WELCOME

Opportunities for Builders And Architects to Construct Passive Solar Buildings in Maharashtra

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INTRODUCTION

- A SHELTER WITH SECURITY HAS BEEN THE BASIC NEED OF MANKIND
- LATER: COMFORTABLE INDOOR ENVIRONMENT WITH ARCHITECTURAL BEAUTY
- RAPID GROWTH IN URBAN POPULATION IN THE POST-INDUSTRIAL REVOLUTION
- LOW-COST HOUSING FOR EXPANDING LABOUR FORCE REQUIRED
- THIS LED TO DESIGNING OF "INTERNATIONAL STYLE" MODERN BUILDINGS

INTRODUCTION (Contd.)

- COMFORT AT THE COST OF ENORMOUS AMOUNT OF ENERGY CONSUMED
- COMFORTABLE INDOOR ENVIRONMENT WELL ENJOYED UNTIL ENERGY CRISIS
- CONCEPT OF "SOLAR PASSIVE ARCHITECTURE" EVOLVED IN MODERN CONTEXTS
- DEFINITION: ACHIEVING INDOOR THERMAL AND VISUAL COMFORT WITH MINIMUM OR NO USE OF ARTIFICIAL ENERGY.
- NATURAL MEANS : CLIMATIC RESPONSIVE DESIGN : “SOLAR PASSIVE BUILDING”
- ARTIFICIAL MEANS : ENERGY-CONSCIOUS DESIGN : "LOW ENERGY BUILDING".
- OBJECTIVE: AN INSIGHT: SPA IN DIFFERENT CLIMATIC ZONES OF MAHARASHTRA

PRACTICAL POSSIBILITY

- **"WILL THE HOUSE GET TOO HOT OR COLD?**
- **WILL IT BE UGLY AND FUTURISTIC LOOKING?**
- **WILL IT LOOK LIKE GLASS HOUSE WITH BLACK PAINTING?**
- **WILL IT BE HIGHLY EXPENSIVE TECHNOLOGY?"**

NONE OF THESE FEARS ARE WELL FOUNDED

- **SOLAR HOME: KEEPING TRADITIONAL FEATURES INTACT WITHOUT ADDED EXPENSE**
- **JUST RE-ARRANGEMENT OF TRADITIONAL BUILDING**
- **CLIMATE-SENSITIVE BUILDINGS REDUCE FUEL BILLS UP-TO 50% NO EXTRA COSTS.**

PRACTICAL POSSIBILITY (Contd.)

- SOLAR HOUSES NEED NOT BE IDENTICAL, NOR NEED THEY BE DULL
- THOUSANDS OF SOLAR BUILDINGS BUILT IN WORLD
- IN INDIA, LESS THAN HUNDRED IN NUMBERS
- SOLAR PASSIVE BUILDING IS A PRACTICAL POSSIBILITY

BASIC PRINCIPLES

1. EMPLOYS THE METHODS OF COLLECTING, STORING, DISTRIBUTING & CONTROLLING THERMAL ENERGY FLOW BY MEANS OF NATURAL PRINCIPLES OF HEAT TRANSFER.
2. JUDICIOUS SELECTION OF DESIGN-PARAMETERS
3. SITE SELECTION, ORIENTATION, ROOF, WALLS, WINDOWS,
4. DAY - LIGHTING, VENTILATION, COLOR AND TEXTURE

CLIMATIC ZONES

- **CLIMATIC ZONE CHARACTERIZED BY PREDOMINANT AVERAGE WEATHER**

1. **CLIMATIC FACTORS**:

   (A) SOLAR RADIATION, (B) AMBIENT TEMPERATURE, (C) AIR HUMIDITY, (D) RAIN OR SNOW FALL, (E) WIND AND (F) SKY CONDITION.

2. **COMFORT ZONE**:

- **"THERMAL COMFORT CONDITION" : MAJORITY OF PEOPLE FEEL COMFORTABLE**
- **20-30 ^{0}C DRY BULB TEMPERATURE, 30-60% OF RELATIVE HUMIDITY**

CLIMATIC ZONES (Contd.)

- **CLIMATIC ZONES IN INDIA:**

  SIX TYPES OF CLIMATIC ZONES

- **CLIMATIC ZONES IN MAHARASHTRA : FOUR CLIMATIC ZONES**

(a) WARM AND HUMID - COASTAL AREAS

(b) COMPOSITE - VIDARBHA AND MARATHWADA

(c) HOT AND DRY - SHOLAPUR & ADJOINING AREAS

(d) MODERATE - PUNE, LONAVALA

OPPORTUNITIES IN MAHARASHTRA

FOUR SAMPLE CASES WITH COMMON ASSUMPTIONS:

(A) PLAINER AREA, RECTANGULAR SHAPE, SITE AREA: 5000 SQ.FT., BUILT-IN AREA: 2000 SQ. FT.

(B) BUNGALOW, SINGLE STORIED OFFICE-CUM-RESIDENCE, CAR-GARAGE AND SERVANT'S ROOM

(C) RESIDENTIAL SIDE: 3 BEDROOMS, A HALL AND A KITCHEN, CONNECTED THROUGH A CORRIDOR, COURT-YARD

(D) 10' WIDTH LEFT OUT ALL SIDES FOR VEGETATION

PUNE - MODERATE ZONE

A. EAST FACING, LONGER AXIS NORTH-SOUTH

B. FLAT RCC ROOF, REFLECTIVE TILES, OPENING IN PARAPET WALL

C. FLOORING SIMILAR TO OTHER ZONES

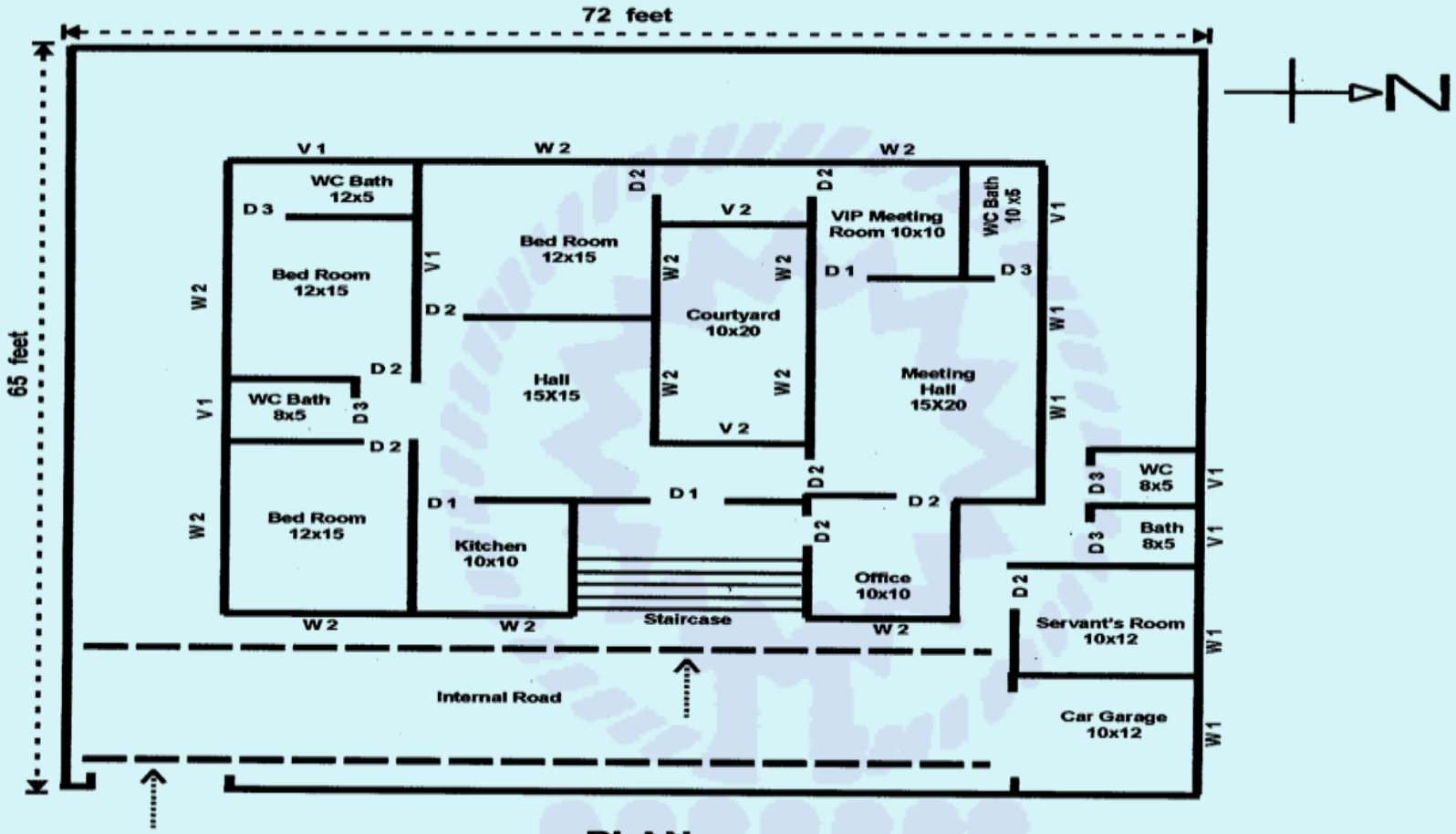
D. BURNT BRICK WALL, TEXTURED SURFACE, LIGHT COLOR

E. WINDOW:

15-20% OF FLOOR AREA, LARGER: NORTH, SMALLER: OTHER SIDES

F. CROSS VENTILATION NEAR ROOF LEVEL

G. WINDOW CURTAINS FOR DAY LIGHTING



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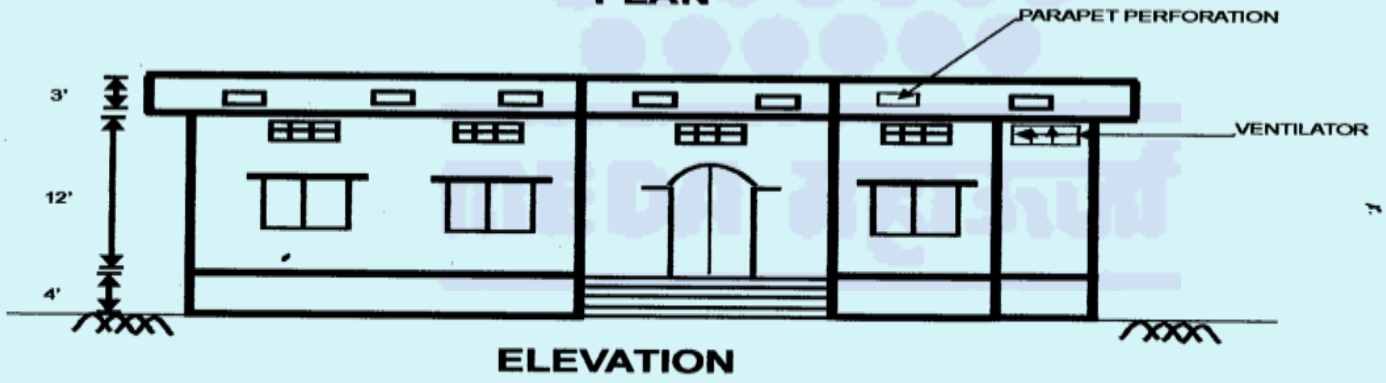
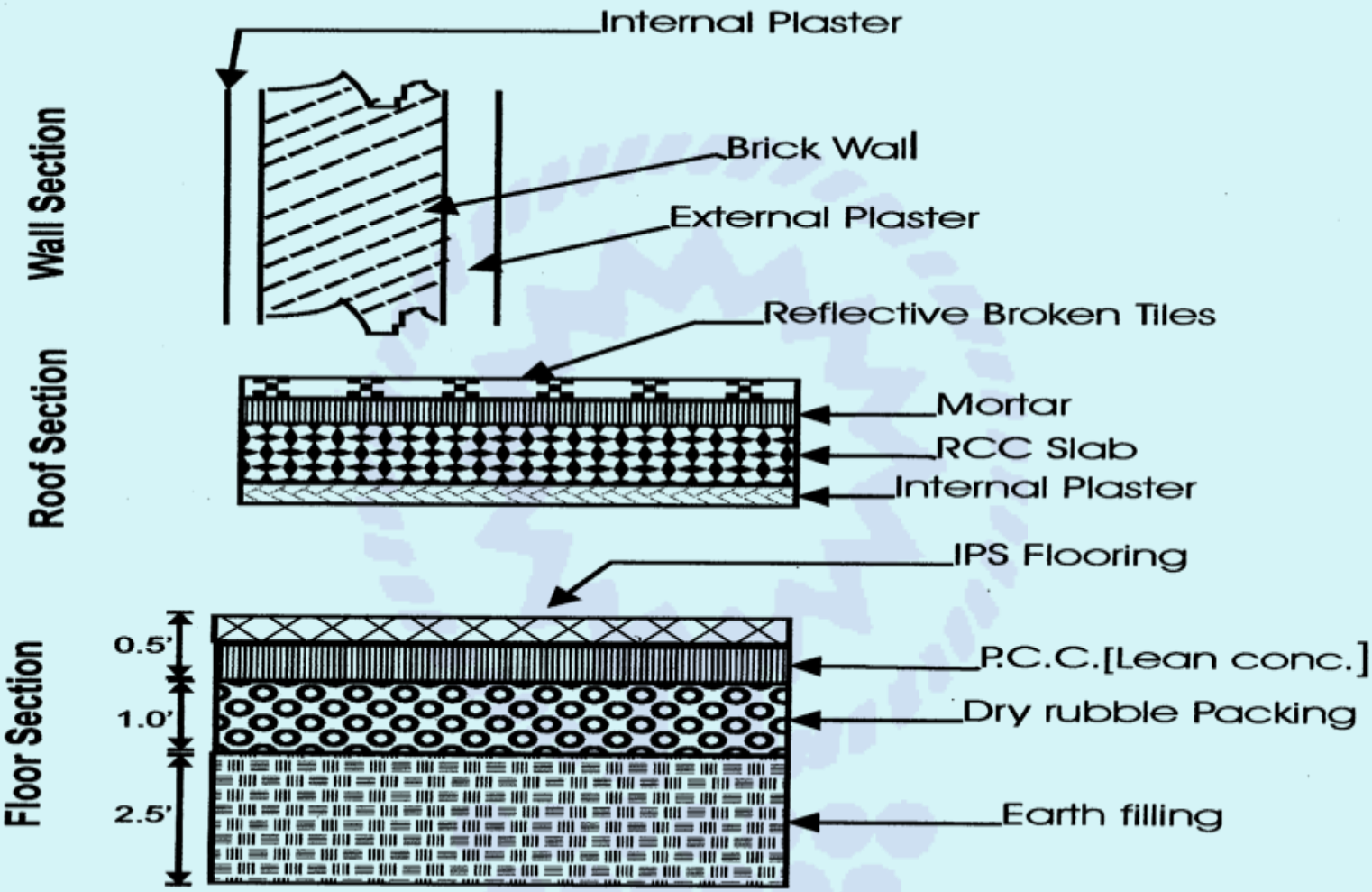


ELEVATION

Schematics of Solar Passive Building in Moderate Climatic Region : Pune



Dimensions

S.N.	Item	Symbol	Size
1.0	Ventilator	V1	1' x 2'
2.0		V2	1' x 3'
3.0	Window	W1	4' x 5'
4.0		W2	4' x 3'
5.0	Door	D1	5' x 7'
6.0		D2	4' x 7'
7.0		D3	3' x 7'

Section View of Solar Passive Building in Moderate Climatic Region : Pune

SHOLAPUR - HOT AND DRY ZONE

A. RCC ROOF, WITH TOP COVER OF HIGHLY REFLECTIVE BROKEN TILES, PARAPET WALL WITH HOLES

B. FLOOR: EARTH FILLING, DRY RUBBLE, PCC AND IPS FLOORING

C. BURNT BRICK WALL, OUTER WALL SHADING, TEXTURED OUTSIDE PLASTER AND LIGHT COLOR

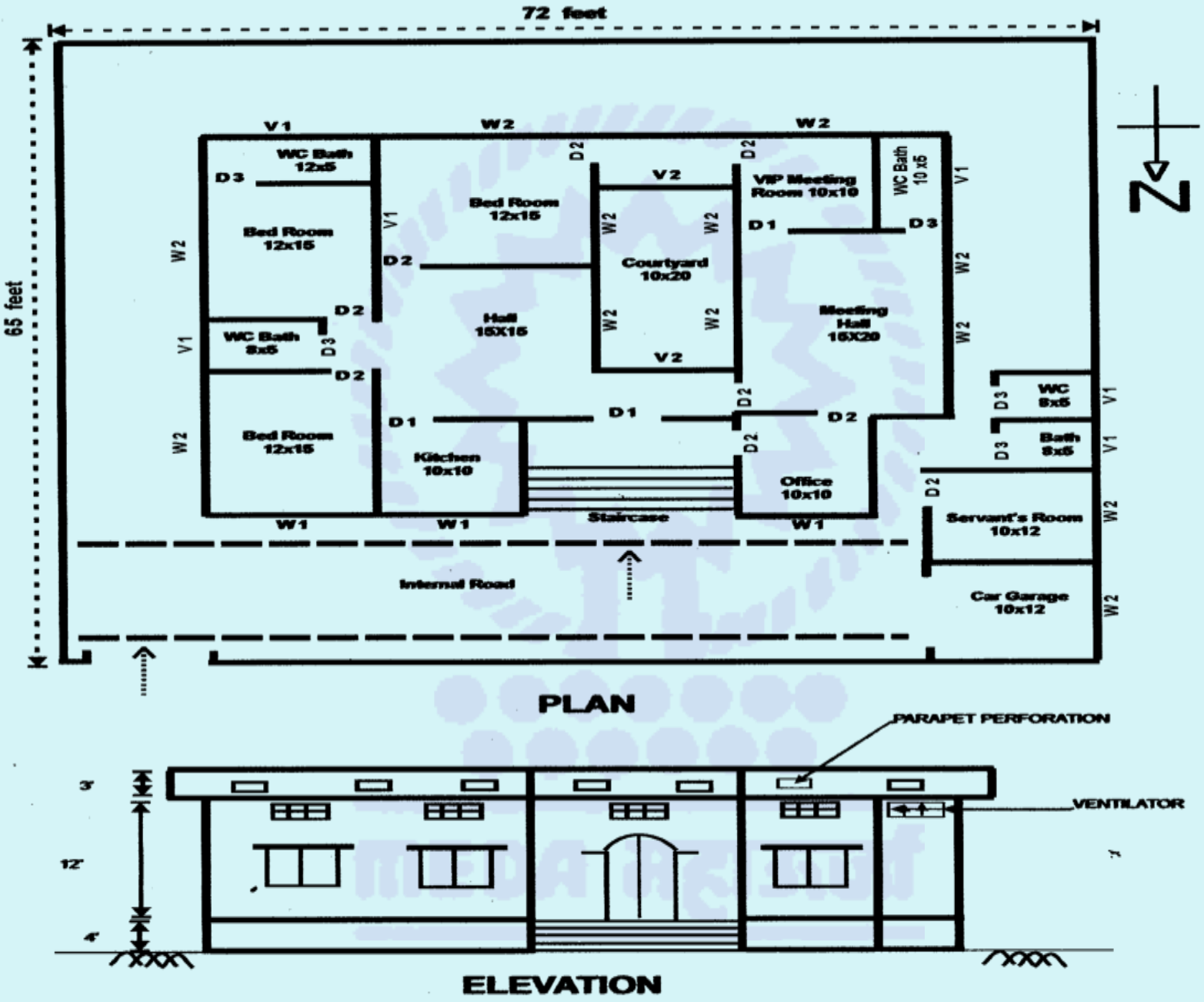
D. WINDOW AREA NOT MORE THAN 10% OF FLOOR AREA

E. LONGER AXIS: EAST-WEST, FRONT NORTH SIDE

F. LARGER WINDOWS: NORTH SIDE, SMALLER: OTHER THREE SIDES

G. CROSS VENTILATION IN EACH ROOM NEAR ROOF

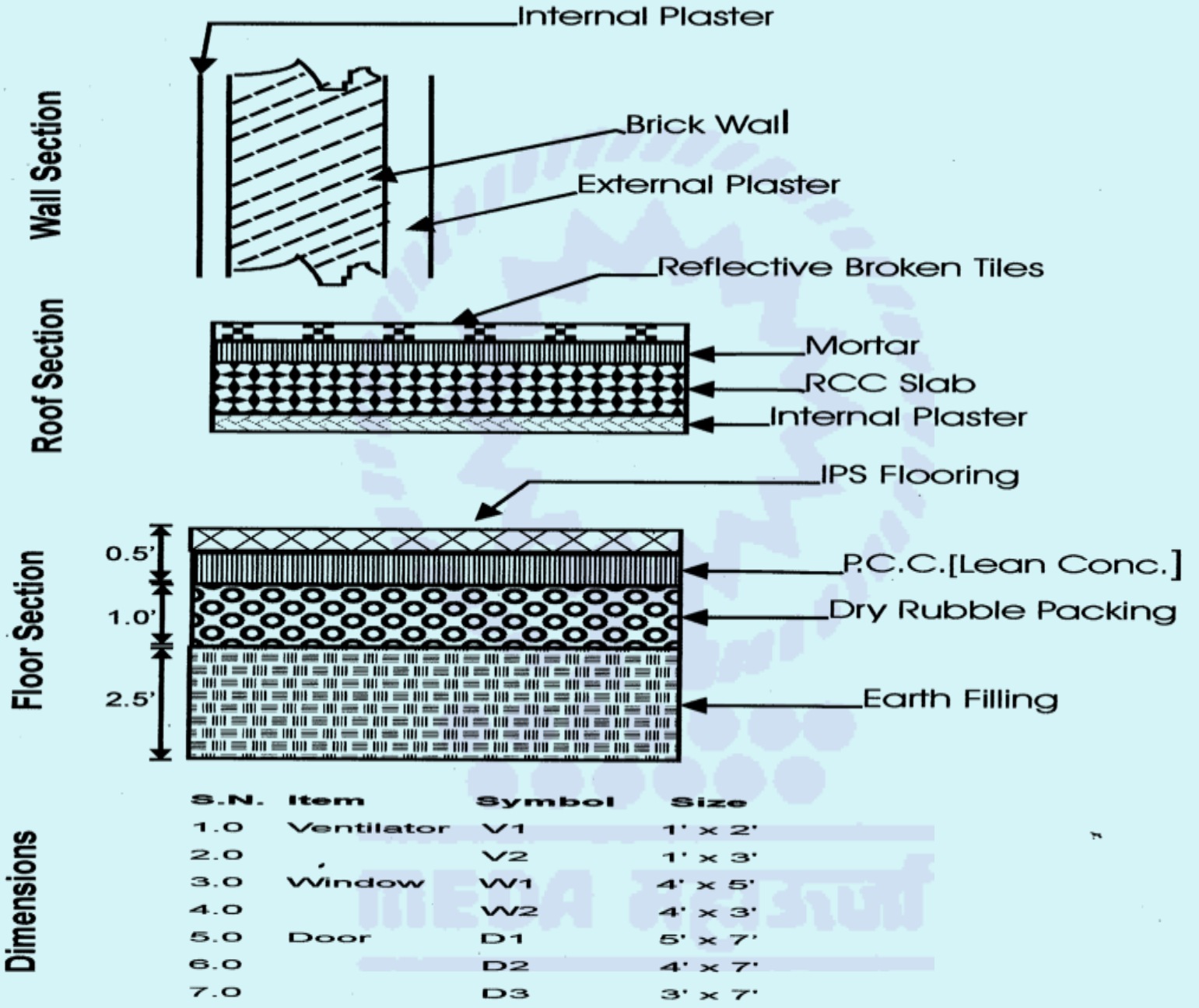
H. WATER FOUNTAIN AND VEGETATION IN COURTYARD



PLAN

ELEVATION

Schematics of Solar Passive Building in Hot and Dry Region : Sholapur



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Section View of Solar Passive Building in Hot and Dry Region : Sholapur

NAGPUR - COMPOSITE ZONE

A. MIXED CLIMATE, ADJUSTABLE ARRANGEMENTS

B. LONGER AXIS: EAST-WEST, FRONT FACING SOUTH

C. PITCHED ROOF: RCC, NO REFLECTIVE COVER, ADJUSTABLE FALSE CEILING

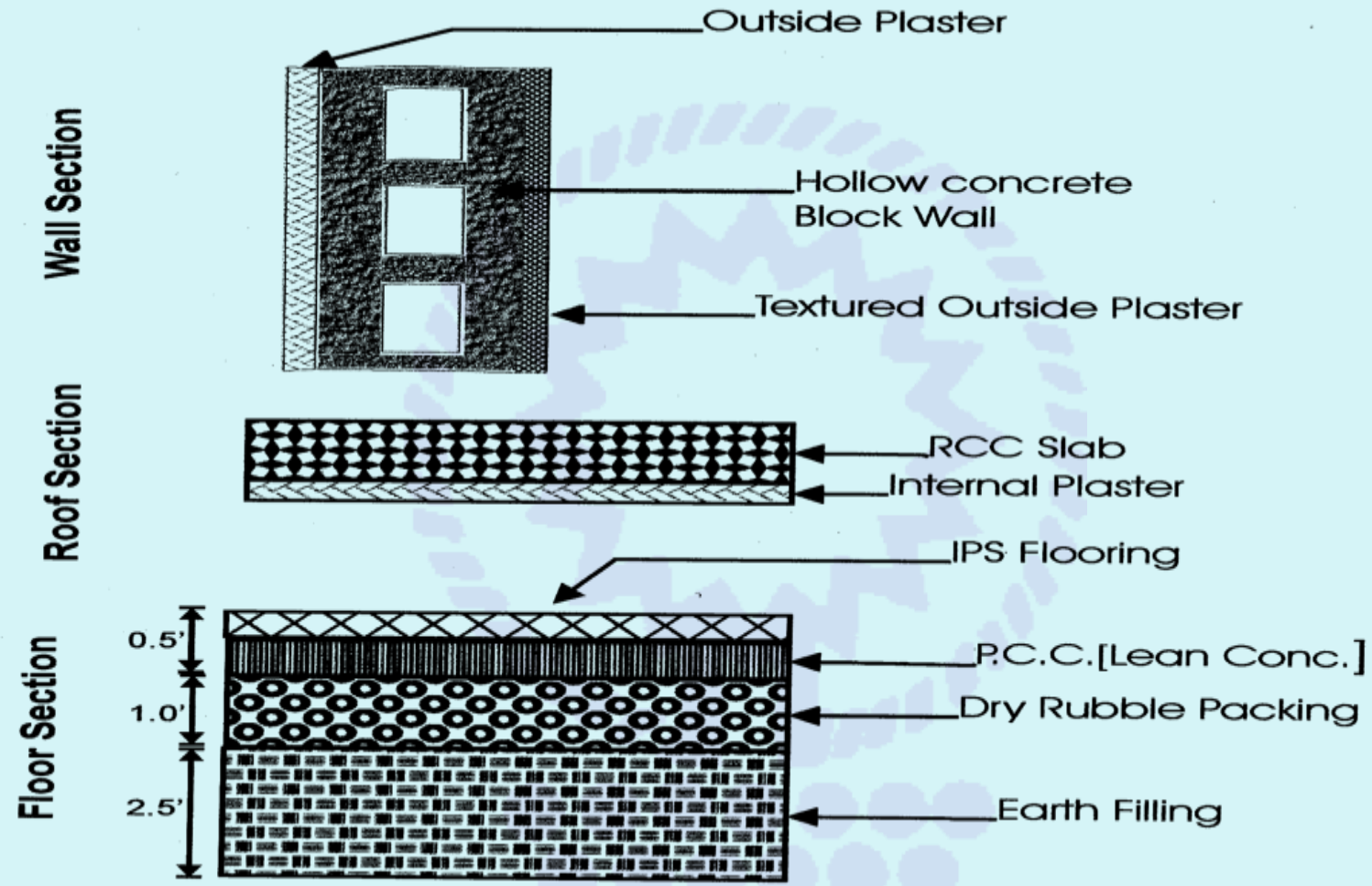
D. FLOORING: SAME AS IN HOT AND DRY CLIMATE

E. WALLS: HOLLOW CONCRETE BLOCKS, NORMAL SHADING, TEXTURED PLASTER AND LIGHT COLOR

F. WINDOW: 20% OF THE FLOOR AREA, LARGER: SOUTH, SMALLER: OTHER SIDES

G. ADJUSTABLE VENTILATION NEAR ROOF LEVEL, CURTAINS, OPENABLE SHUTTERS AND VENETIAN BLINDS

Schematics of Solar Passive Building in Composite Climatic Region : Nagpur



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2.0		V2	1' x 3'
3.0	Window	W1	4' x 5'
4.0		W2	4' x 3'
5.0	Door	D1	5' x 7'
6.0		D2	4' x 7'
7.0		D3	3' x 7'

Section View of Solar Passive Building in Composite Climatic Region : Nagpur

NEW MUMBAI - WARM AND HUMID ZONE

A. NORTH FACING, LONGER AXIS EAST- WEST

B. VENTILATION AND HIGH AIR CHANGE RATE

C. FLOORING SIMILAR TO OTHER ZONES

D. PITCHED ROOF WITH REFLECTIVE COVER

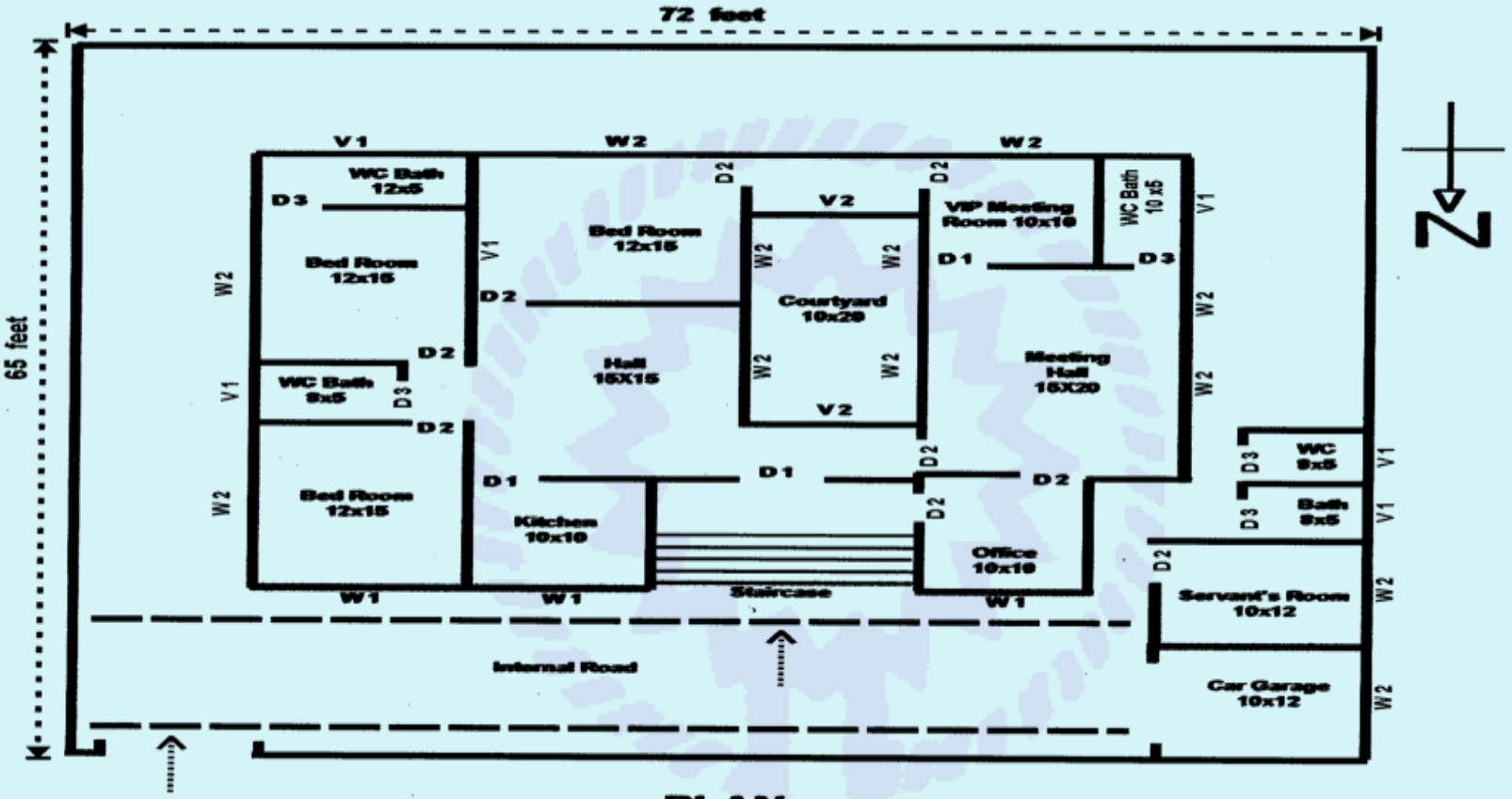
E. EXPOSED BRICK WALLS:
BUILDING TO BREATHE

F. WINDOW: 20% OF THE FLOOR AREA, LARGER WINDOWS ON ALL SIDES

G. VENETIAN BLINDS OR LOUVERS

H. VENTS AT ROOF-TOP

I. INDIRECT DAY LIGHTING



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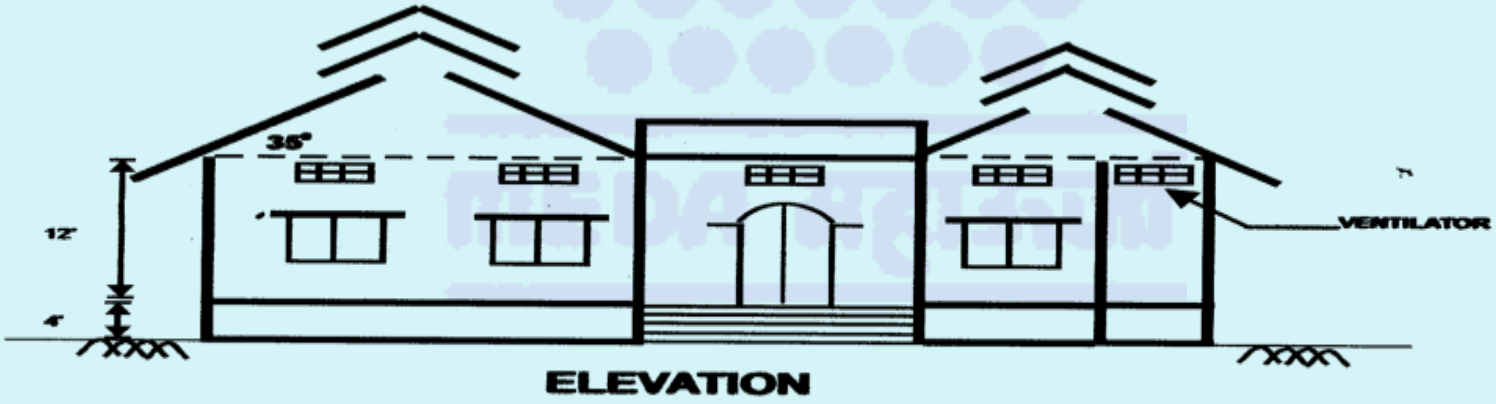

ELEVATION

Schematics of Solar Passive Building in Hot and Humid Region : New Mumbai

Dimensions

S.N.	Item	Symbol	Size
1.0	Ventilator	V1	1' x 2'
2.0		V2	1' x 3'
3.0	Window	W1	4' x 5'
4.0		W2	4' x 6'
5.0	Door	D1	5' x 7'
6.0		D2	4' x 7'
7.0		D3	3' x 7'

Section View of Solar Passive Building in Hot and Humid Region : New Mumbai

OTHER ADVANCE FEATURES

A. RESEARCH EFFORTS, FIELD TRIALS, ADVANCED FEATURES

B. THERMAL STORAGE WALLS / ROOFS, SOLARIUM (SUNSPACE), SOLAR AIR HEATER, WIND TOWER, EVAPORATIVE ROOF-COOLING, EARTH BERMING, INDUCED VENTILATION, DESICCANT COOLING, EARTH TUNNELS, CURVED ROOFING, ROOF VEGETATION COVER AND VARYTHERM WALL

C. MOSTLY REQUIRED IN EXTREME CLIMATIC CONDITIONS

D. MAHARASHTRA BLESSED WITH NON-EXTREME CLIMATE

E. USE OF RENEWABLE ENERGY DEVICES AT LITTLE EXTRA COST

F. PHOTOVOLTAIC PANELS, SOLAR WATER HEATER,

G. SOLAR AIR HEATER ON SOUTH FACING ROOF

H. SLIDING SOLAR COOKER: SOUTH WALL OF KITCHEN

THANK YOU