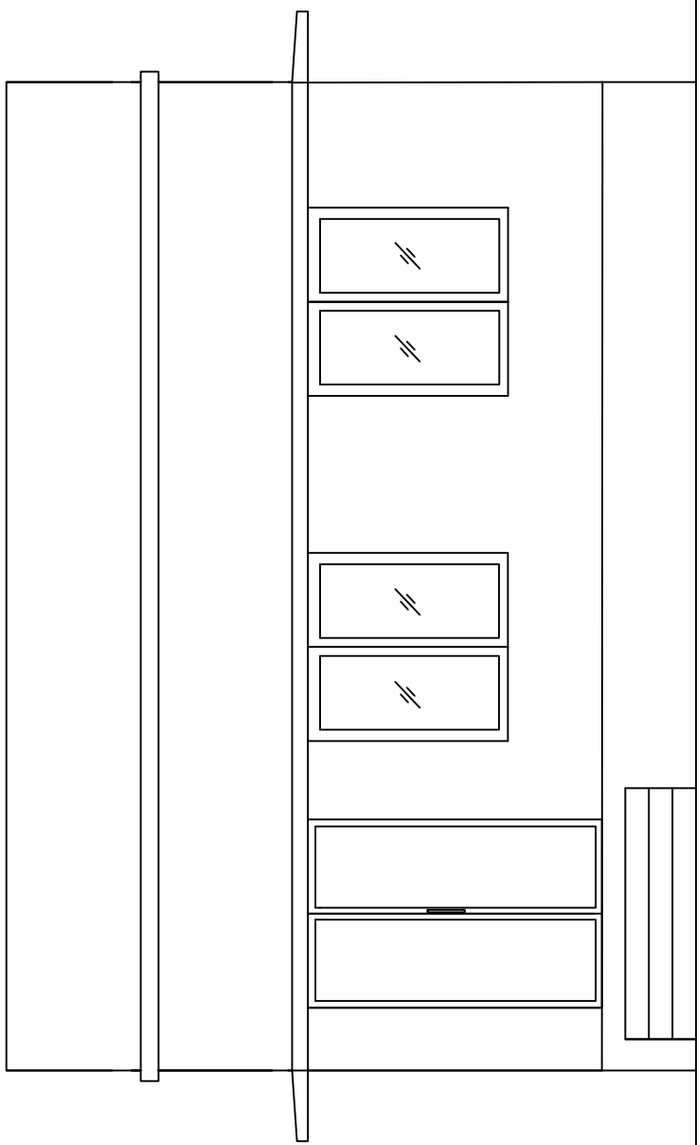
Assume any other data suitably, if necessary.



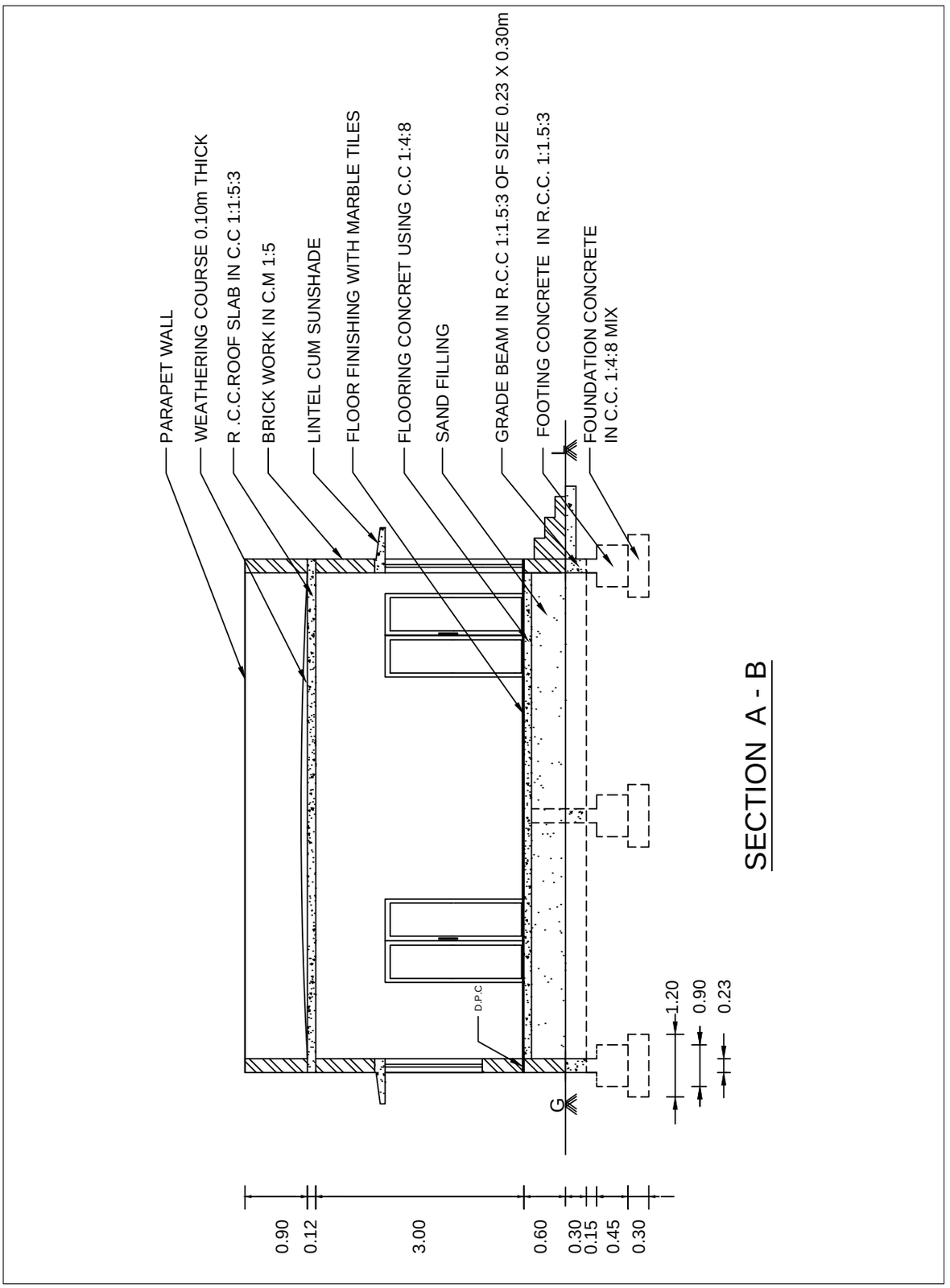
LINE SKETCH

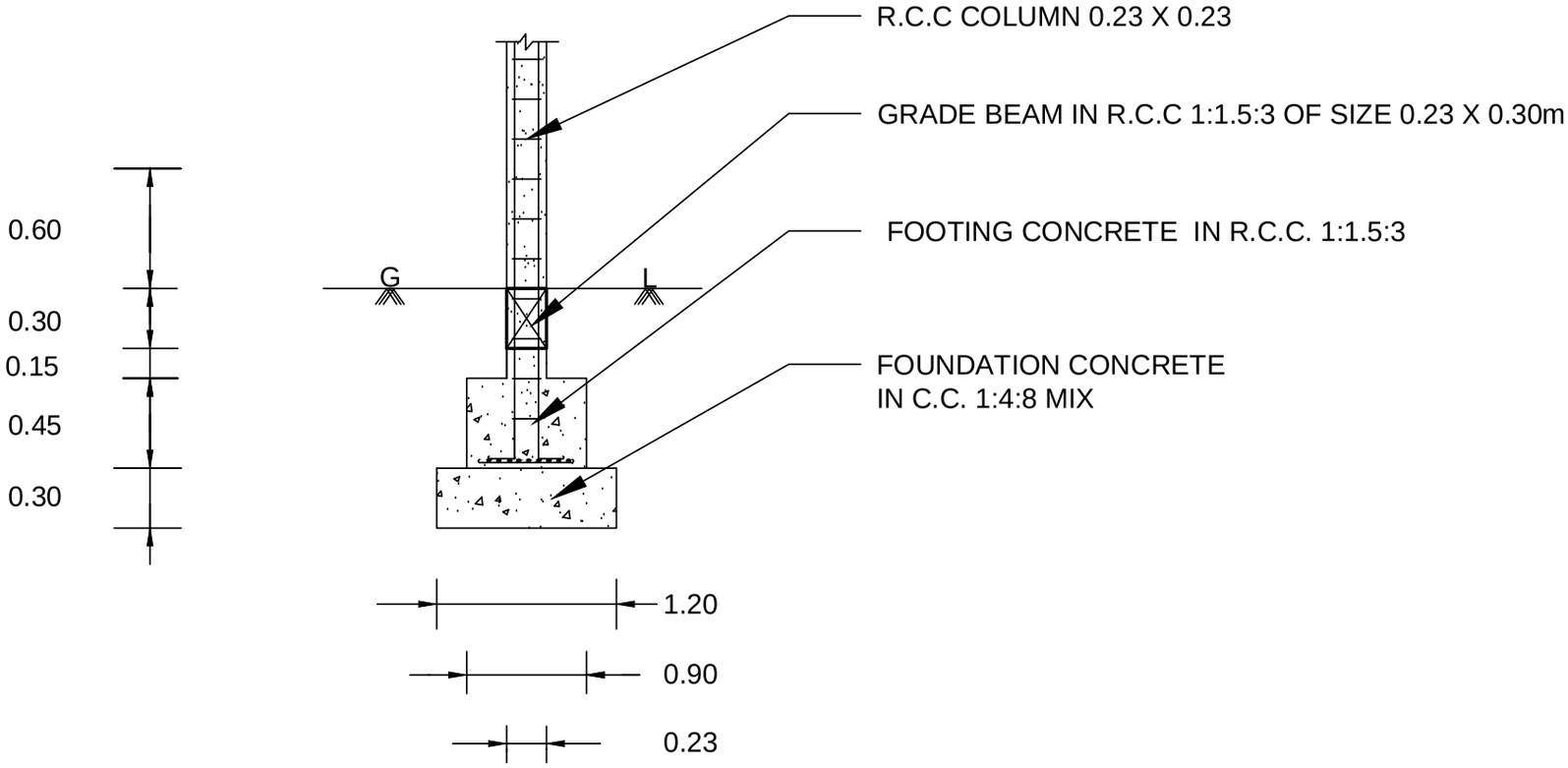


PLAN



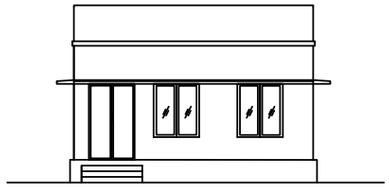
ELEVATION



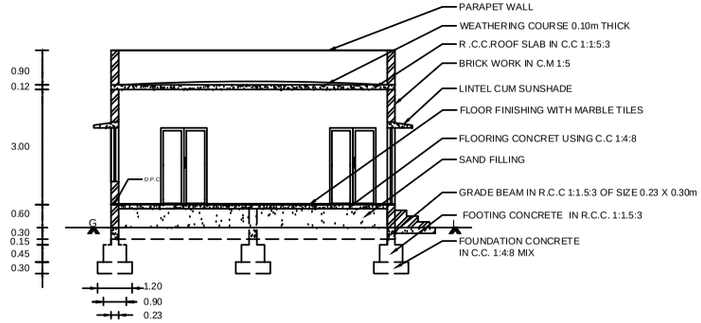


FOUNDATION DETAILS

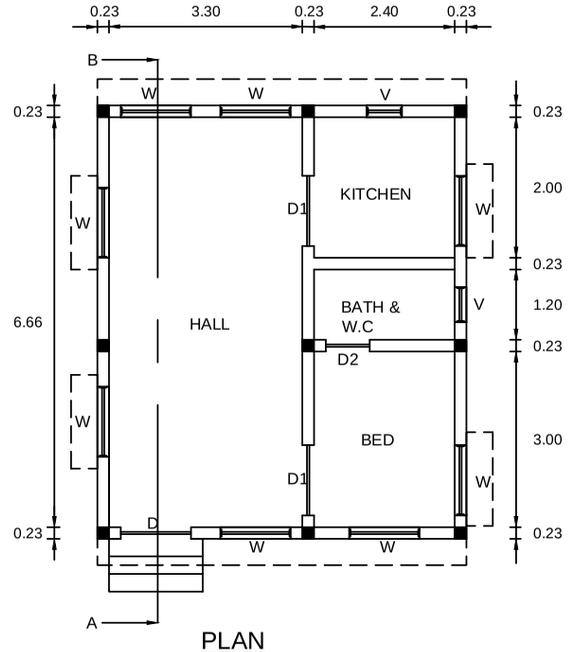
ALL DIMENSIONS ARE IN 'm'



ELEVATION



SECTION A - B



PLAN

A RESIDENTIAL BUILDING

ALL DIMENSIONS ARE IN 'm'

SCALE 1:100

REFERENCE	
D - PANELLED WOODEN DOOR	1.20 X 2.10
D2 - PVC DOOR	0.75 X 2.10
D1 - PANELLED WOODEN DOOR	0.90 X 2.10
W - PANELLED WOODEN WINDOW	1.20 X 1.40
V - VENTILATOR	0.60 X 0.45

NAME	
CLASS	
ROLL NO	
PLATE NO	
DATE	

6) A SCHOOL BUILDING – Using AUTO CAD

The following line sketch shows the internal dimensions of A SCHOOL BUILDING. Draw to a scale of 1:50/1:100, the following views: using AUTO CAD

A) Plan

B) Section on AB

C) Elevation

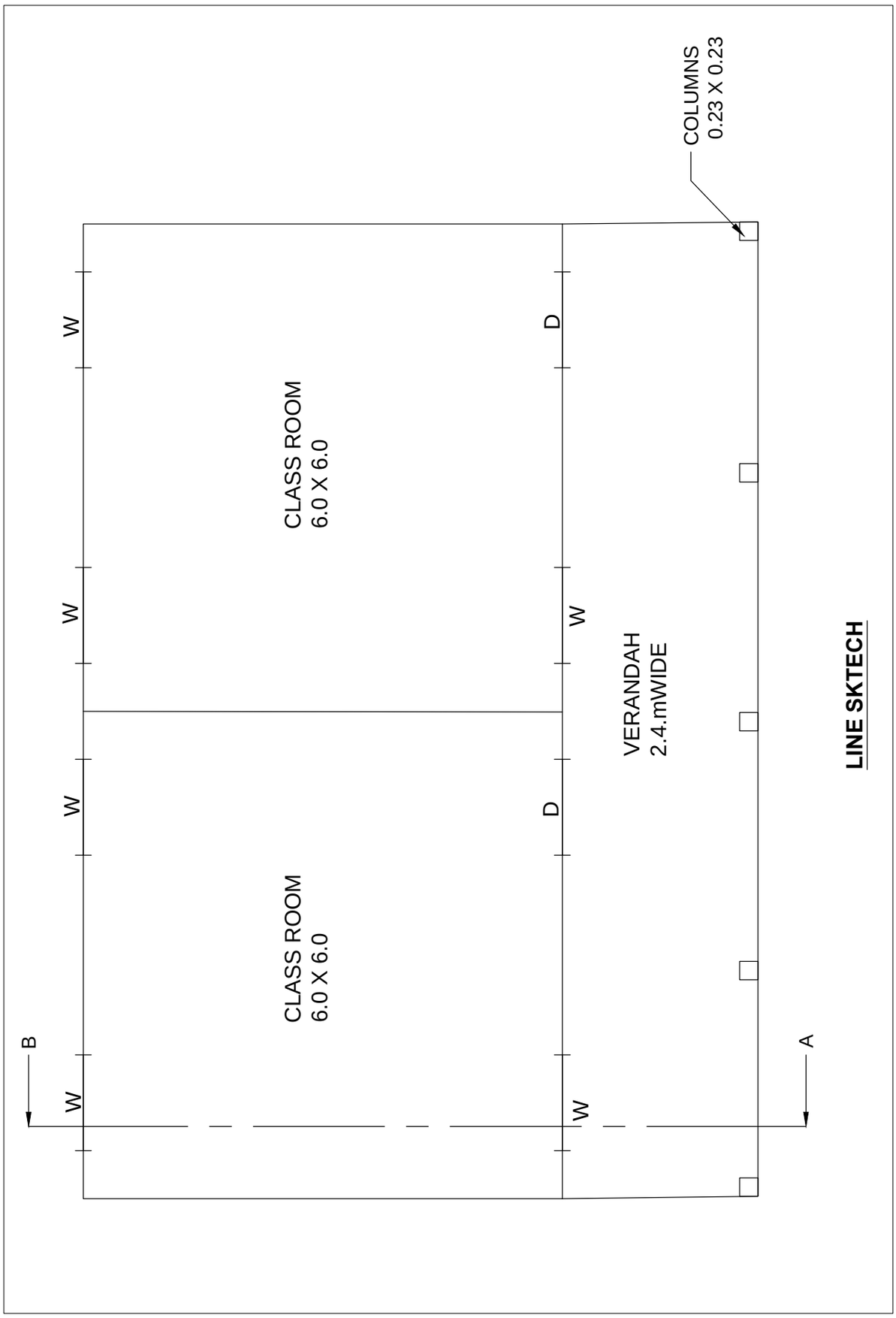
	SPECIFICATIONS
a) FOUNDATION	Depth of foundation is 1.50 m below natural ground level. The concrete base course is 1.2 m wide and 0.3 m thick in PCC of 1:4:8 mix
b) FOOTING	Isolated footings as per design in RCC 1:1.5:3 will be provided in appropriate places. The breadth and thickness of footing will be 1.00 m and 0.45 m respectively. Over the footing, RCC column 0.23 x 0.23m (or) 0.23 x 0.45 m size are raised upto the grade beam level .
c) GRADE BEAM	A beam of size 0.23 x 0.45 m is provided as per the structural design alround the building up to the ground level.
d) BASEMENT	The basement will be of brick masonry in CM 1:5 and of height 0.45m above the Grade beam. The thickness of plinth wall is 0.23m and a damp proof course 0.02m thick in CM 1:3 which is mixed with 5% crude oil will be provide around the building.
e) FLOORING	Over 0.30m depth of sand filling, flooring of 0.15m thick in CC 1:4:8 finished with tiles is provided.
f) SUPERSTRUCTURE	RCC columns 0.23 x 0.23 m and 0.23 x 0.45 m are raised in right places above the Grade beam upto roof level in correct sequence. The thickness of walls is 0.23 in brick work using CM 1:5. The height of the parapet wall is 0.6 m above the roof top level. Lintel – cum – sunshade will be provided over the door and window openings. Thickness and bearing of RCC lintel in CC 1:1:5:3 will be 0.15m. The projection of sunshade will be 0.45m from the wall. The thickness is 0.08m at support and 0.05m at free end. Ceiling height will be 3m above the floor level.
g) ROOFING	Roofing will be of flat RCC in CC 1:1.5:3, 0.12m thick. A weathering course of 0.1m thick is provided over the roof slab with sufficient slope to drain rainwater.
h) STEPS	Tread = 0.3m. Rise = 0.15m.

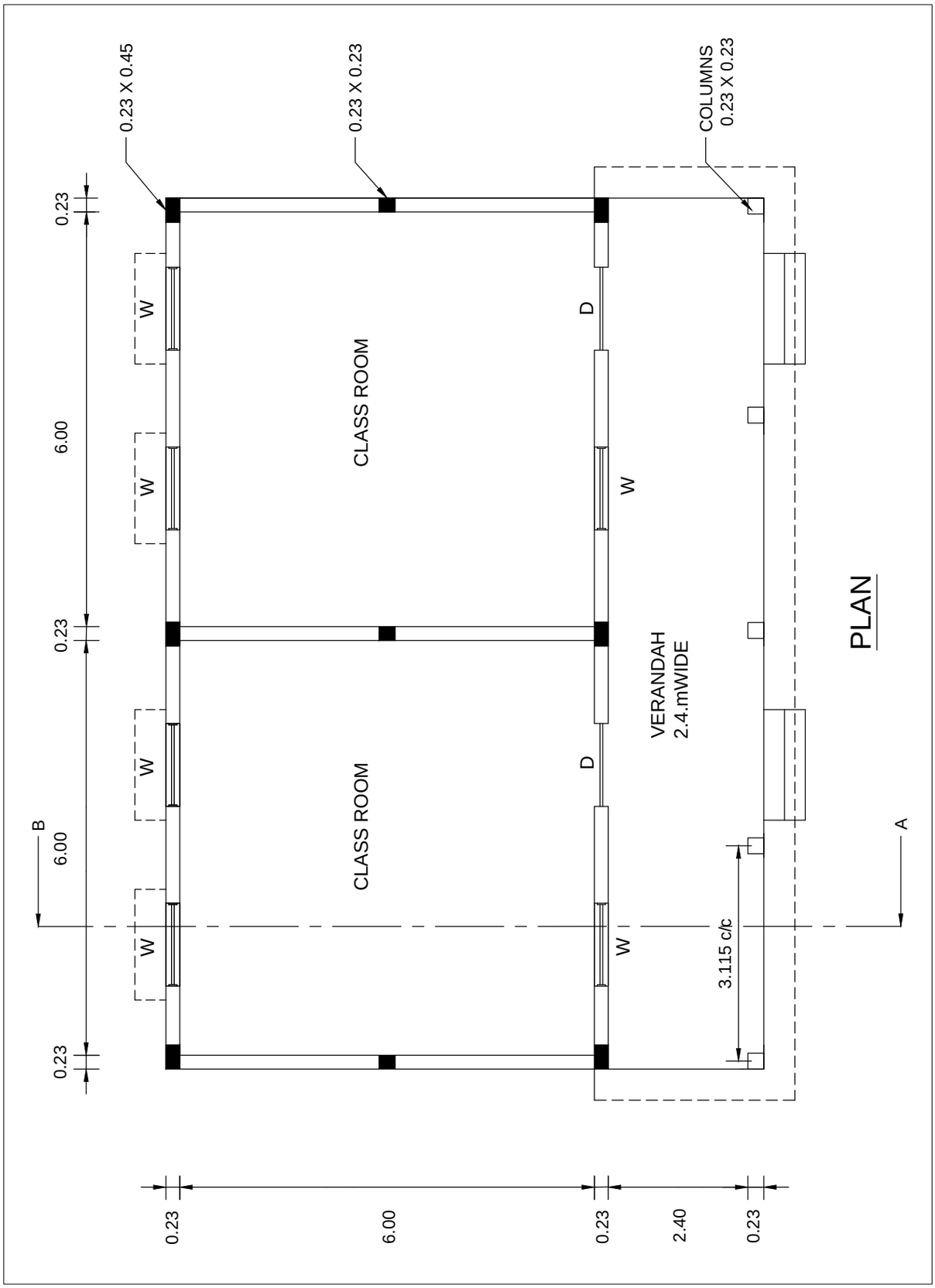
REFERENCE

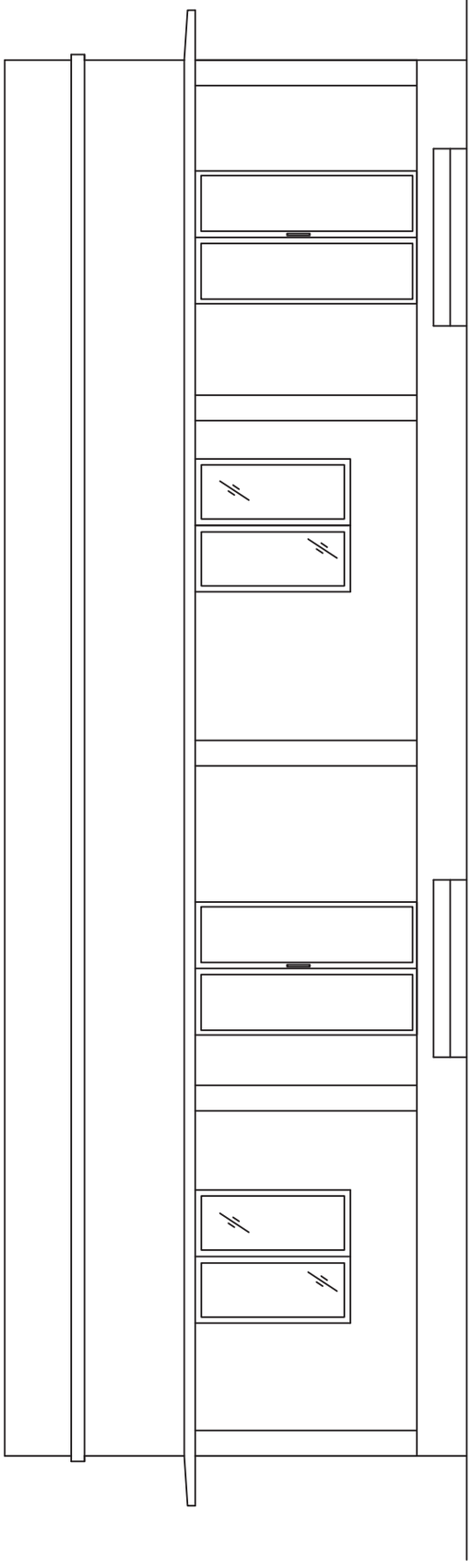
D - Panelled Wooden Door - 1.2 m x 2.10 m

W - Panelled Wooden Window - 1.2 m x 1.40 m

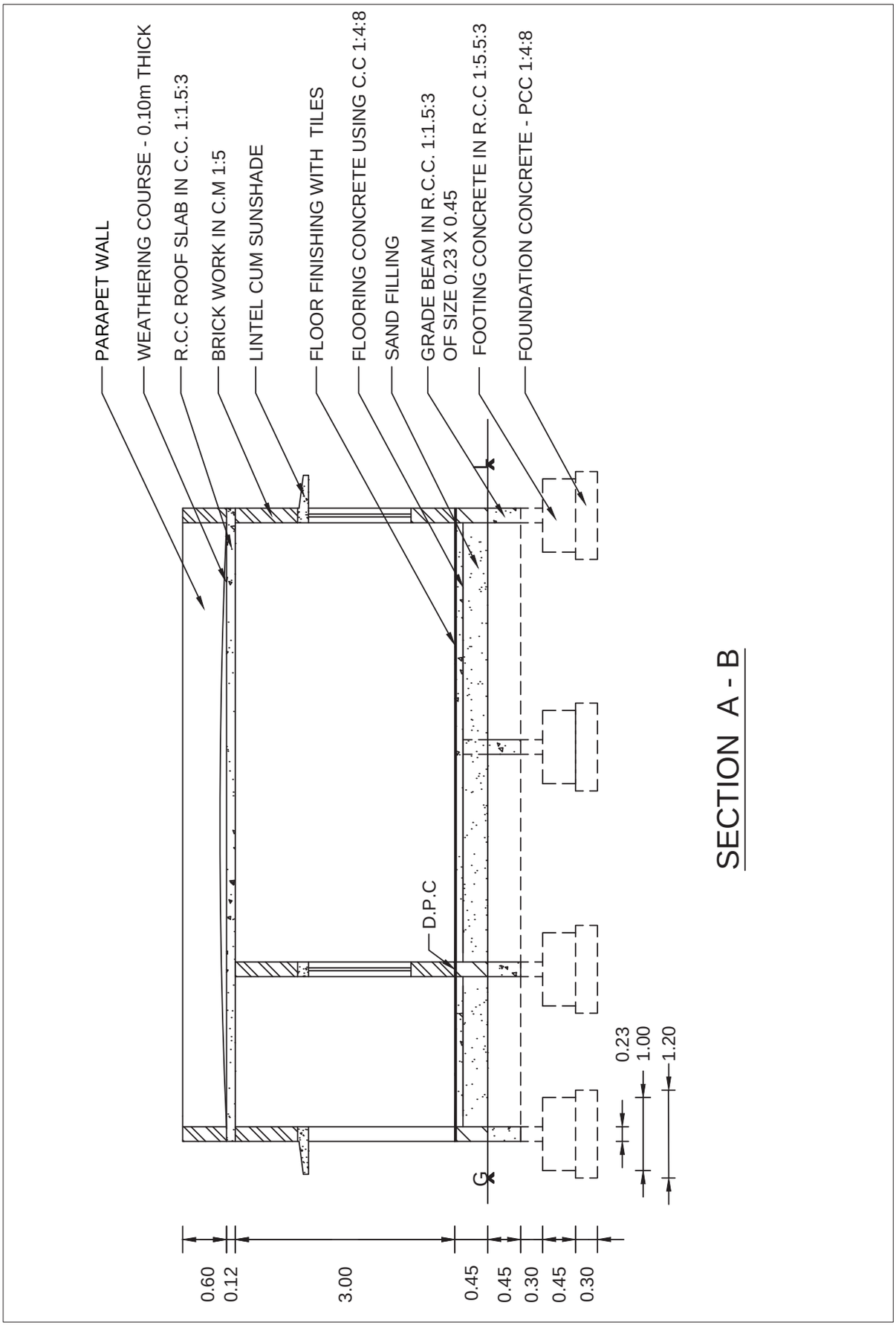
Assume any other data suitably, if necessary.

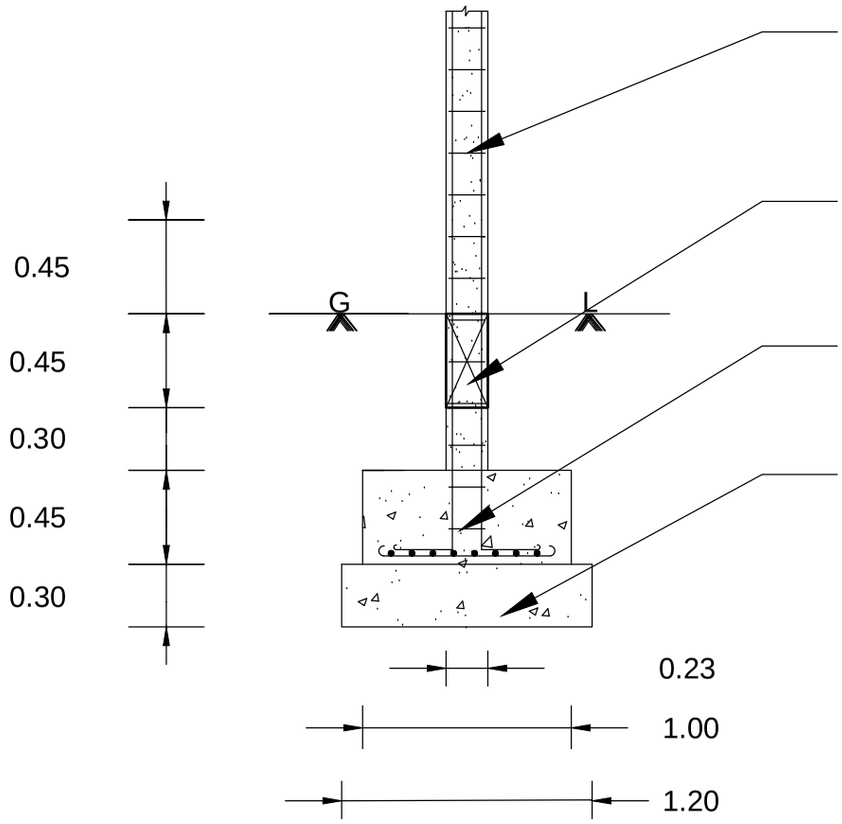






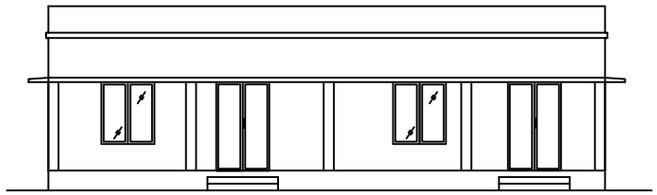
ELEVATION



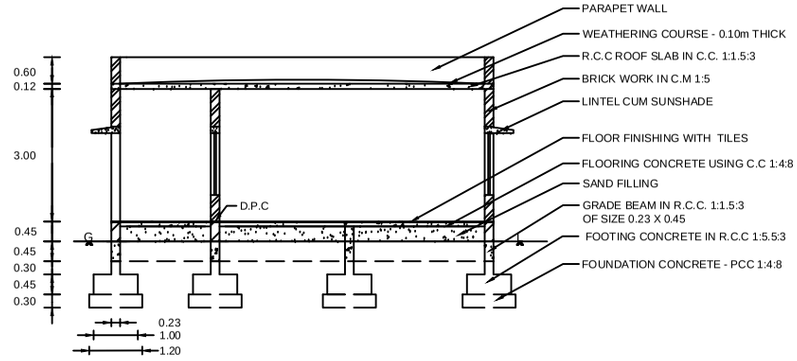


FOUNDATION DETAILS

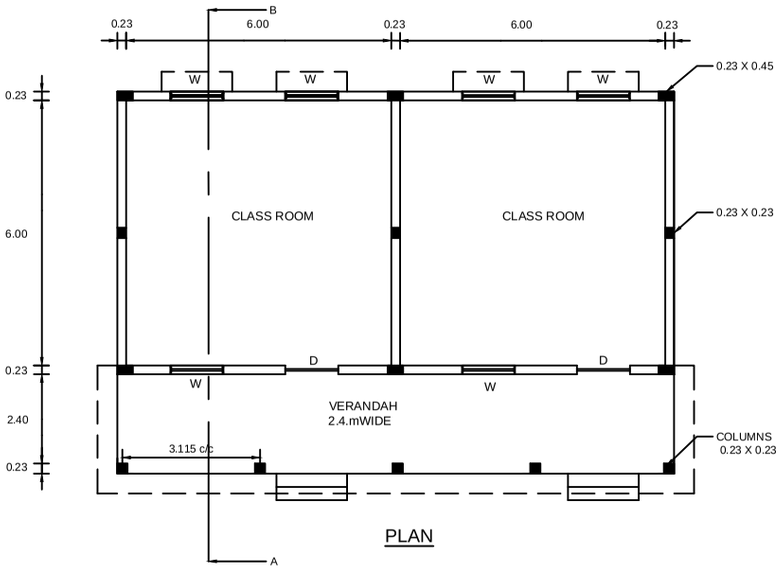
ALL DIMENSION ARE IN 'm'



ELEVATION



SECTION A - B



PLAN

A SCHOOL BUILDING

ALL DIMENSION ARE IN 'm'

SCALE 1:100

REFERENCE	
PANELLED WOODEN DOOR	1.20 X 2.00
PANELLED WOODEN WINDOW	1.20 X 1.40

NAME	
CLASS	
ROLL NO	
PLATE NO	
DATE	

III. QUANTITY SURVEYING – DETAILED AND ABSTRACT ESTIMATE

7) Prepare the Detailed and Abstract Estimate for a Compound Wall for the following items of work.

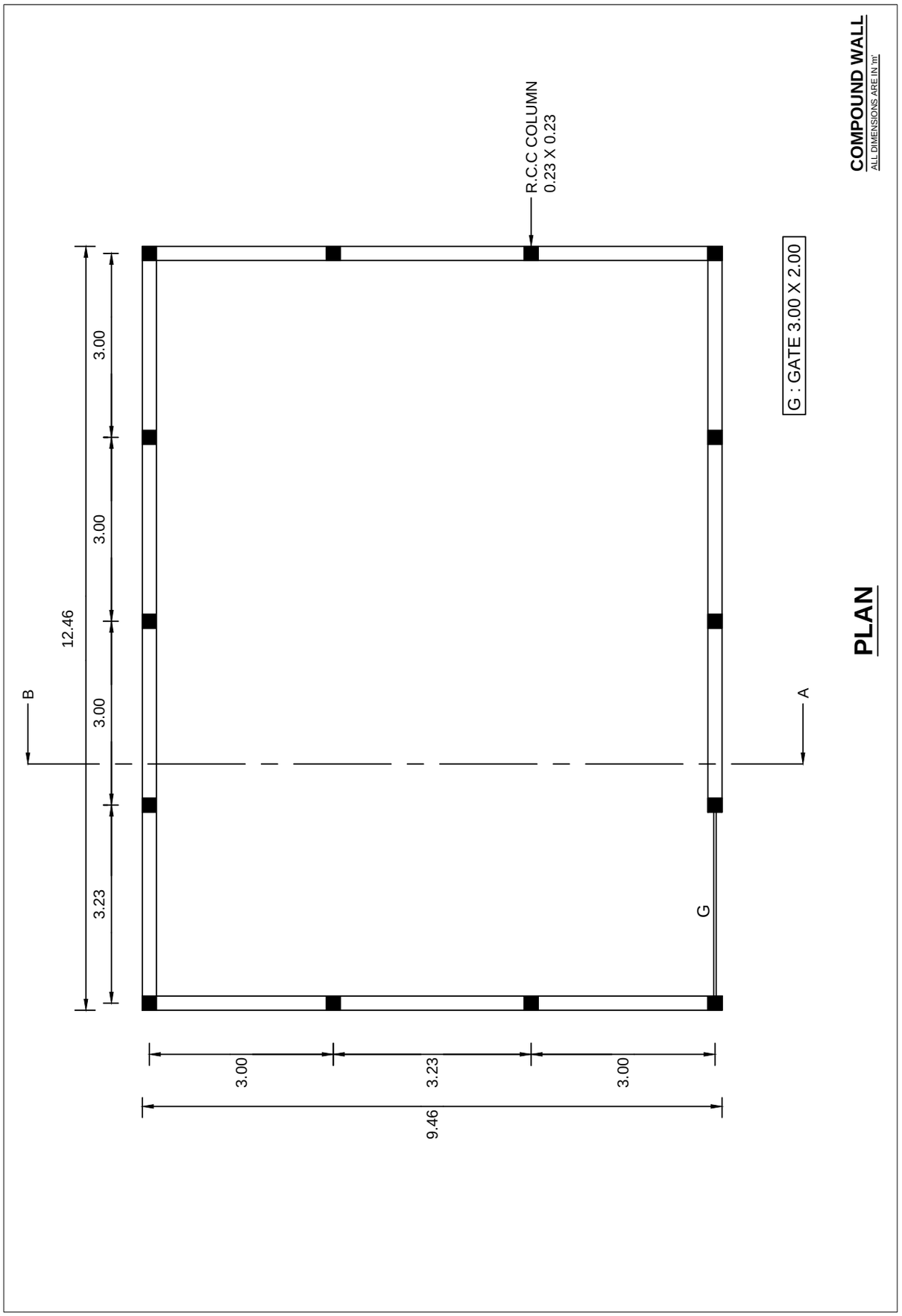
1. Earth work excavation for foundation
2. Foundation concrete in P.C.C 1:4:8
3. R.C.C Footing in 1:1.5:3 mix
4. R.C.C columns in 1:1.5:3 mix
   a. Up to Grade beam
   b. above Grade beam
5. R.C.C Grade beam 0.23×0.30 m size in 1:1.5:3 mix
6. Brick work above the Grade beam in C.M 1:5 mix
7. Plastering the Brick work (Both sides)
8. White washing for the plastered wall (Both sides)
9. Providing and fixing of Gate.
10. Painting with enamel paint for the gate.

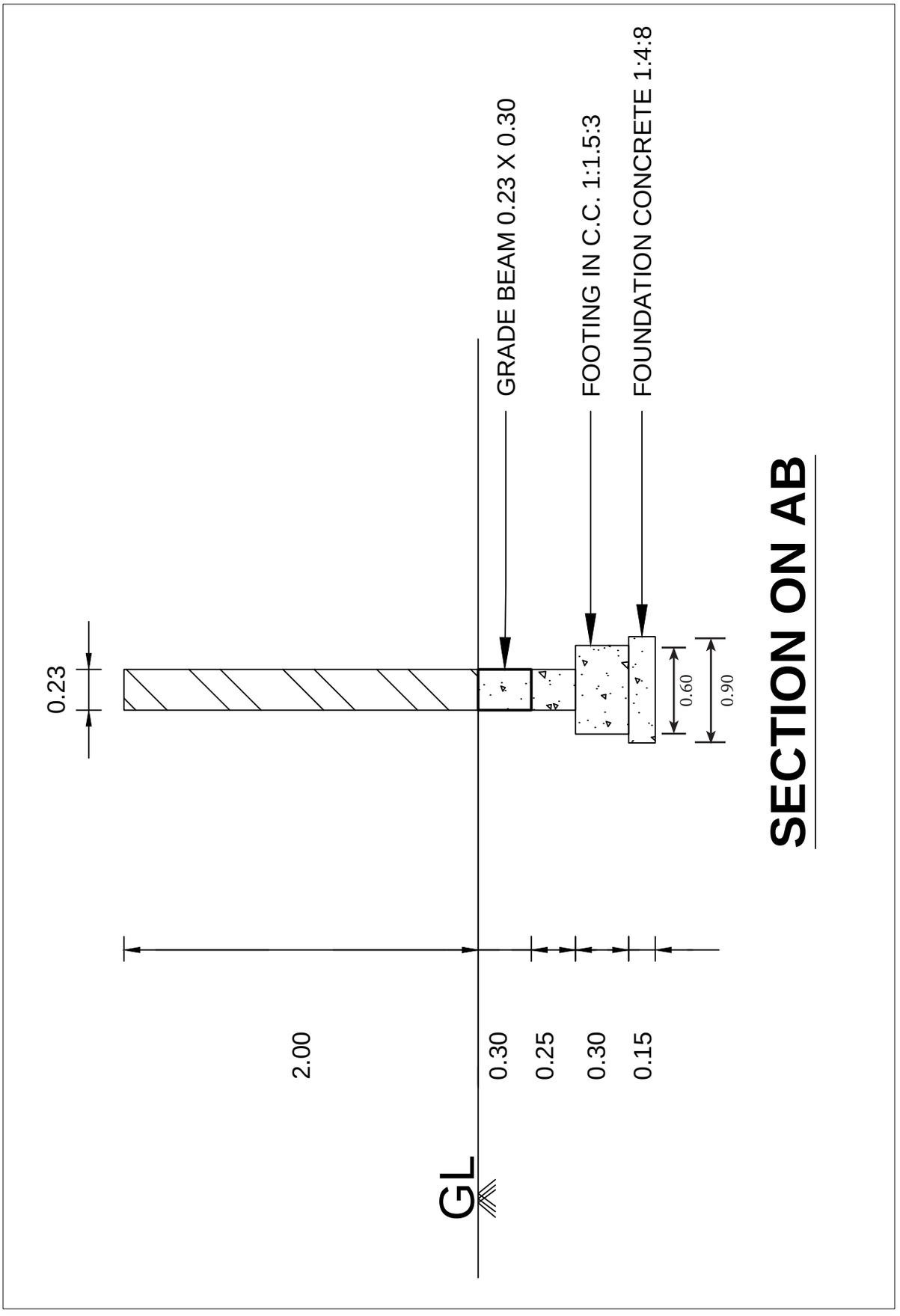
Detailed Estimate:

Sl. No.	Description of Item	Nos.	Dimensions in Metre			Quantity	Total
			Length	Breadth	Depth/Height		

Abstract Estimate:

Sl. No.	Description of Item	Quantity	Rate/Unit	Amount





8) Prepare the Detailed and Abstract Estimate for a single room building for the following items of work.

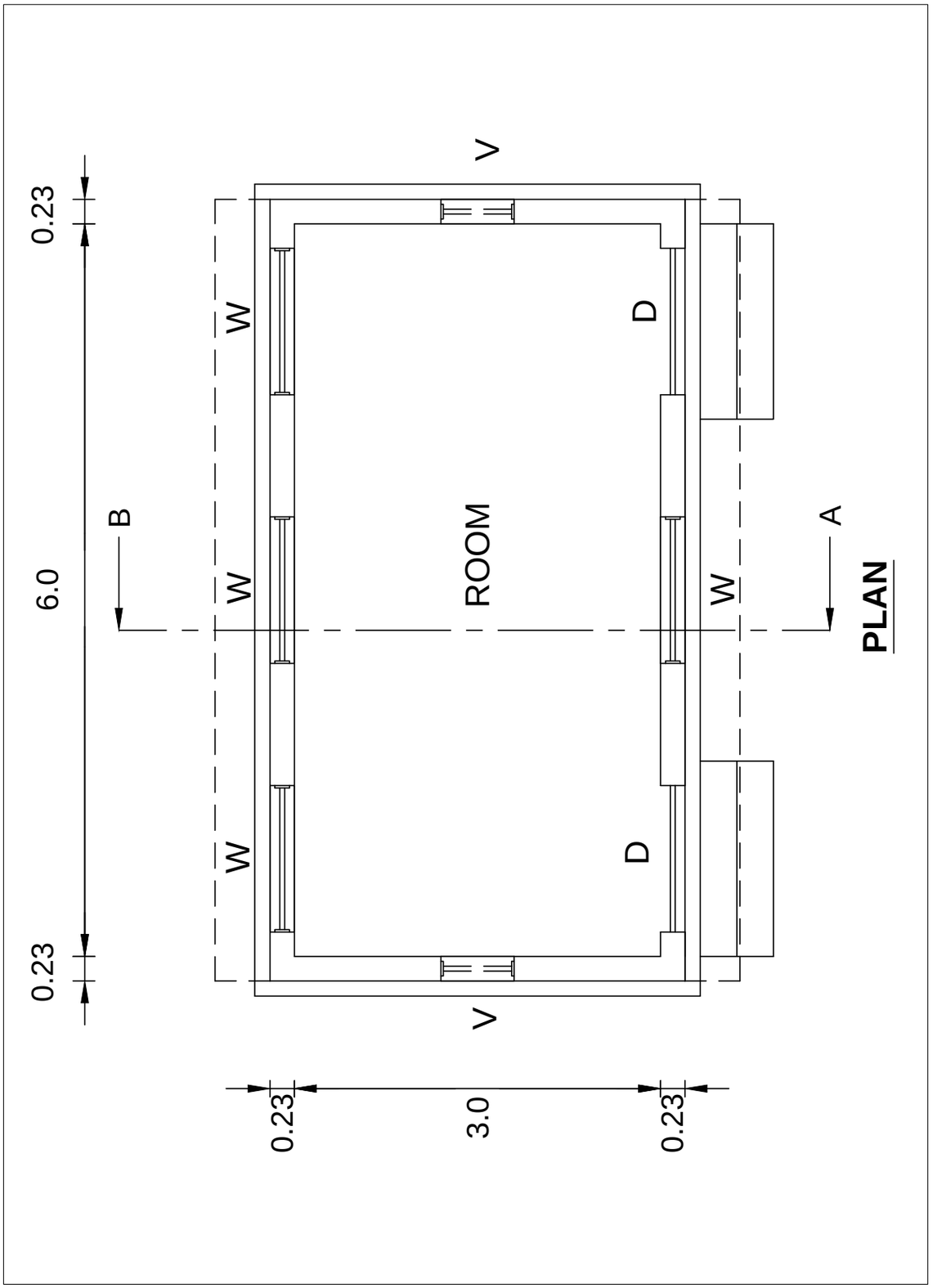
1. Earthwork excavation for foundation
2. Foundation concrete in P.C.C 1:4:8
3. R.R. masonry in C.M 1:5
   a) Footing
   b) Basement
4. Damp proof course 0.02 m thick
5. Sand filling in basement.
6. Flooring concrete in P.C.C 1:4:8
7. B.W in super structure (including parapet) in C.M 1:5
8. Lintel cum sunshade in RCC 1:1.5:3
9. RCC roof in 1:1.5:3 mix – 0.12 m thick.
10. Providing door and windows (including safety grill)
11. Ceiling plastering in C.M 1:4.
12. Plastering the Brick work (Both side)
13. Steps.
14. White washing the plastered surface (both sides)
15. Weathering course in B.J.L.C - 0.1 m thick.
16. Color washing the white washed surface with emulsion paint.
17. Floor finishing using granite tiles.
18. Painting the doors and windows with enamel paint.

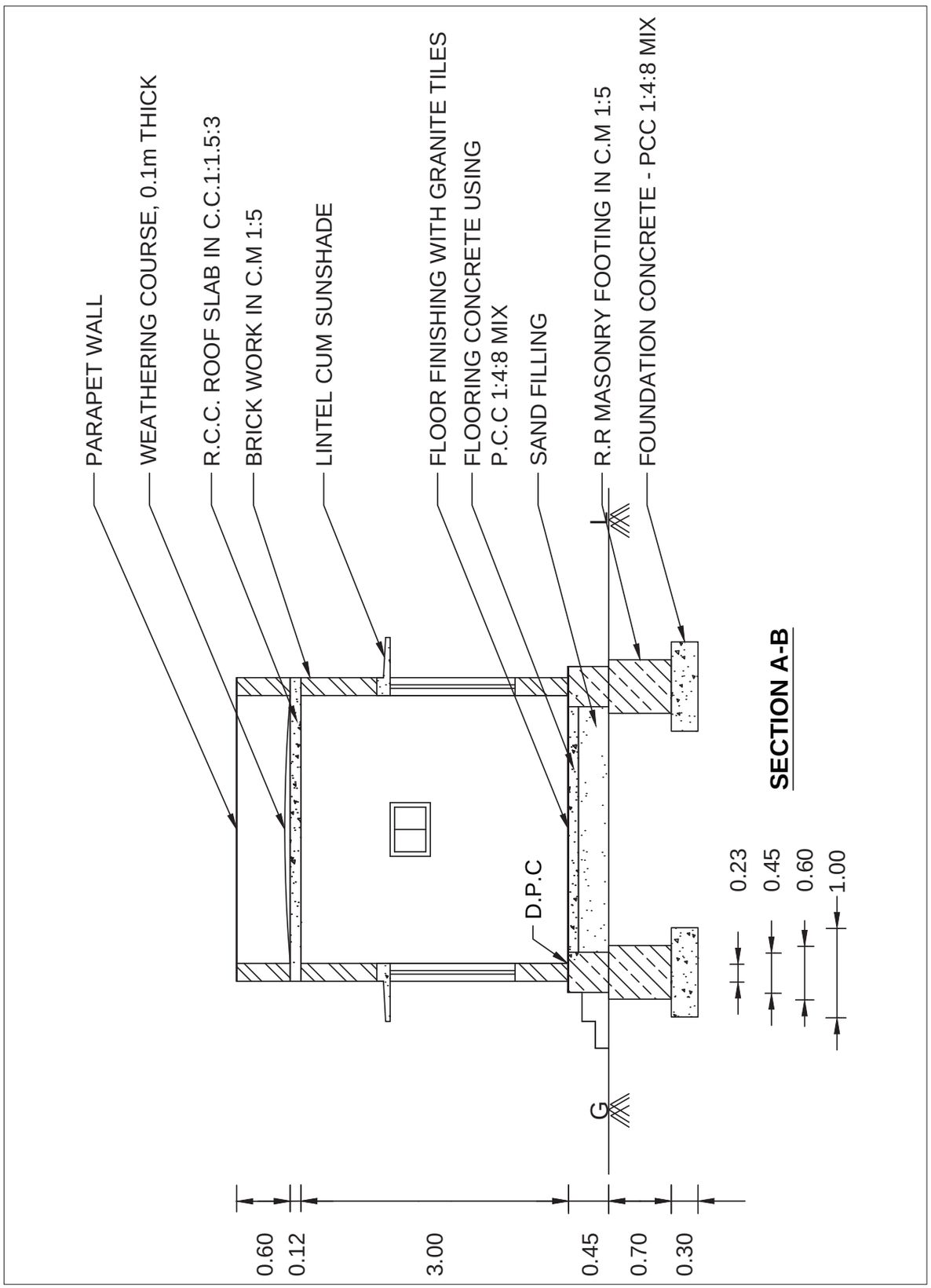
Detailed Estimate:

Sl. No.	Description of Item	Nos.	Dimensions in Metre			Quantity	Total
			Length	Breadth	Depth/Height		

Abstract Estimate:

Sl. No.	Description of Item	Quantity	Rate/Unit	Amount





9) Fly leveling – Closed Traverse

Conduct fly levelling for a closed traverse using a dumpy level (10 ground points with 2 change points). Enter the readings taken in a level book form and reduce the levels using height of collimation method / Rise and fall method. Do the arithmetic check.

Height of Collimation Method

Station	B.S	I.S	F.S	HOC	R.L	Remarks

Rise and Fall Method

Station	B.S	I.S	F.S	Rise	Fall	R.L	Remarks

10) Fly leveling – Open Traverse

Conduct fly leveling for a open traverse using a dumpy level (10 ground points with 2 change points). Enter the readings taken in a level book form and reduce the levels using height collimation method / Rise and fall method. Do the arithmetic check.

Height of Collimation Method

Station	B.S	I.S	F.S	HOC	R.L	Remarks

Rise and Fall Method

Station	B.S	I.S	F.S	Rise	Fall	R.L	Remarks