Chapter 2
Building Drawings

2.1 Introduction

Building or construction drawings refers to the drawings and verbal documents which contain projection views of buildings and their parts and provide information necessary for erection of buildings and for manufacture of structural members and units. Construction drawings are prepared so that designers can communicate their requirements to the contractor in a clear, concise and unambiguous manner. It is important to ensure that drawings are not unnecessarily congested or complicated. The clarity of original drawing that will be reproduced, is, therefore, most important. The written descriptions on drawings should be as brief as possible, consistent with completeness and the lettering should be clear.

Most of the drafting skills and techniques used in civil engineering and architectural works are similar to those in mechanical drawing courses. However, there are some drafting procedures that are somewhat different. These involve the use of line techniques, various templates, lettering practices, time saving devices, dimensioning practices, etc. The differences are primarily due to the large size of most civil engineering and architectural drawings and to the great speed with which civil engineering and architectural drawings need be prepared. For these reasons civil engineering and architectural drawings contain many abbreviated techniques. Various line weights such as visible contour lines, invisible contour lines, center line and measurement lines are used to emphasize or de-emphasize areas of a drawing.

2.2 Drawing Equipment

In order to produce constructional drawings, items like drawing board/table, drawing paper, drawing pencils, ruler, ink, various time saving devices such as templates, protractor and other accessories such as drawing tape, set squares, eraser, etc. are required. Some of the most important items of drawing equipment are discussed below and are shown in Fig.3.1

2.2.1 Drawing Board

The drawing board shall be firm to produce even backing and must satisfy certain requirements. The edges of the board must be absolutely straight, the surface must be level and relatively hard and the board must be large enough to take the drawing paper. The size of a drawing board is variable. For instance, a drawing board of height 50cm and length 62 cm is adequate for a drawing of size A2.

2.2.2 Drawing Paper

Drawing paper is relatively thick, non-transparent paper, which can be used to prepare the draft drawing, which is usually, made using pencils. After checking is completed, it is the

traced on a thin, transparent paper using various size and qualities of rapidographs. The drawing paper is normally fastened to the board with drawing tape.

2.2.3. Pencils

Pencils are graded in different degrees of hardness varying from the very soft (6B) to the very hard (9H). A medium pencil (HB or F) is recommended for writing and lettering while somewhat hard pencil (2H) is preferable for constructional drawings.

2.2.4 T- Square

A T-square is used for drawing horizontal lines. It is placed against the left edge of the drawing board and moved along the edge until it is placed in the right position. It is important to see that the T-square keeps its right angle and that the edge is not damaged.

2.2.6 Eraser and Ruler

A soft eraser, which does not scratch the surface of the drawing paper, ought to be included in the equipment. For measurements, a ruler graded in millimeters and centimeters is used.

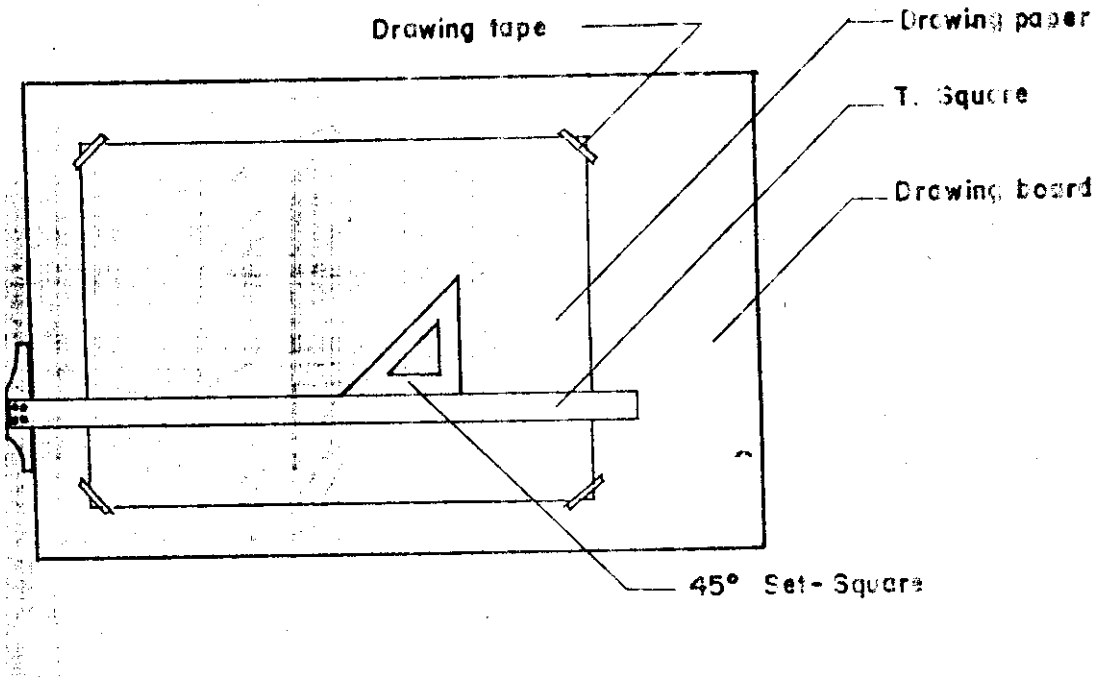


Figure 3.1 Typical items of drawing equipment

2.3 Standard Sizes of Drawing Paper

It is generally advisable to use international standard-sized papers in drawings to facilitate filing of drawings. According to the International and Ethiopian Standards the dimensions and symbols for different paper sizes are given in Table 3.2.

Table 3.1: Dimensions and symbols for a series of paper size.

Format A		Format B		Format C	
Symbol	**Size [mm]**	**Symbol**	**Size [mm]**	**Symbol**	**Size[mm]**
A0	841x1189	B0	1000x1414	C0	917x1297
A1	594x841	B1	707x1000	C1	648x917
A2	420x594	B2	500x707	C2	458x648
A3	297x420	B3	353x500	C3	324x458
A4	210x297	B4	250x353	C4	229x324
A5	148x210	B5	176x250	C5	162x229
A6	105x148	B6	125x176	C6	114x162
A7	74x105	B7	88x125	C7	81x114
A8	52x74	B8	62x88	C8	57x81

The most common sizes of constructional drawings are, however, A1 and A2 sizes. The relative sheet sizes of format A are shown on figure 3.2. It is essential to choose a drawing paper 3-5 cm larger in both directions than the size of the completed drawings to allow space for fastening tape or drawing pins. These extra edges will be cut off leaving a completed standard size drawing.

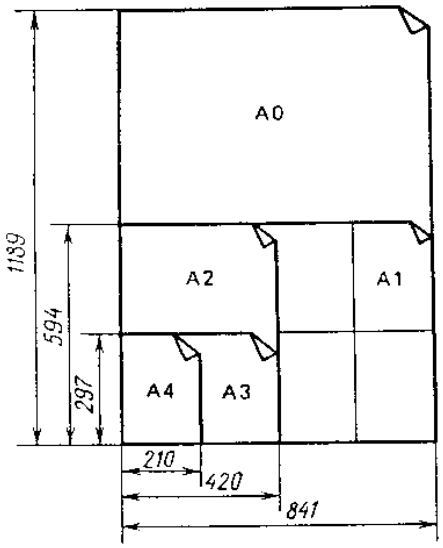


Fig. 3.2 Relative sheet sizes of the A format

In the bottom corner of a drawing paper, about 150mm long and 100 mm high rectangular or square block is drawn. The block should include at least the following information: design office (name), project title (name and place of the project), drawing type, designer (name), drawn by (name), checked by (name), date of completion, scales, and drawing number written in a systematic way.

Consecutive numbering systems are used to indicate where the drawings belong to the particular building. The use of relevant abbreviations is thus useful. For instant, AR-3 indicates, the third architectural drawings, whereas ST-5 indicates the fifth structural drawing in a series. Distinct and uniform letters and figures ensure the production of good and legible prints.

Capital letters should be used for all titles and sub-titles. Typical drawing paper arrangement and information in a lettering block are shown in Fig. 3.3 and Fig. 3.4, respectively.

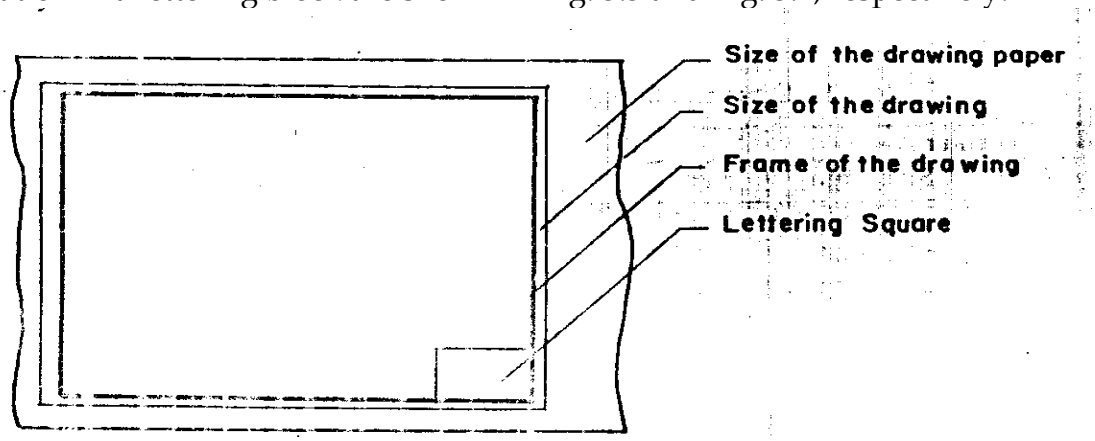


Fig 3.3 Typical drawing paper with provision for frame and lettering square

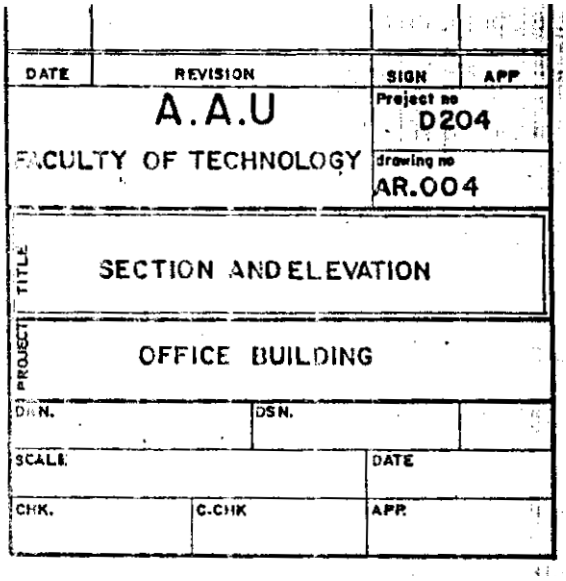


Figure 3.4: Sample lettering block

2.4 Drawing for House Construction

Drawing for house construction shall include: site plan, sketch drawings, working drawings, detailed drawings, construction drawings and installation drawings.

2.4.1. Site Plan

Site plans are used to indicate the location of the building with regard to the dimension of perimeter, proximity to the road, etc. in a scale of 1:100 or 1:200. The direction of the North point should be clearly shown on site plans. Typical site plan of a residential building is shown in Fig. 3.5 and 3.6.

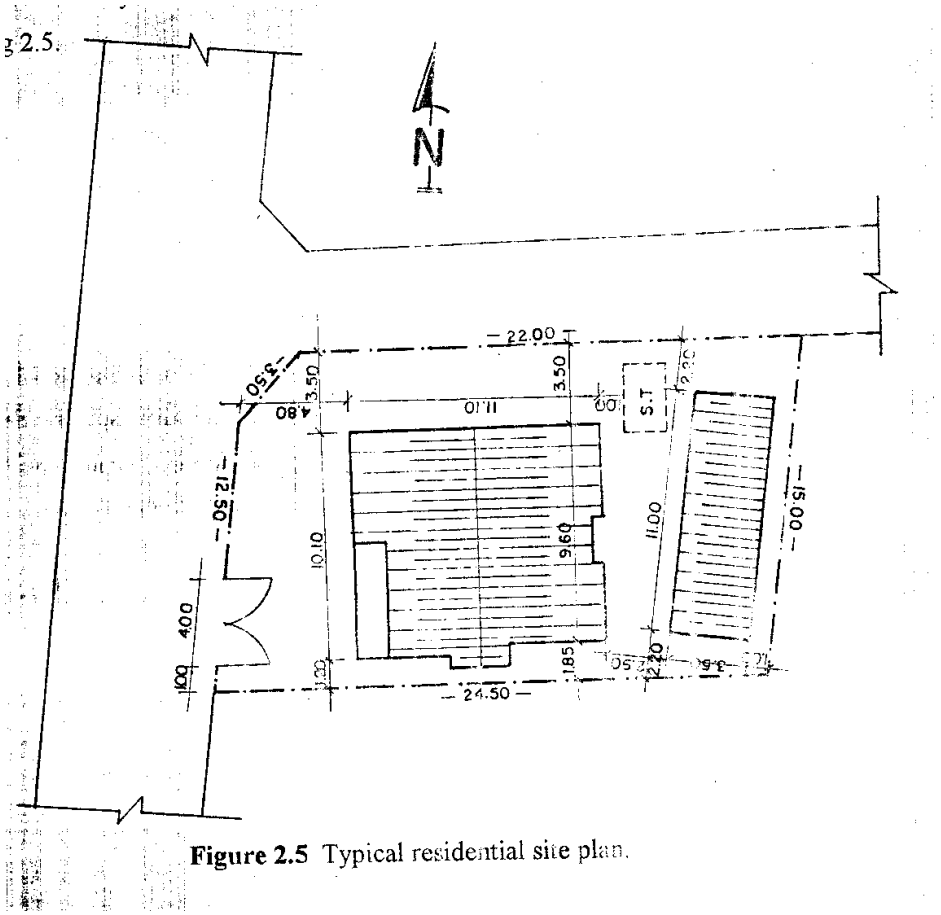


Figure 2.5 Typical residential site plan.

Fig. 3.5 Typical residential site plan

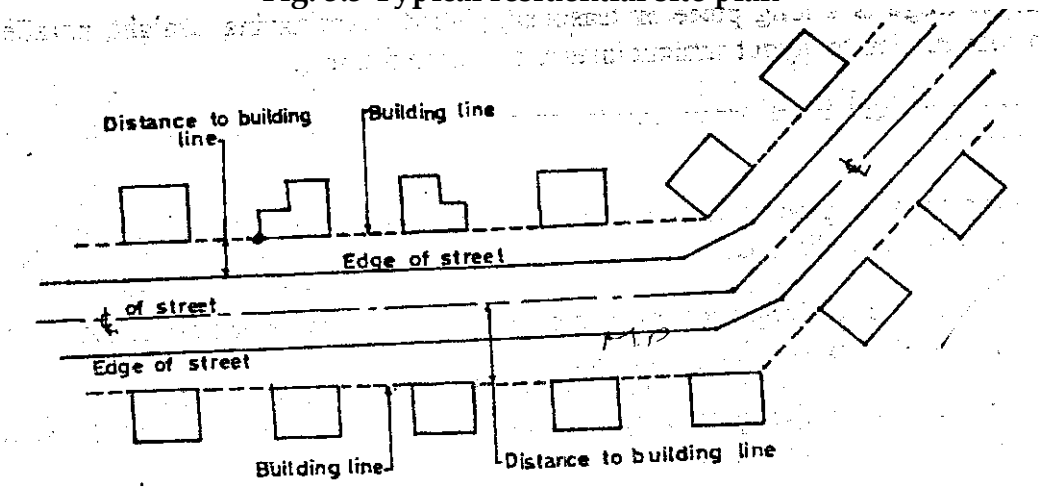


Fig 3.6 Site plan

2.4.2 Sketch drawings

They are prepared to the extent necessary depending on how complicated the building is. They can be prepared in a scale of 1:1, 1:5, 1:10 or 1:20, and show specific details, such as stair-cases, gutter to down pipe connection and metal joineries. Typical wall to foundation connection details are shown in Fig. 3.7.

2.4.5 Construction drawings

Construction drawings are prepared for the foundation work, for construction in steel, concrete and wood.

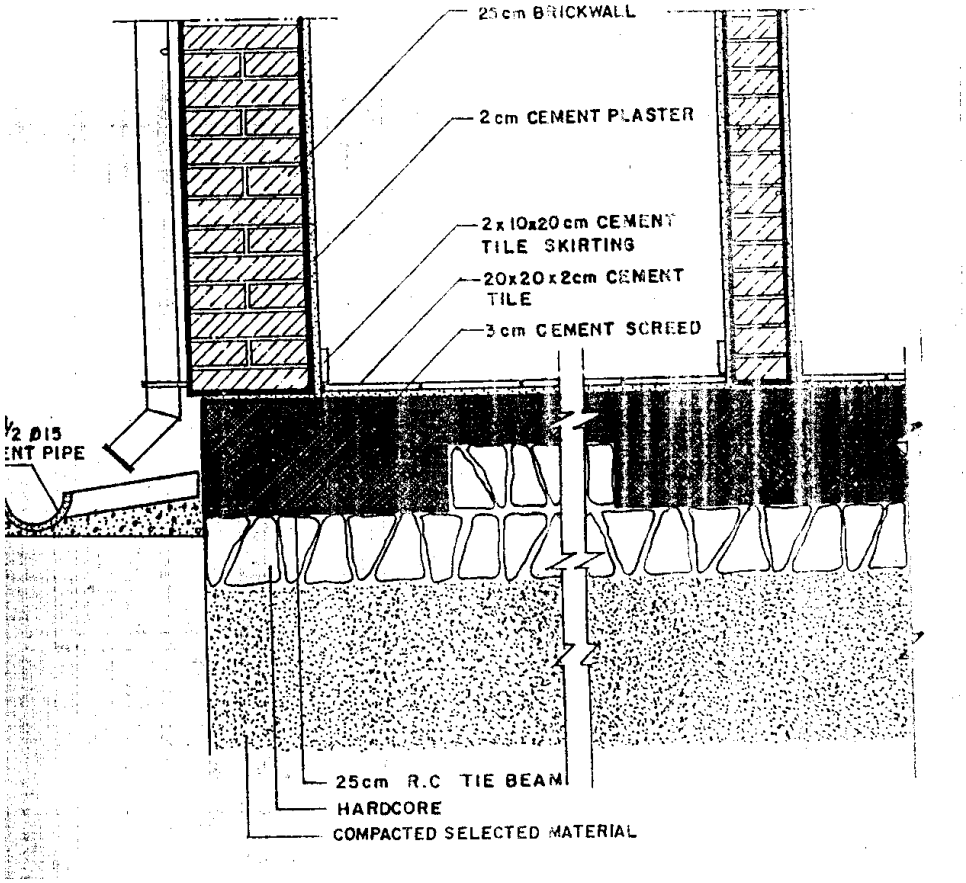


Fig 3.7 Typical wall to foundation connection details

2.4.6 Installation drawings

Installation drawings comprise drawings for water and drainage pipes, as well as for electrical installations. For residential buildings a scale of 1:50 is normally preferred. Partial sanitary and electrical installation drawings for a certain residential building floor are shown in Fig 3.8 & 3.9.

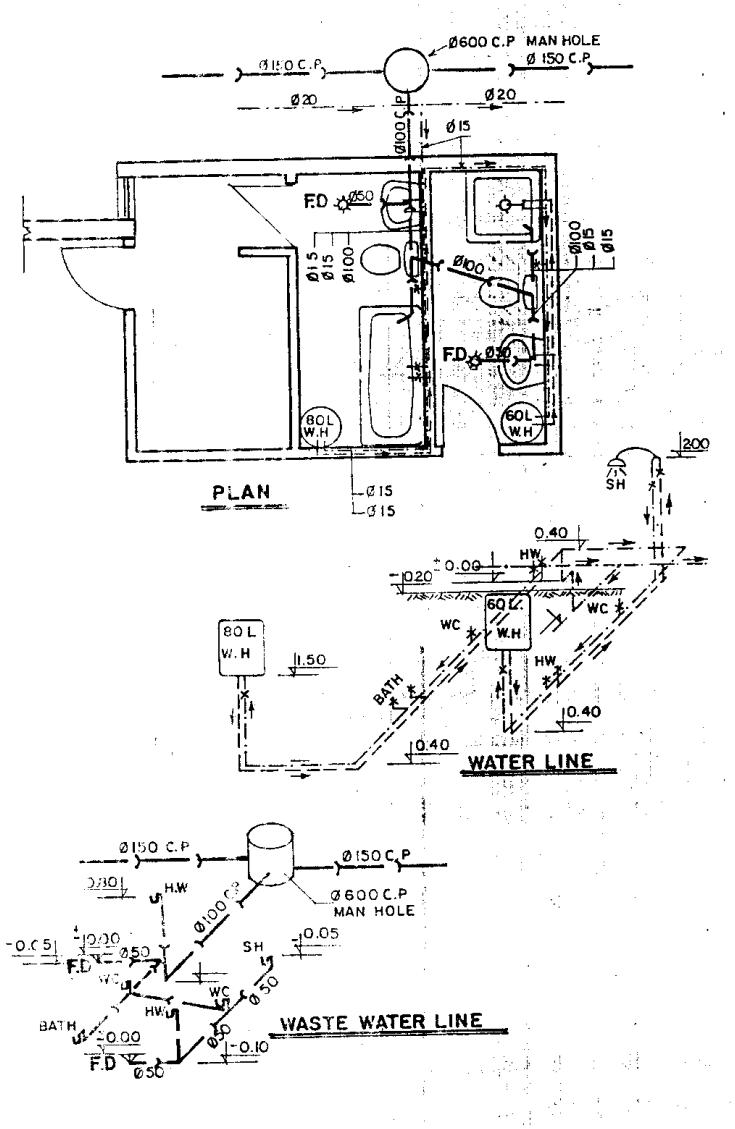


Fig 3.8 Partial sanitary installation drawing for residential building floor

2.5. Working Drawings

Working drawings include: floor plans drawings; elevation drawings and sectional drawing and are the most important component of building drawings and thus the following detail discussion is included.

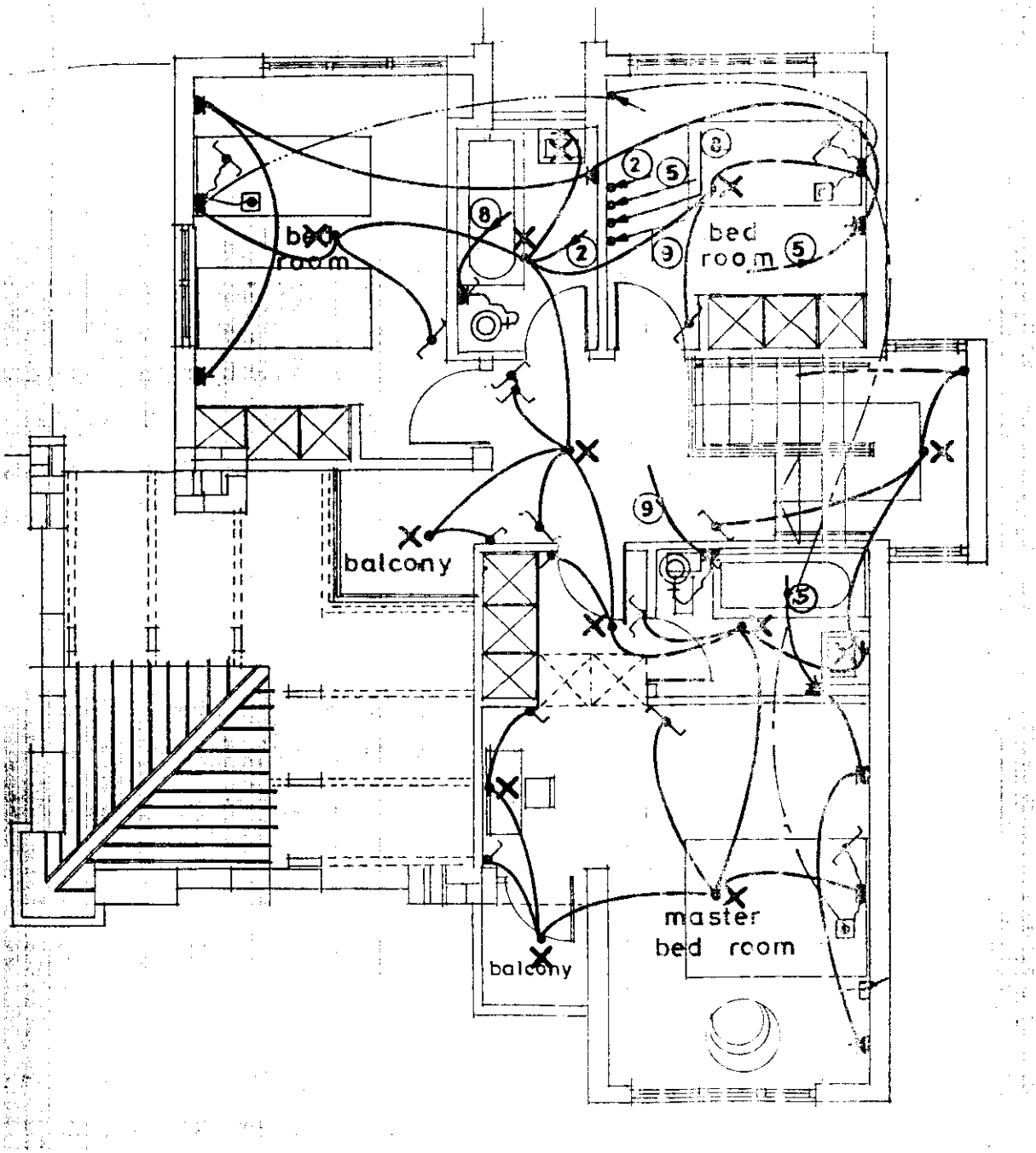


Fig. 3.9 Partial electrical installation drawing for residential building floor

2.5.1 Floor plan drawings

The most commonly used type of building drawing is the floor plan. The floor plan in drawing of the outline and partitions of a building as you would see them if the building were cut horizontally about 1.2m above the floor level. The floor plan provides more special information about the design of the building than any other plan and is used as a base for the projection of other drawings. See Fig 3.10.

The Steps in floor plan drawings can be summarized as:

- start with laying center line of walls, which will give the designer a good idea about the position of the floor plan drawing on the drawing paper;
- mark window and door openings;
- mark wall thickness;
- locate furniture position;
- indicate material type;
- add measurements and other details.

Designers use symbols for materials and fixtures in floor plans. It is more convenient to draw symbol of a material than to repeat a description every time that material is used. Although design (architectural) symbols are standardized, some variations of symbols are used different parts of the world. Finally, the floor plans are dimensioned to give even information, such as center to center distances, internal and external widths and lengths.

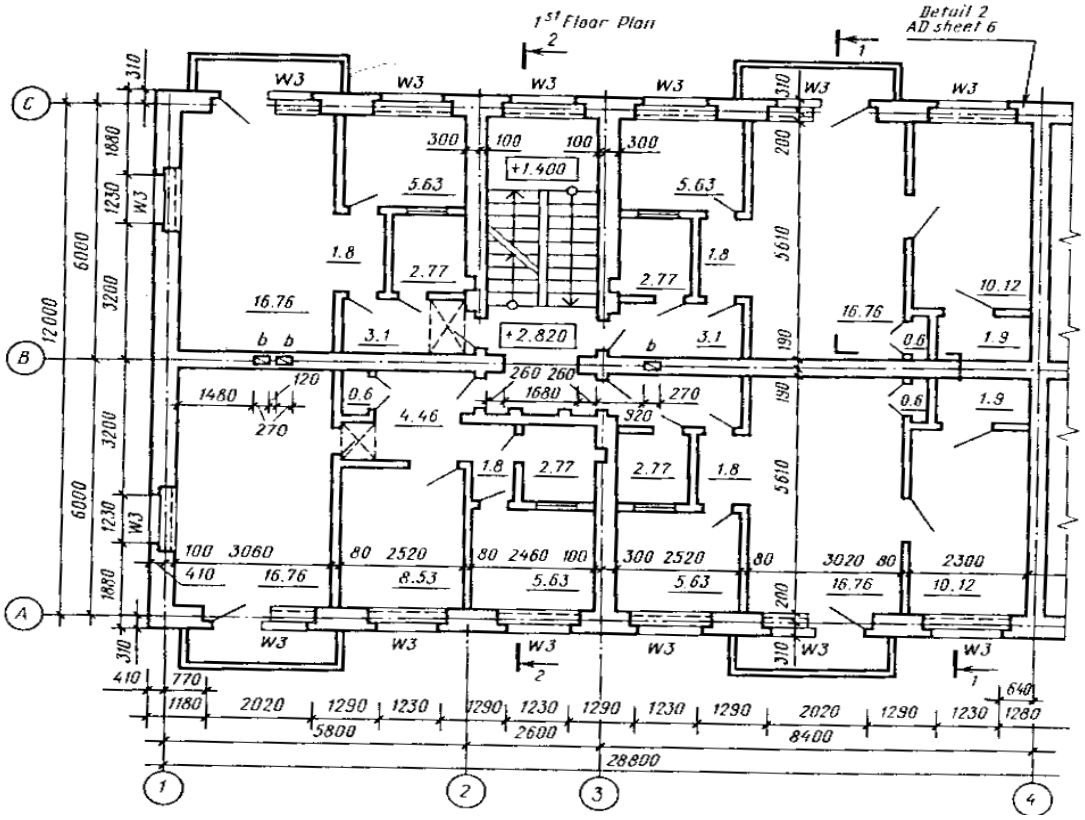


Fig 3.10 Floor plan (1st floor)

2.5.2. Elevation drawings

We have noticed in the above section that the main features of the interior of a building are shown on the floor plan. Likewise, the main features of the outside of a building are shown on elevation drawings. Elevation drawings are orthographic drawings of the exterior of a building,

i.e, they are prepared to show the design, materials, dimensions, and final appearance of the exterior of a building. Elevation drawings are projected from the floor plan of an architectural drawing just as the side views are projected from the front view of orthographic drawings. See Fig 3.11.

When these elevations are classified according to their function, they are called the Front Elevation, the Rear Elevation, the Right Side Elevation and Left Side Elevation, or North, South, East and West elevation. When a floor plan has more than four sides, an auxiliary elevation view is often necessary. The major lines of an elevation are derived by projecting vertical lines from the floor plan and measuring the position of horizontal lines from the ground line. The steps in projecting elevations can be summarized as follows.

- ***Project Vertical lines***. Vertical lines, which represent the main lines of the building, should first be projected. Theses lines show the overall length and width of the building. They also show the length of the major part or offsets of the building.
- ***Project Horizontal lines.*** Horizontal lines which represent the height of the eave line, ridge line, and chimney line, line above the ground level, are projected to intersect with the vertical lines drawn from the floor plan. The intersections of these lines provide the overall outline of the elevation.
- ***Locate Rooflines.*** The ridge line and eave line cannot be accurately located until the roof pitch (angle) is established. On a high-pitch roof there is a greater distance between the ridgeline and the eave line than on a low-pitch roof.
- *Add Elevation symbols.* Symbols are needed to clarify and simplify elevation drawings. Symbols help to describe the basic features of the elevation. They show what building materials are used, and they describe the style and position of doors and windows. Symbols also help to make the elevation drawing look realistic.
- *Give Elevation dimensions.* Horizontal width and length dimensions are placed on floor plans, while vertical (height) dimensions are placed on elevation drawings. Many dimensions on elevation drawings show the vertical distance from a datum line.

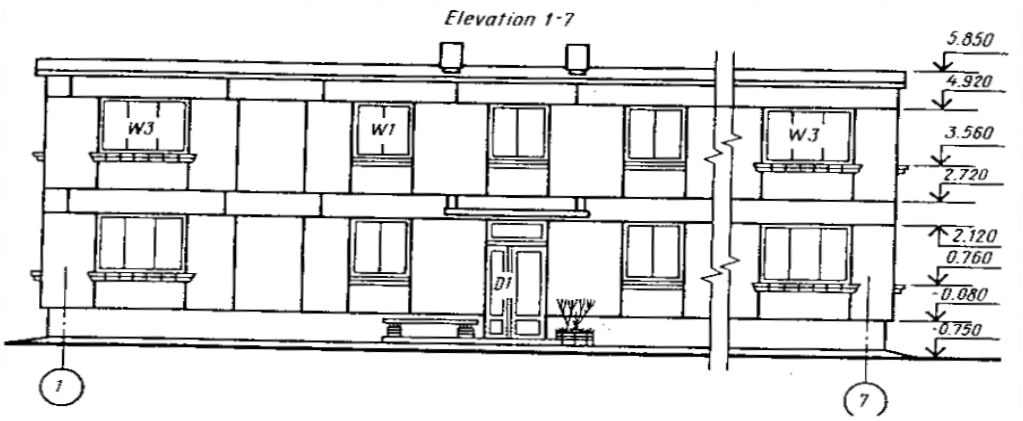


Fig 3.11 Elevation

2.5.3. Sectional drawings

Sectional drawings reveal the internal construction of an object. Architectural sectional drawings are prepared for the entire structure (full sections), or are prepared for specific parts of the building (detail sections). The size and complexity of the part usually determines the type of section.

2.5.3.1. Full sections

Designers frequently prepare drawings which show a buildings cut in half. Their purpose is to show how the building is constructed. These drawings are known as longitudinal or transverse sections. Transverse and longitudinal sections have the same outlines as the elevation drawings of the building. The cutting plane is an imaginary plane, which passes through the building. The position of the cutting plane is shown by the cutting plane-line. The cutting-plane line is usually a long heavy line with two dashes. It is placed in the part to be sectioned and the arrows at its extreme show the direction from which the section is supposed to be viewed. The cutting-plane line often interferes with many dimensions, notes and details. In order to avoid such cases only the extremes of the cutting-plane lines are sometimes used.

Section lining symbols represent the way building materials look when they are cut through. Many of the symbols used in floor plans also apply to longitudinal sections. Since longitudinal sections expose the size and shape of building materials and component not revealed on floor plans and elevations, the longitudinal section is an excellent place on which to locate many detailed dimensions. See fig 3.12.

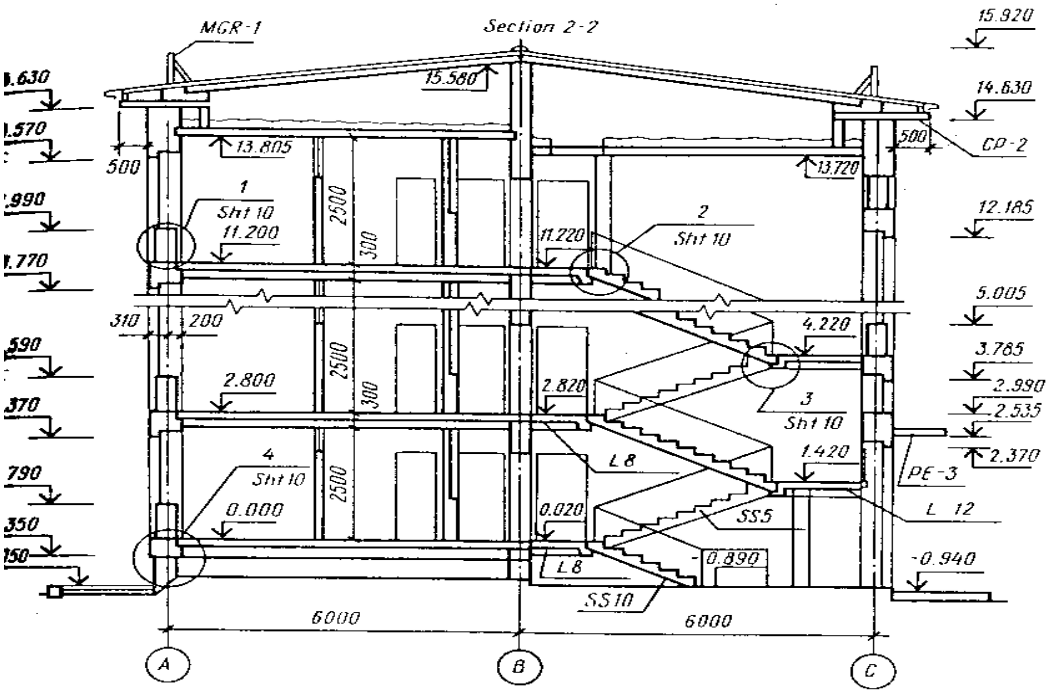


Fig 3.12 Sectional view

2.5.3.2 Detail sections

Because longitudinal sections are usually drawn to a small scale (1:50), many parts of the building are difficult to interpret and dimension. In order to reveal the exact position and size of many small members, the draftsman needs an enlarged section. One method of showing sections larger than is possible in the longitudinal section (elevation section) is through the use of break lines to reduce vertical distances on exterior walls. Using break lines allows the draftsman to draw the area larger than is possible when the entire length is included in the drawings. Break lines are placed where the material does not change over a long distance. See Fig 3.13.

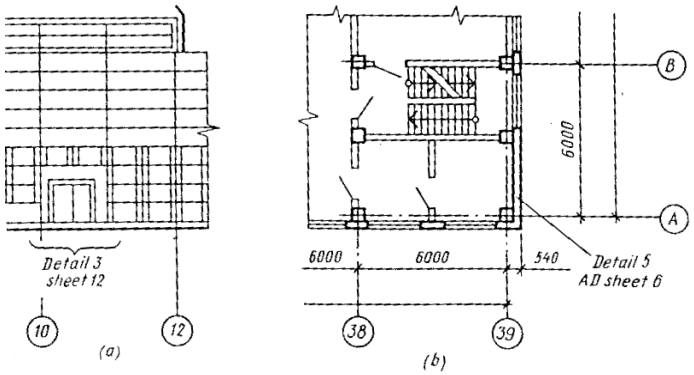
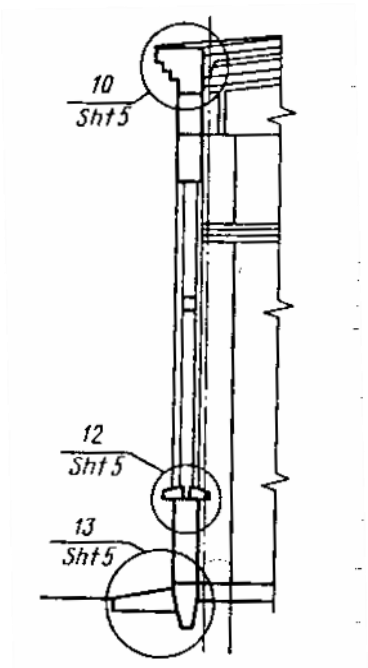


Fig 3.13 Detail section using break lines

When a very large section is needed for interpretation or dimensioning purposes, it is impossible to draw the entire wall section even with the use of break lines. In this case a removed section is prepared. See Fig 3.14. Removed sections are frequently drawn for areas such as wall. Windowsill, cornice, gutter line and ridge section. Also typical roof to foundation details are shown Fig. 3.15 and 3.16.



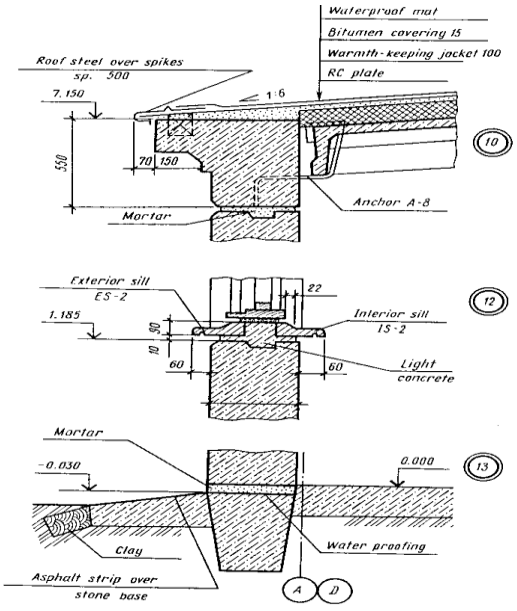


Fig 3.14 Detail sections (Removed section)

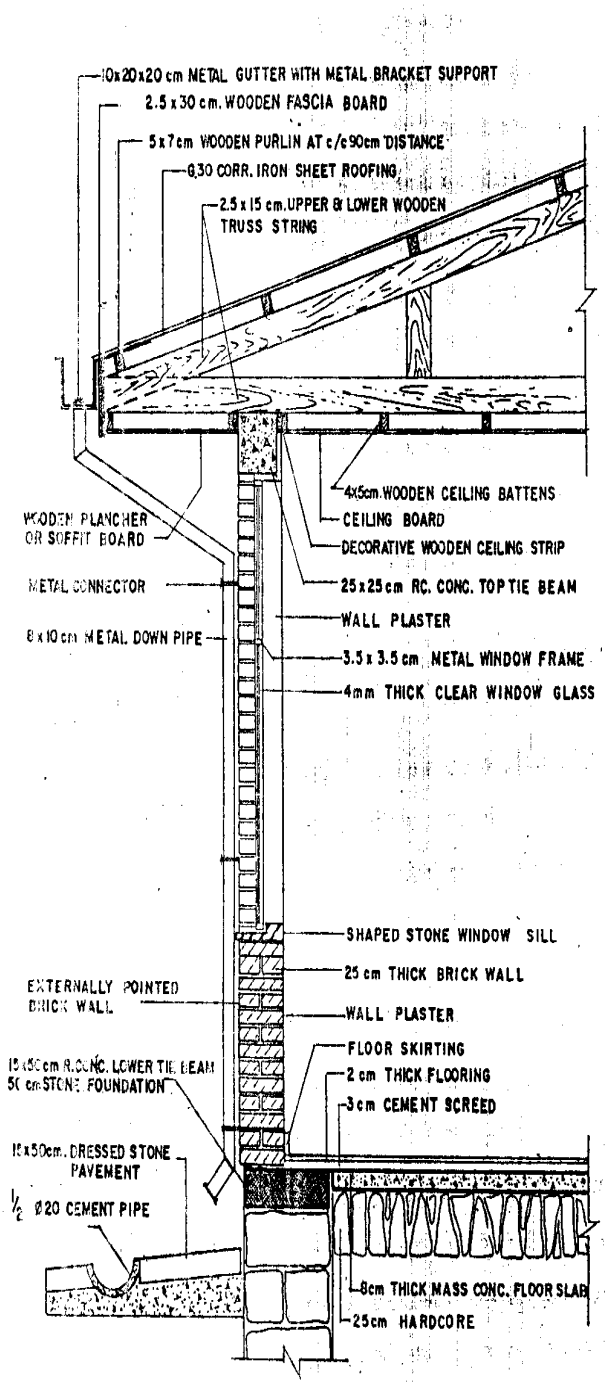
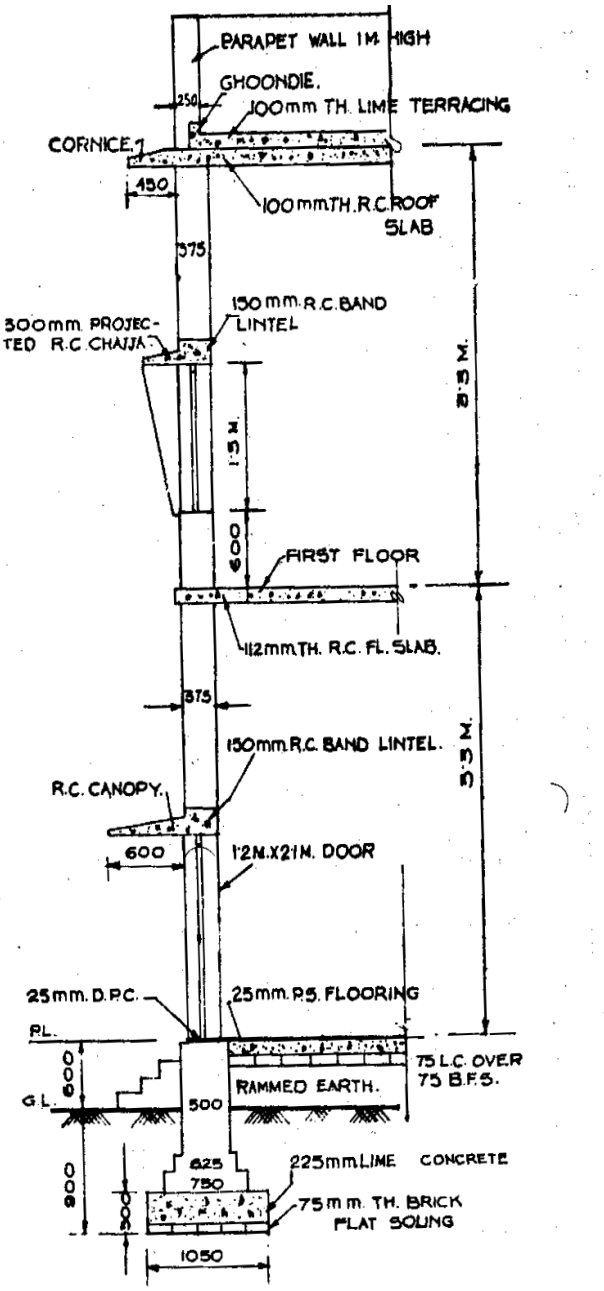


Fig. 3.15 Typical roof to foundation detail (sloping roof)



SECTION THROUGH A WALL (FOR A TWO STOREYED DOMESTIC BUILDING) SHOWING DETAILS FROM FOUNDATION TO PARAPET

Fig 3.16 Typical roof to foundation detail (Flat Roof)

Typical Building Drawings

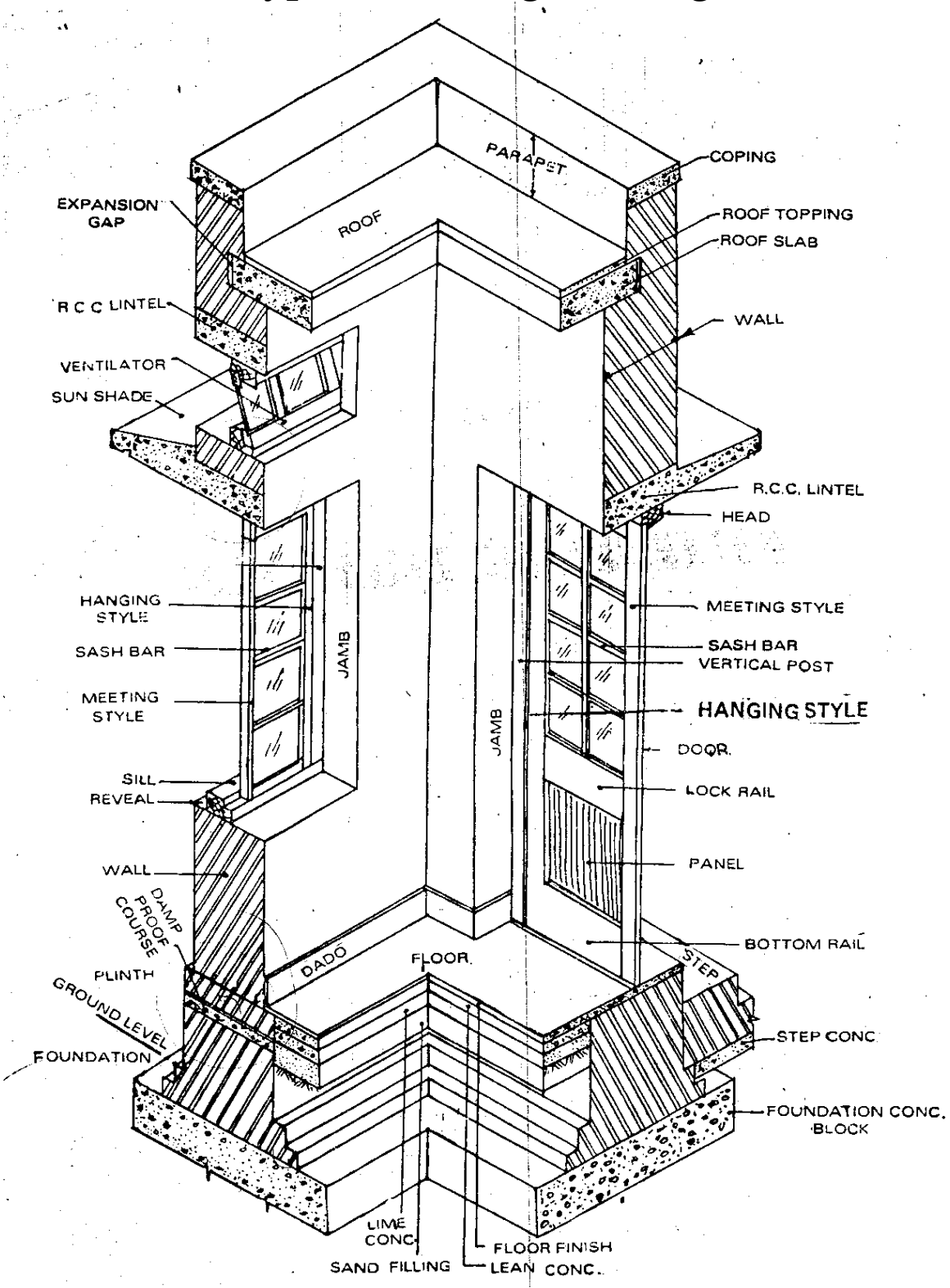
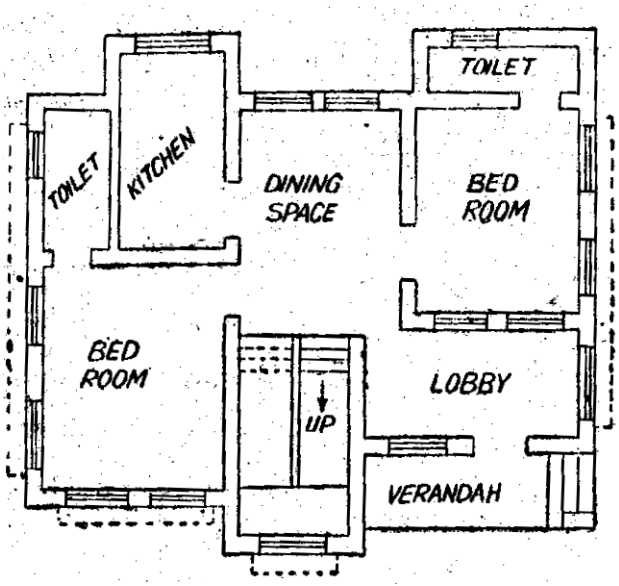
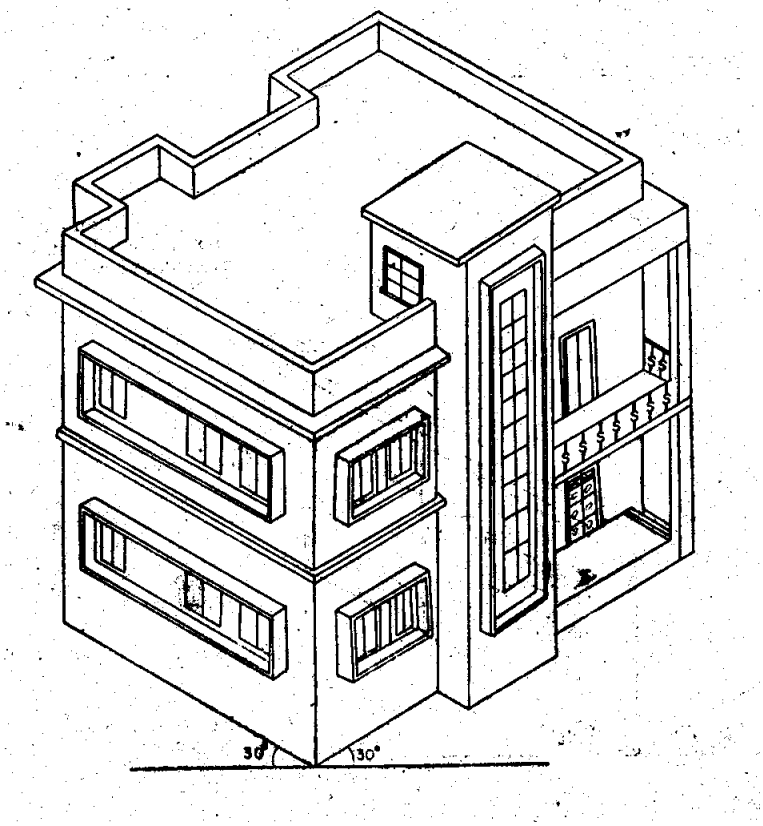


Fig 3.17 Building details and some technical terms used in building

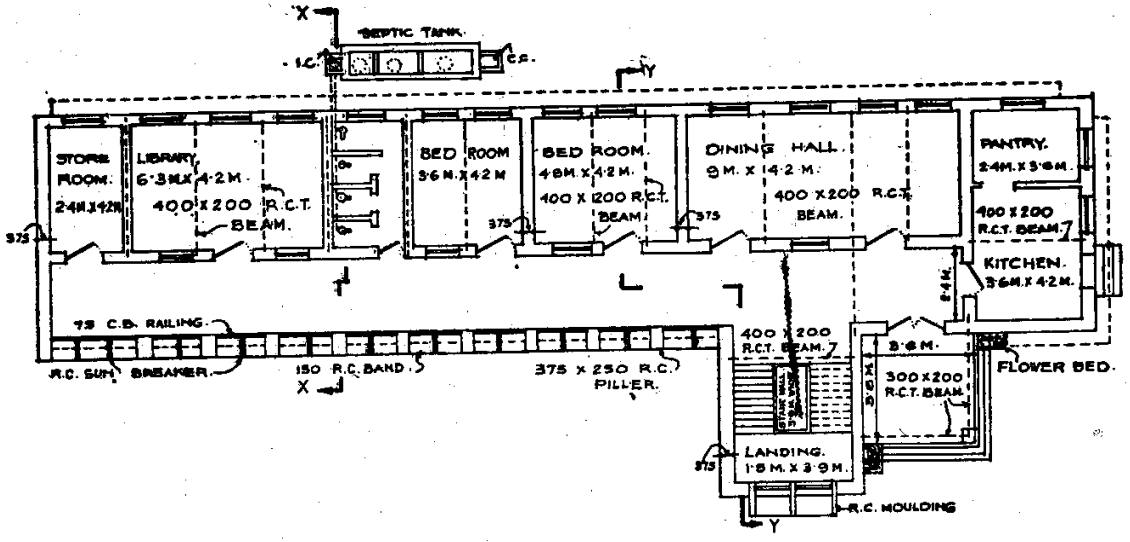


Plan

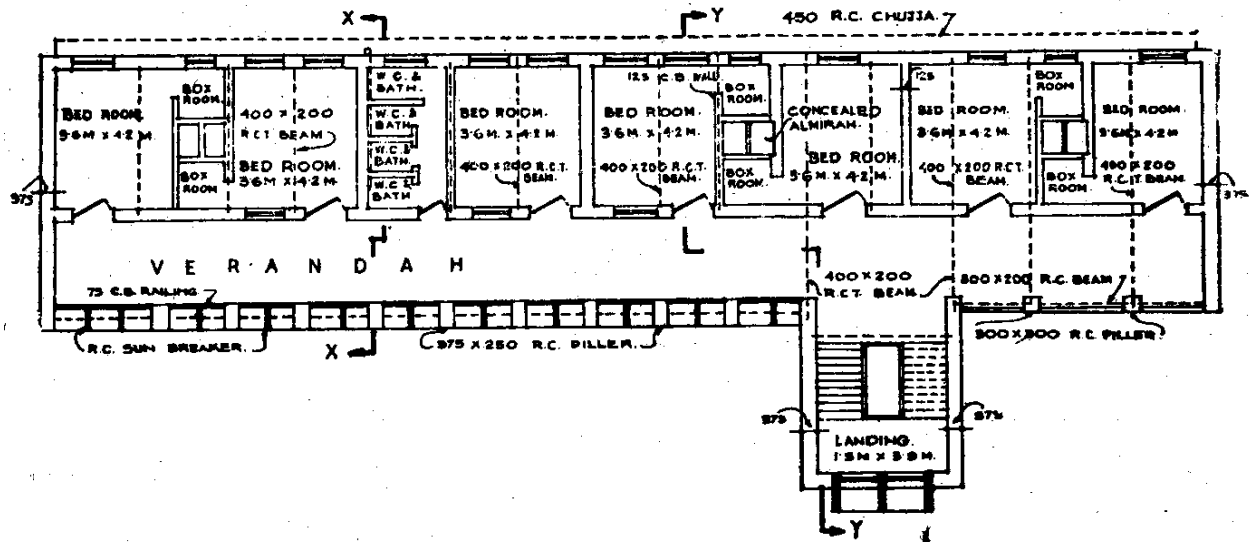


Perspective view

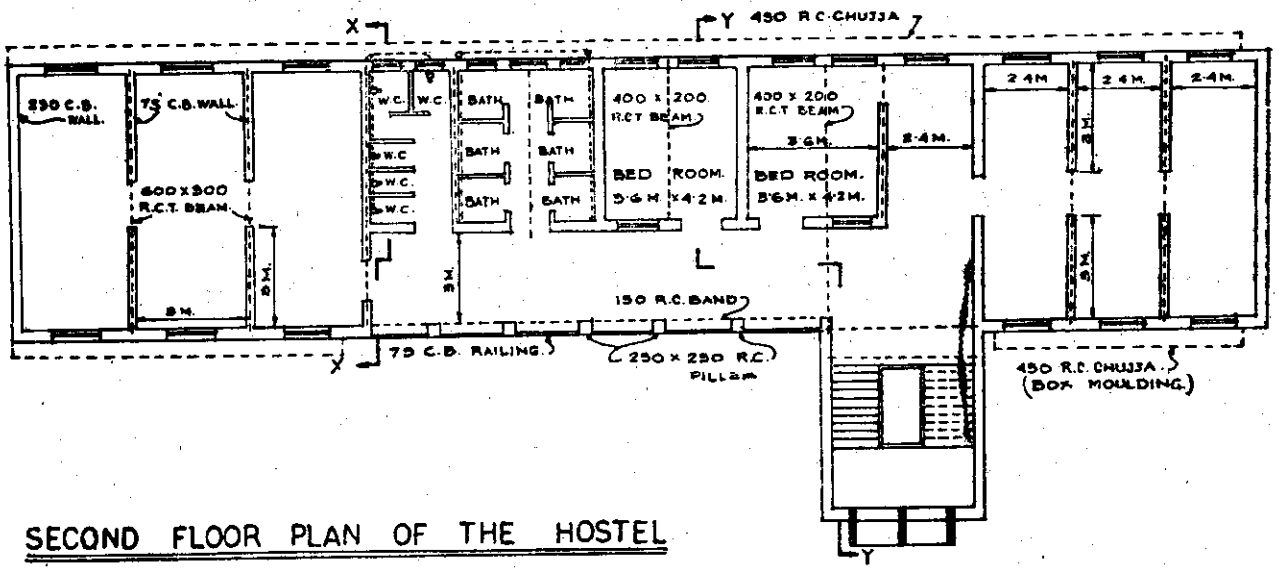
Fig 3.18 Plan and Perspective view of residential building



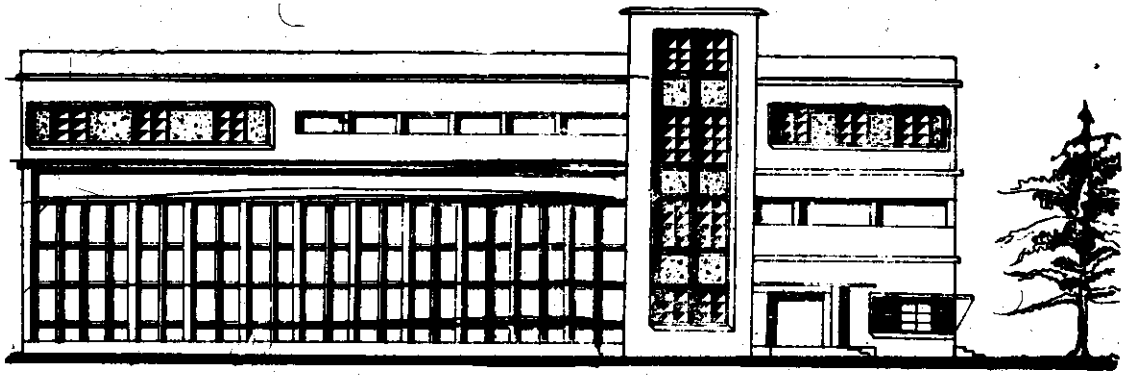
Ground Floor Plan of a Hostel Building



First Floor Plan of a Hostel Building

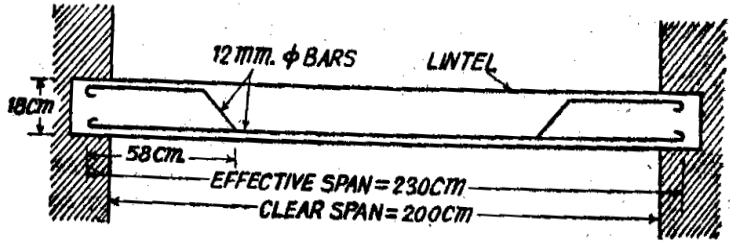


Second Floor Plan of a Hostel Building

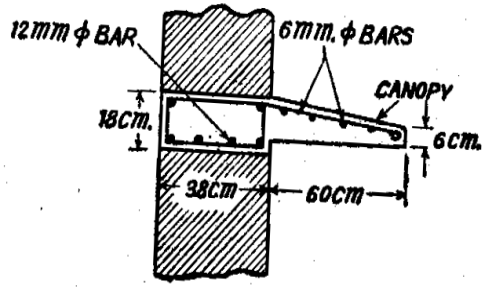


Front Elevation View of a Hostel building

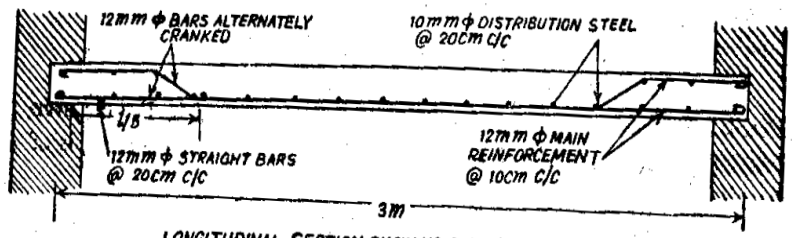
Fig 3.19 Drawing of a Hostel Building



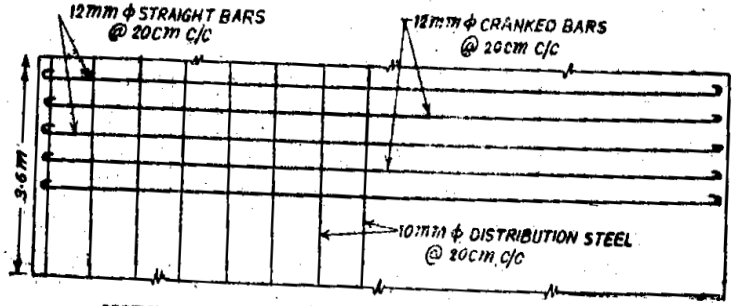
Reinforcement in Lintel
Fig. 17·1.



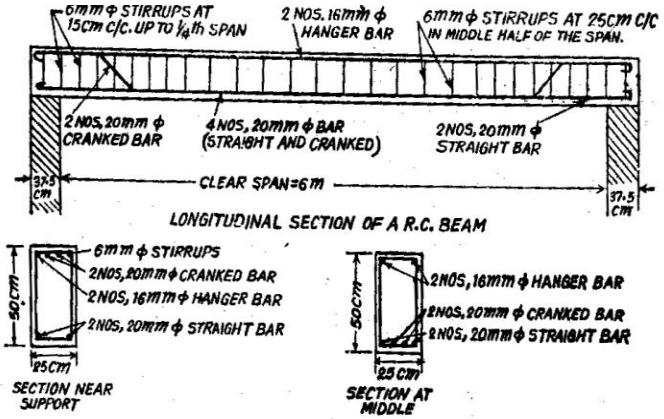
Reinforcement in Lintel with projected canopy
Fig. 17·2.



LONGITUDINAL SECTION SHOWING SLAB REINFORCEMENTS

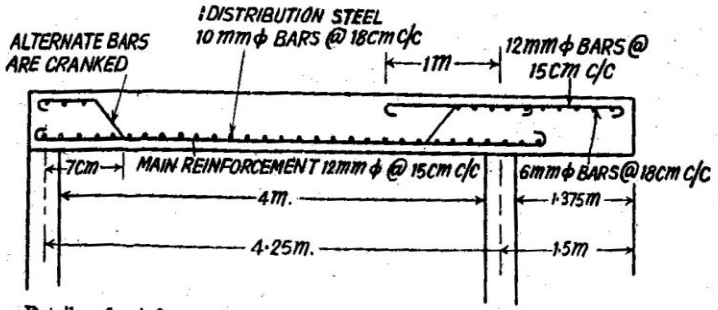


SECTIONAL PLAN SHOWING SLAB REINFORCEMENTS



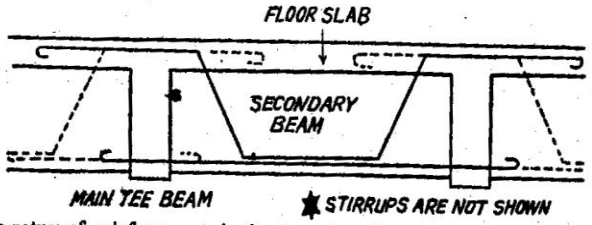
Reinforcement in R.C. Beam

Fig· 17·4.

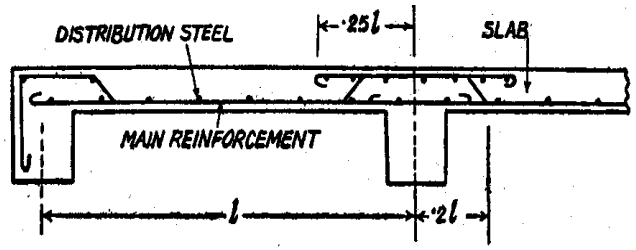


Details of reinforcement steel provided in an overhanging slab. For the overhanging part, the reinforcement is provided at top, as the bending there, is of hogging nature.

Fig. 17·5.

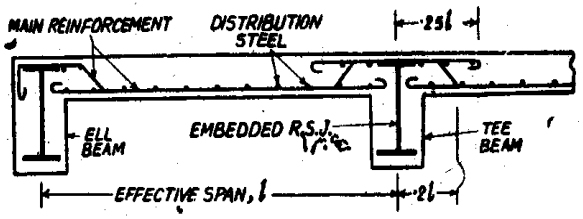


The nature of reinforcement in the secondary beam placed between main Tee beams. The reinforcement in the main Tee beams and in the floor slab are



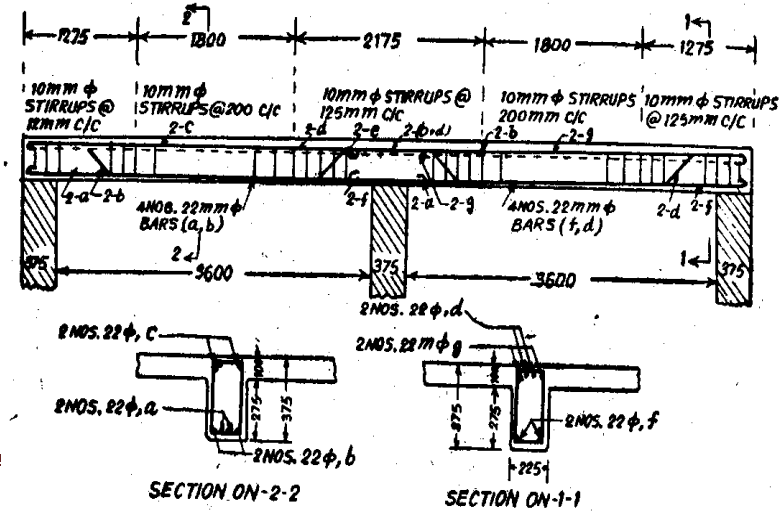
Details of reinforcement in a continuous slab. The slab itslf acts as the compression flange of the Tee Beams. At the end of the slab Ell beams are used. Reinforcements in Tee beam and Ell beam are not shown here.

Fig. 17·1.

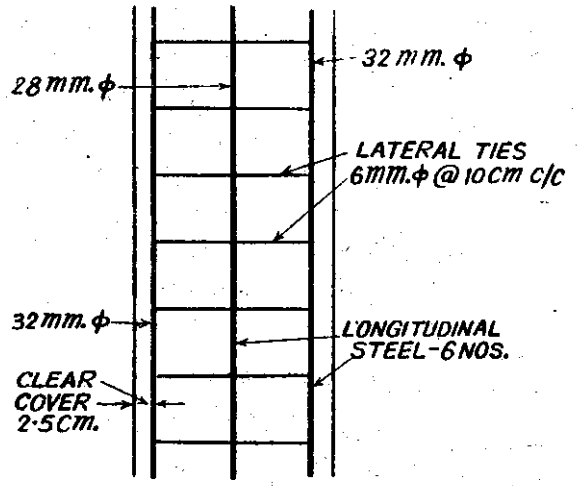


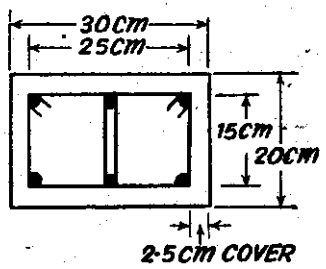
Rolled steel joists are embedded in concrete beams instead of reinforcement steel. Reinforcement bars shown, are for the slab only. Mark carefully, the position and placement of reinforcement bars at the end and intermediate beams.

Fig. 17·8.

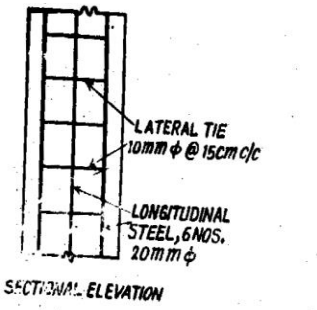


Details of Reinforcement in a Continuous Beam

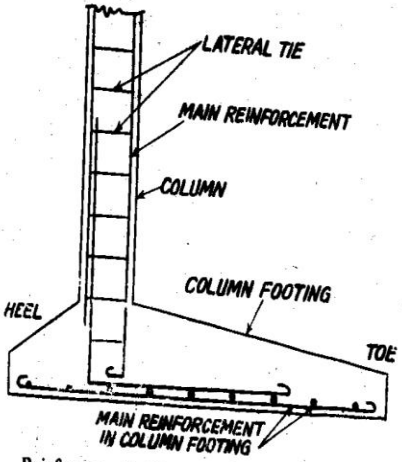




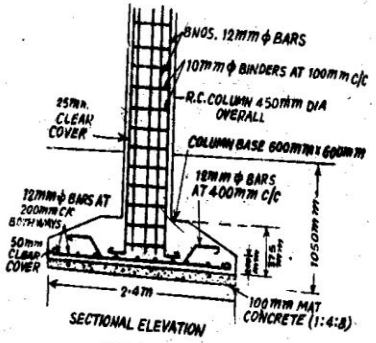
Reinforcemcnt in a R.C. column, rectangular in section.

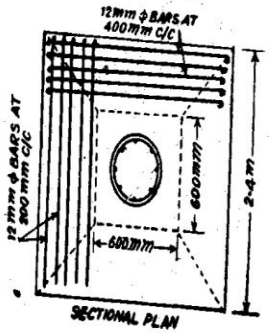


Reinforcement in a circular column.
Fig. 17·14



Reinforcement in Eccentria columc Footing.
Fig. 17·15





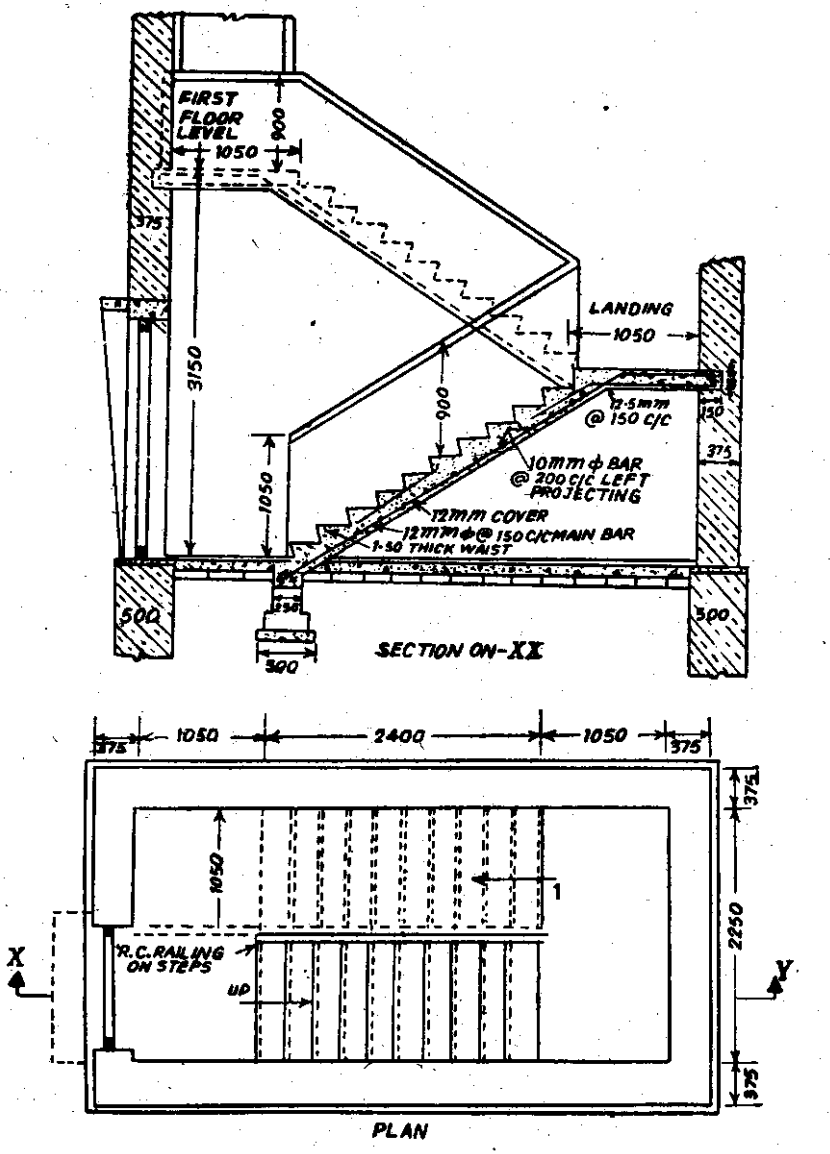


Fig 3.20 Structural and reinforcement drawings

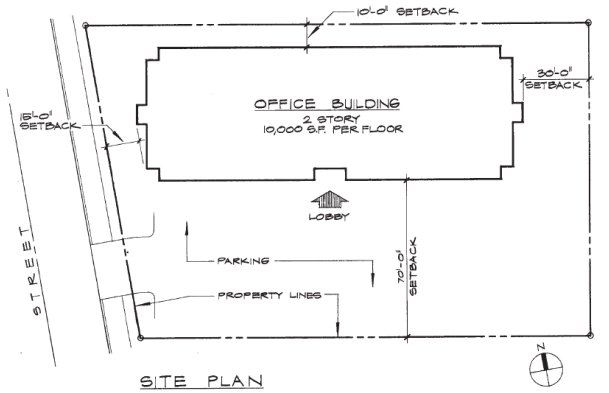
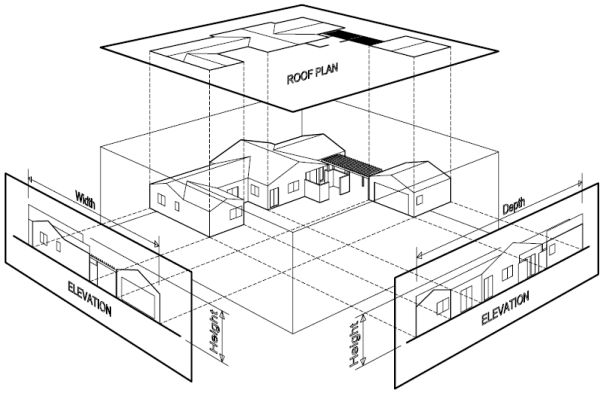
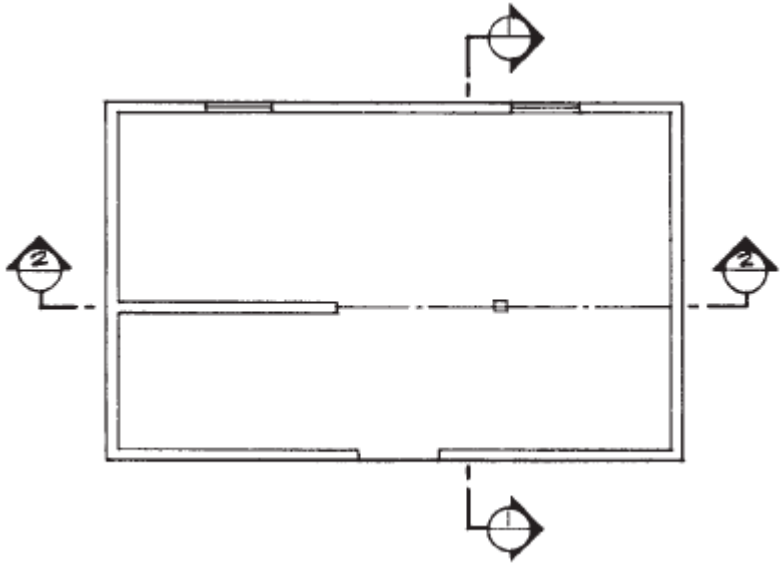
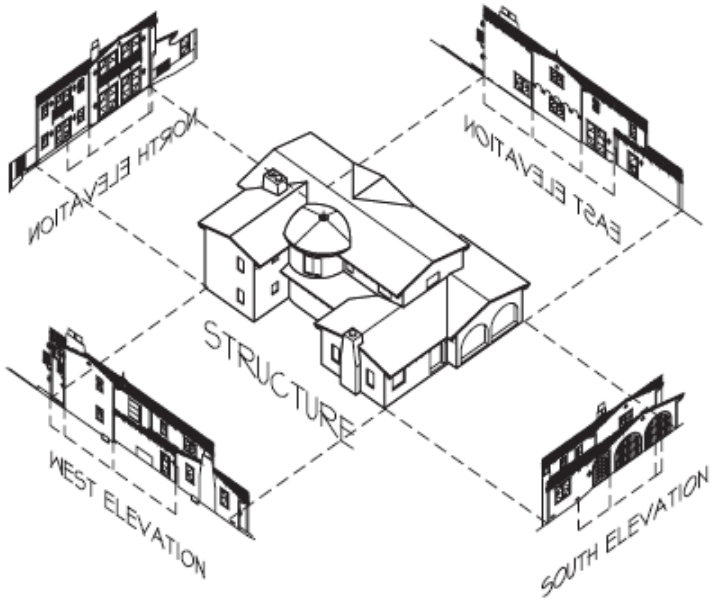


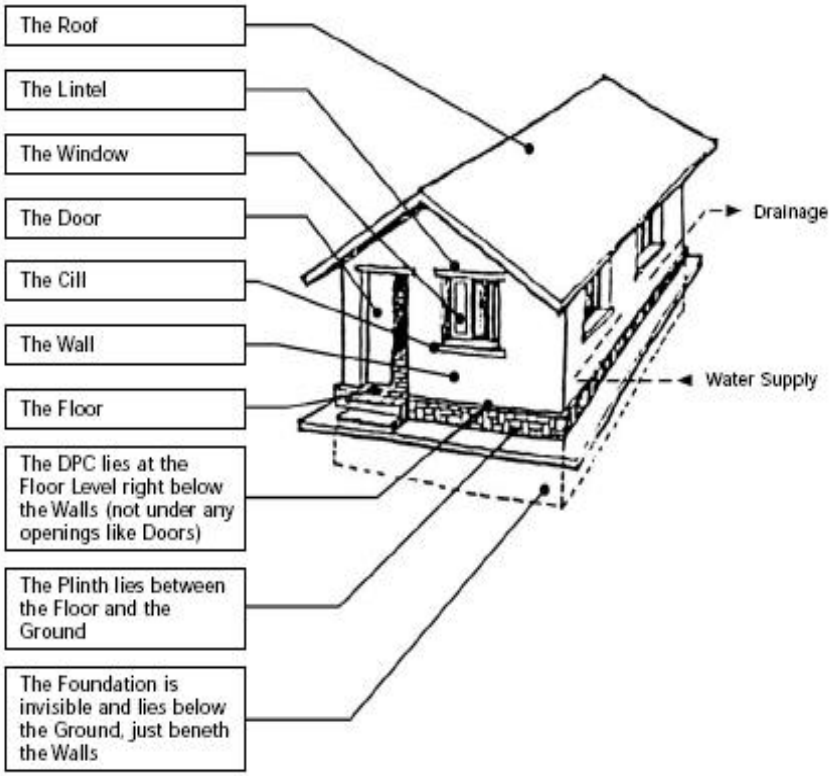
Figure 1.15 Site plan.

tions. An acceptable egress travel will terminate at the to which the architect or designer will continually refer








The Roof
The Lintel
The Window
The Door
The Cill
The Wall
The Floor
The DPC lies at the Floor Level right below the Walls (not under any openings like Doors)
The Plinth lies between the Floor and the Ground
The Foundation is invisible and lies below the Ground, just beneth the Walls
Drainage
Water Supply

Assignment_2

Mr. X wants to build G+ 2 resident houses. He has prepared 60sq.m for built up area of his house. He wants car parking integrated with the building. As an engineer prepare the working drawing which include perspective elevation, all side view, floor plan, and section view which shows the appearance of staircase.

Hint: Use any design and any imagination as an engineer.