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# Architectural and Structural Planning of a Bungalow

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**Abstract:** This study focuses on the architectural planning and structural design of a residential bungalow with a built-up area of 176 m<sup>2</sup>. The objective is to develop a functional, comfortable, and structurally safe dwelling by integrating space planning principles, zoning techniques, and reinforced concrete structural systems. The design emphasizes efficient land utilization, proper ventilation, natural lighting, and compliance with Indian building standards.

## I. INTRODUCTION

A bungalow is a low-rise residential building, typically designed for single-family use with one or two floors. Modern bungalow design focuses more on planning efficiency, comfort, and adaptability rather than just appearance.

## II. OBJECTIVES

- 1) To design a functional residential bungalow for 176 m<sup>2</sup> area
- 2) To apply principles of architectural planning
- 3) To design a safe RCC structural system
- 4) To ensure proper ventilation, lighting, and orientation

For a 176 m<sup>2</sup> plot (~1895 sq.ft), careful planning is essential to balance:

1. Built-up area
2. Open spaces
3. Circulation
4. Structural stability

## III. ARCHITECTURAL PLANNING

### A. Space Planning

Space planning involves organizing rooms based on user needs and activities. It is a key element in residential design.

Recommended Room Distribution (176 m<sup>2</sup>):

| Room           | Area (Approx.)          |
|----------------|-------------------------|
| Living Room    | 20–25 m <sup>2</sup>    |
| Dining Area    | 12–15 m <sup>2</sup>    |
| Kitchen        | 10–12 m <sup>2</sup>    |
| Master Bedroom | 15–18 m <sup>2</sup>    |
| Bedroom        | 12–15 m <sup>2</sup>    |
| Guest Room     | 10–12 m <sup>2</sup>    |
| Toilets        | 4–6 m <sup>2</sup> each |
| Circulation    | 10–15%                  |

### B. Zoning Principles

A well-planned bungalow must have clear zoning:

- Public Zone: Living room, drawing room
- Private Zone: Bedrooms
- Service Zone: Kitchen, toilets

This improves privacy and reduces unnecessary movement.

**C. Orientation & Climate Consideration**

- Living spaces → East/North (better daylight)
  - Bedrooms → South-West (thermal comfort)
  - Windows → Cross ventilation
  - Use verandah/courtyard for passive cooling
- Proper orientation improves comfort and reduces energy usag

- Windows → Cross ventilation
- Use verandah/courtyard for passive cooling

**D. Circulation Planning**

- Minimum corridor width: 1.0–1.2 m
- Efficient layout reduces wasted spac
- Direct connectivity between kitchen and dining

**E. Plot Coverage**

Typical bungalow planning uses:

- 45–60% built-up area
- Remaining for garden, parking, setbacks

For 176 m<sup>2</sup>:

- Built-up ≈ 80–105 m<sup>2</sup> per floor (if G+1)

3.0 Structural Brief

(Quantity Life and Dead Loads Acting on Structure)

**Dimension of structure**

| Structure | Dimension                                    |
|-----------|--|
| Slab      | 0.15m (thickness)                            |
| Wall      | 0.15m X 3.0m (thickness X height)            |
| Beam      | 0.2m X 0.3 m (width X depth)                 |
| Column    | 0.3m X 0.3m X 0.3m (width X length X height) |

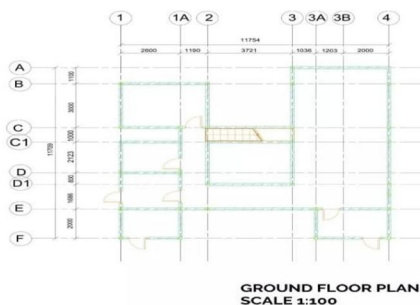
**Standard Weight of Material**

| Material            | Standard Weight (kN/m <sup>3</sup> ) |
|---------------------|--------------------------------------|
| Brickwork           | 19                                   |
| Reinforced concrete | 24                                   |

**Structure Self-Weight**

| Structure     | Calculation                              | Self-weight           |
|---------------|--|-----------------------|
| Concrete slab | 0.15m X 24kN/m <sup>3</sup>              | 3.6kN/m <sup>2</sup>  |
| Brick wall.   | 0.15m X 3.0m X 19kN/m <sup>3</sup>       | 8.55kN/m <sup>2</sup> |
| Beam          | 0.2m X 0.3m X 24kN/m <sup>3</sup>        | 1.44kN/m <sup>2</sup> |
| Column        | 0.3m X 0.3m X 0.3m X 24kN/m <sup>3</sup> | 6.48kN/m <sup>2</sup> |
| Roof          | -  | 1.0kN/m <sup>2</sup>  |

2.0 Architectural Plans



**1. Ground floor beam D/1-1A**

**Calculations & Analysis**

**Dead Load**

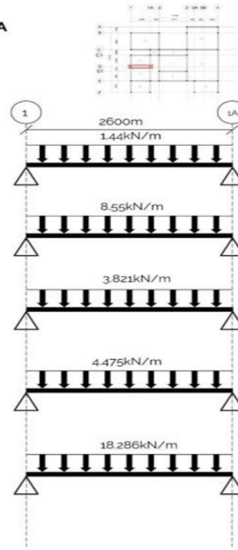
**Beam self weight**  
 $= (0.2 \times 0.3) \text{ m}^2 \times 24 \text{ kN/m}^3$   
 $= 1.44 \text{ kN/m}$

**Brick wall self weight**  
 $= (0.15 \times 3.0) \text{ m}^2 \times 19 \text{ kN/m}^3$   
 $= 8.55 \text{ kN/m}$

**Slab C1-D/1-1A**  
 $= (2.123 \text{ m}^2) \times (0.15 \text{ m} \times 24 \text{ kN/m}^3)$   
 $= 3.821 \text{ kN/m}$

**Slab D-E/1-1A**  
 $= (2.486 \text{ m}^2) \times (0.15 \text{ m} \times 24 \text{ kN/m}^3)$   
 $= 4.475 \text{ kN/m}$

**Total dead load**  
 $= 1.44 \text{ kN/m} + 8.55 \text{ kN/m} + 3.821 \text{ kN/m}$   
 $+ 4.475 \text{ kN/m}$   
 $= 18.286$



**IV. STRUCTURAL PLANNING**

**A. Structural System**

- RCC framed structure (most common)
- Components:
  - Slab
  - Beam
  - Column
  - Foundation

Design follows **IS 456:2000** guidelines

**B. Load Considerations**

- Dead Load (self-weight)
- Live Load (occupants, furniture)
- Wind Load

**C. Column Layout**

- Grid spacing: 3m–5m
- Columns placed
  - Beam intersections
  - 5.4 Foundation
- Isolated footing (for normal soil)
- Depth depends on SBC (Safe Bearing Capacity)

**D. Slab Design**

- Thickness: 120–150 mm
- Reinforcement based on span
- Designed using limit state method

**E. Beam Design**

- Supports slab load
- Typical size: 230 mm × 300 mm

## V. PLANNING CONSIDERATIONS

### A. Functional Efficiency

- No dead spaces
- Easy movement
- Logical room arrangement

### B. Aesthetic Design

- Simple geometry reduces cost
- Natural materials improve appearance

### C. Sustainability

- Natural lighting
- Rainwater harvesting
- Energy-efficient materials

## VI. SAMPLE LAYOUT CONCEPT (176 M<sup>2</sup>)

### A. Ground Floor

- Living room
- Dining
- Kitchen
- 1 Bedroom
- Toilet

### B. First Floor (optional)

- 2 Bedrooms
- Balcony
- Terrace

## VII. CONCLUSION

The planning of a bungalow for a 176 m<sup>2</sup> area requires a balance between architectural efficiency and structural safety. Proper zoning, orientation, and circulation ensure comfort, while RCC structural design ensures durability and safety. A well-planned bungalow improves quality of life and adapts to future needs.

## VIII. TYPES OF LOADS IN A BUNGALOW (IS CODE BASED)

According to Indian Standards IS 875 & IS 1893, buildings are designed for these loads:

- Dead Load (DL) → Self weight of structure
- Live Load (LL) → People, furniture
- Wind Load (WL)

Earthquake Load (EL)

Load Transfer in Bungalow (Important Concept)

□ Flow:

Slab → Beam → Column → Footing → Soil

## IX. DEAD LOAD CALCULATION (DL)

Formula

Dead Load = Unit Weight × Volume

Standard Values

- RCC = 25 kN/m<sup>3</sup>
- Brick wall = 20 kN/m<sup>3</sup>

Example (Slab Load)

- Thickness = 150 mm = 0.15 m
  - RCC density = 25 kN/m<sup>3</sup>
- Dead Load = 0.15 × 25 = 3.75 kN/m<sup>2</sup>

Add:

- Tiles = 1.2 kN/m<sup>2</sup>
  - Plaster = 0.3 kN/m<sup>2</sup>
- Total Dead Load = 5.25 kN/m<sup>2</sup>

Standard Values (IS 875):

- Living room = 2 kN/m<sup>2</sup>
- Bedroom = 1.5–2 kN/m<sup>2</sup>

Roof = 1–1.5 kN/m<sup>2</sup>

**X. LIVE LOAD CALCULATION (LL)**

Total Load = Dead Load + Live Load

- Example:
- DL = 5.25 kN/m<sup>2</sup>
  - LL = 2 kN/m<sup>2</sup>
- Total = 7.25 kN/m<sup>2</sup>

**XI. TOTAL LOAD ON SLAB**

Beam takes load from slab.

□ Formula:

Beam Load = (Slab Load × Area / Beam Length)

□ Example:

Room = 3m × 4m

Total slab load = 7.25 × 12 = 87 kN

□ Load transferred to beams

**XII. LOAD ON BEAM**

**XIII. LOAD ON COLUMN**

Column carries:

- Slab load
- Beam load
- Wall load
- Self-weight

Column Load Formula:

Total Column Load =

Slab Load + Beam Load + Wall Load + Column Self Weight

□ Typical: Column self-weight ≈ 10–15 kN/floor

**XIV. WALL LOAD CALCULATION**

Formula:

Wall Load = Thickness × Height × Density

Example:

- Thickness = 0.23 m
- Height = 3 m



- Density = 20 kN/m<sup>3</sup>

- Load =  $0.23 \times 3 \times 20 = 13.8$  kN/m

#### XV. FOUNDATION LOAD

Foundation carries total load of building:

Totl Load = DL + LL + WL + EL

- Factor of Safety = 1.5 (IS 456)

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