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Architectural and Structural Planning of a Bungalow

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***Abstract:** This study focuses on the architectural planning and tructural design of a residential bungalow with a built- up area of 176 m². 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 m² 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 m² 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 m²):

Room	Area (Approx.)
Living Room	20–25 m²
Dining Area	12–15 m²
Kitchen	10–12 m²
Master Bedroom	15–18 m²
Bedroom	12–15 m²
Guest Room	10–12 m²
Toilets	4–6 m² 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.

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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 m²:

- Built-up ≈ 80–105 m² 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 legnth X height)

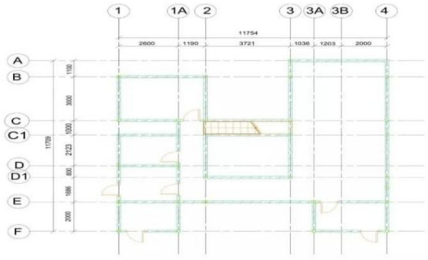
Standard Weight of Material

Material	Standard Weight (kN/m³)
Brickwork	19
Reinforced concrete	24

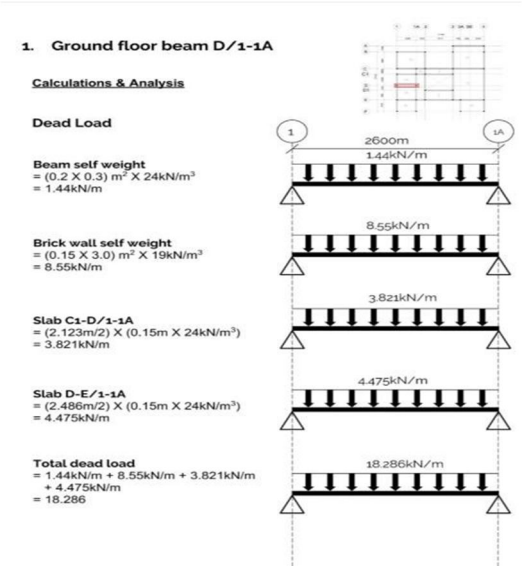
Structure Self-Weight

Structure	Calculation	Self-weight
Concrete slab	0.15m X 24kN/m3	3.6kN/m²
Brick wall	0.15m X 3.0m X 19kN/m³	8.55kN/m²
Beam	0.2m X 0.3m X 24kN/m³	1.44kN/m²
Column	0.3m X 0.3m X 0.3m X 24kN/m³	6.48kN/m²
Roof	-	1.0kN/m²

2.0 Architectural Pans



GROUND FLOOR PLAN
SCALE 1:100



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 M²)

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 m² 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/m³
- Brick wall = 20 kN/m³

Example (Slab Load)

- Thickness = 150 mm = 0.15 m
- RCC density = 25 kN/m³

 Dead Load = 0.15 × 25 = 3.75 kN/m²

Add:

- Tiles = 1.2 kN/m²
- Plaster = 0.3 kN/m²

 Total Dead Load = 5.25 kN/m²

X. LIVE LOAD CALCULATION (LL)

Standard Values (IS 875):

- Living room = 2 kN/m²
- Bedroom = 1.5–2 kN/m²

Roof = 1–1.5 kN/m²

XI. TOTAL LOAD ON SLAB

Total Load = Dead Load + Live Load

 Example:

- DL = 5.25 kN/m²
- LL = 2 kN/m²

 Total = 7.25 kN/m²

XII. LOAD ON BEAM

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

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/m³

 Load = 0.23 × 3 × 20 = 13.8 kN/m

XV. FOUNDATION LOAD

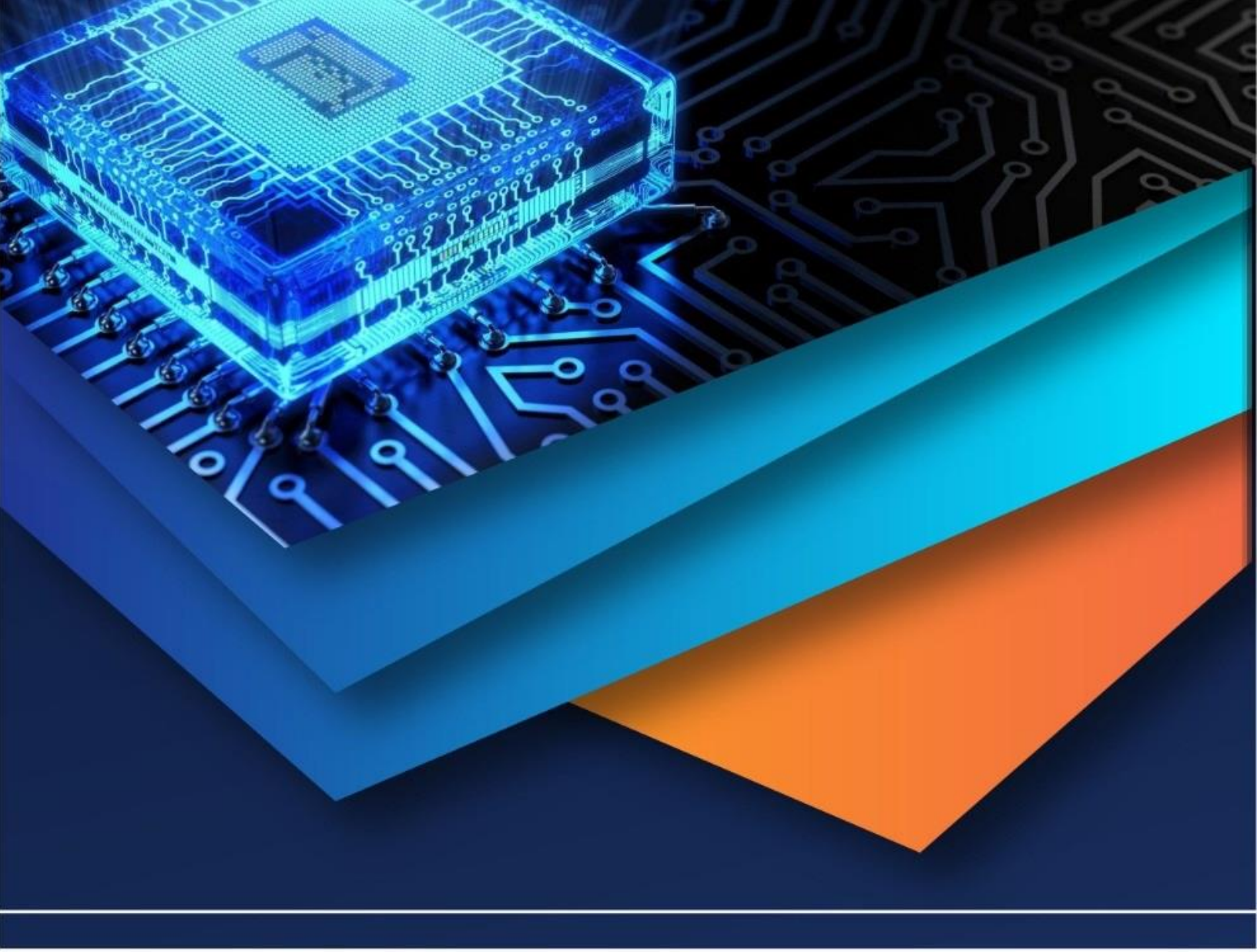
Foundation carries total load of building:

Totl Load = DL + LL + WL + EL

 Factor of Safety = 1.5 (IS 456)

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