LARSEN & TOUBRO LTD:
ENGINEERING DESIGN & RESEARCH CENTRE, CHENNAI, INDIA

PRESENTED BY:

KATHERINE COLLIER

SUCHETH PALAT

SURIL MEHTALIA

SHIVANI KUMAR

LARSEN & TOUBRO LIMITED

We make the things that make India proud.

THE L & T ENGINEERING DESIGN AND RESEARCH CENTRE (EDRC): CHENNAI

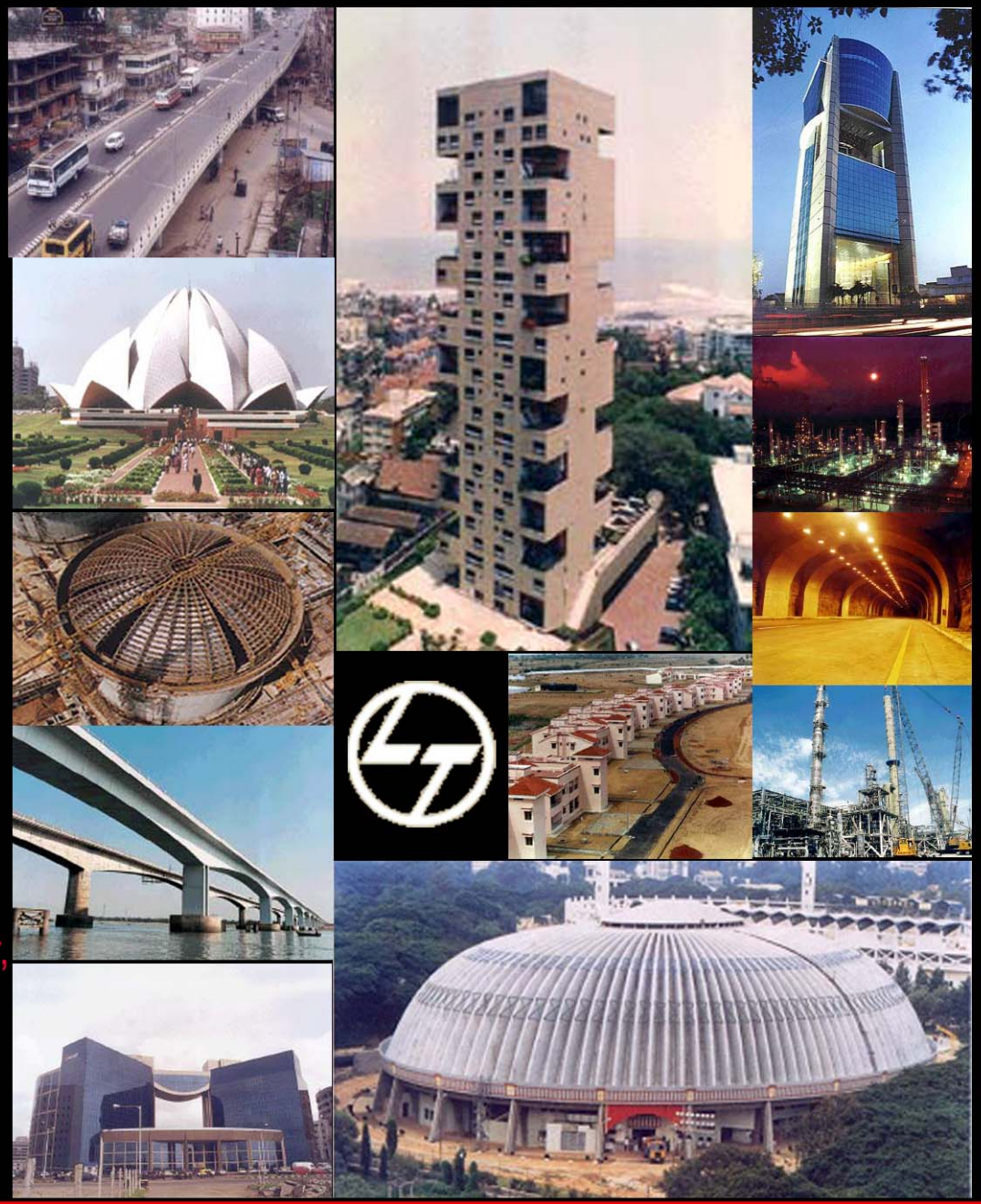
CLIENT:	LARSEN & TOUBRO (L & T) LTD.
LOCATION:	CHENNAI
NATURE OF BUILDING:	OFFICE
ARCHITECT:	K. S. RANGANATH & ASSOCIATES, CHENNAI
STRUCTURAL DESIGN:	L & T LTD.
GENERAL CONTRACTORS:	L & T LTD.
CONSTRUCTION MATERIAL:	REINFORCED CONCRETE
DATE OF COMMENCEMENT:	JULY, 1996
DATE OF COMPLETION:	NOVEMBER, 1998

CLIENTS' PROGRAM:

- REQUIREMENT OF A SPACE FOR LARGE NUMBER OF DESIGN ENGINEERING AND RESEARCH IN THE FIELDS OF STRUCTURAL, ELECTRICAL, SANITARY AND HVAC ENGINEERING.
- DESIGN SELECTED ON THE BASIS OF A DESIGN COMPETITION FLOATED BY THE COMPANY

"...we have the reputation of being the best construction company in India...we have to show to the world that our building is designed in the most innovative manner with a lot of emphasis on the structural system..."

-Mr. Sukumar Hebber, Sr. Engineer, L & T EDRC.



ARCHITECTS CONCEPT:

- COMPETITION WINNING ENTRY - ARCHITECT K. S. RANGANATH & ASSOCIATES, CHENNAI INDIA

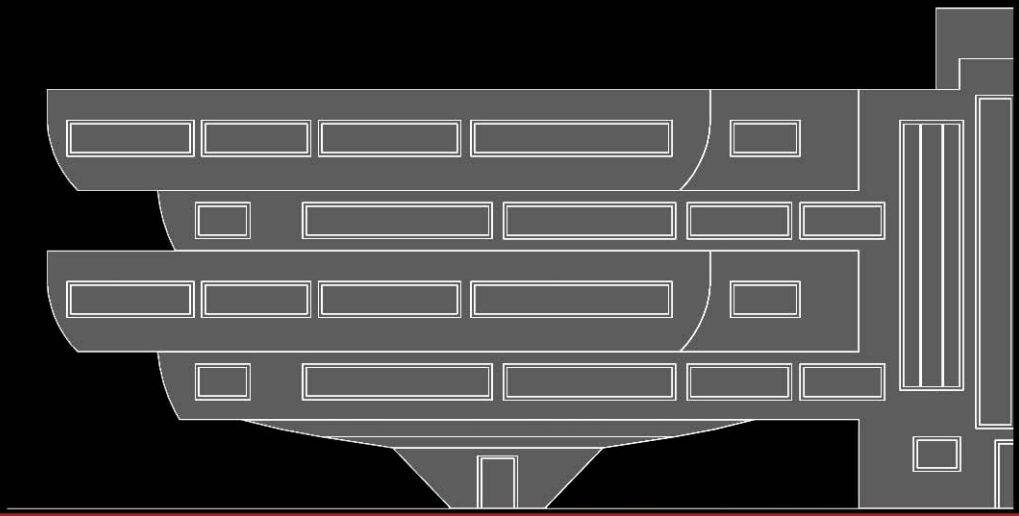
THE WINNING DESIGN BY THE ARCHITECT SOUGHT TO CREATE THE FOLLOWING:

"...an innovative organic form that would spring from the ground, occupying and disturbing very little of its land at its feet, carrying space and matter above like a tree..."

-Indian Architect & Builder, March 1999

"...the most dynamic manifestation of growth in the world is the tree. The EDRC building rises like a tree above ground as a single trunk or column and spreads out at the first floor level, shaping into a triangle with its sides curved to enhance its perception of fluidity and movement..."

-L & T ,ECC Concord, March 2000



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HIGHLIGHTS OF THE STRUCTURE .

- **SINGLE COLUMN** OF DIA. 3.6m (12ft) HOLDS BUILT UP AERA OF 3,900sqm
- **CONCEPT OF A MUSHROOM COLUMN**
- **STRUCTURAL MATERIAL R.C.C.**
  - PRESTRESSING
  - POST TENSIONING
  - RAFT FOUNDATION
  - RIBBED FLOORS
  - STUB COLUMNS
- **CONVENTIONAL BEAM AND COLUMN CONSTRUCTION**
- **PRECAST CONCRETE CONSTRUCTION**

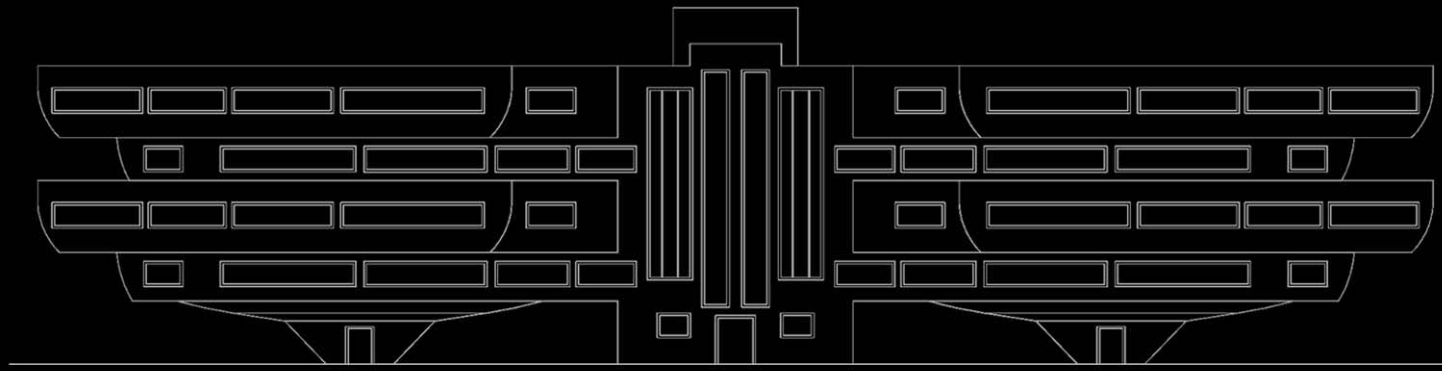
CHOICE OF MATERIAL

- COMBINES STEEL IN TENSION AND CONCRETE IN COMPRESSION .
- THE PLASTICITY OF THE MATERIAL .
- EXTREME STRUCTURAL CAPABILITIES .
- MOULDABILITY OF FORM .
- GOOD LOAD CARRYING CAPACITIES .

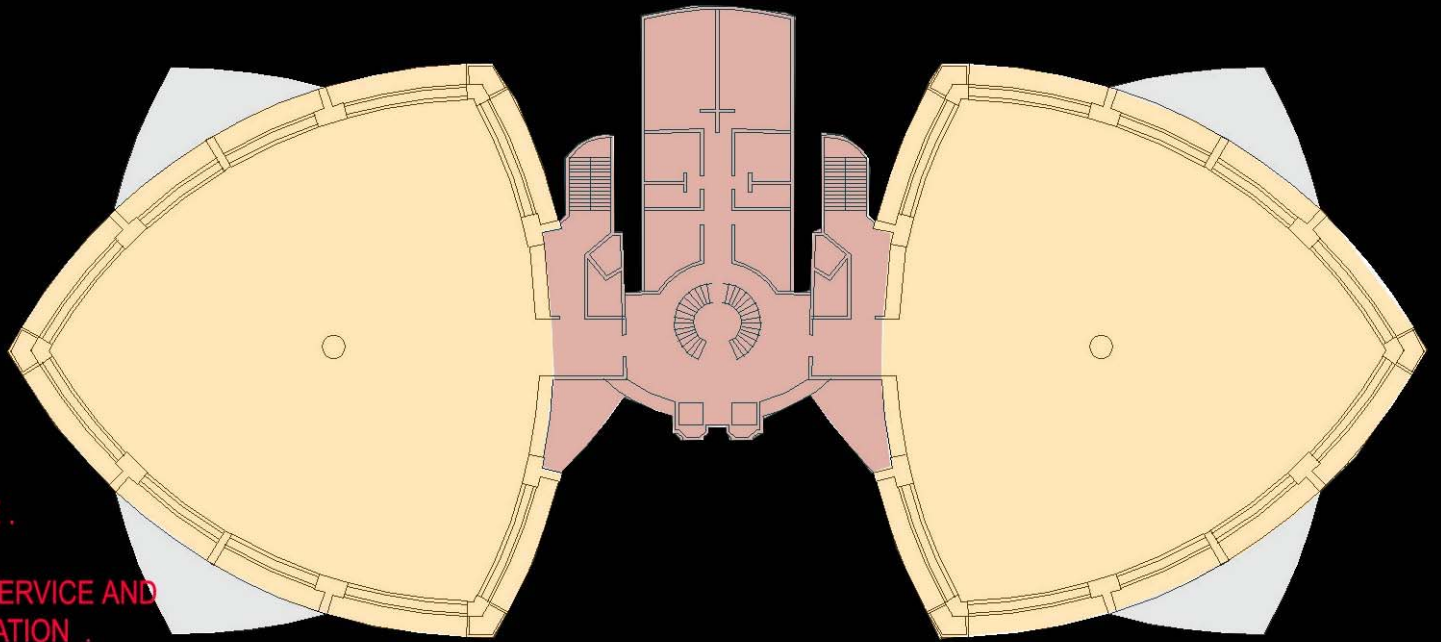
LOADS .

- **DEAD LOADS -** SELF WEIGHT OF THE MATERIAL .
- **LIVE LOADS -** WIND LOADS, EARTHQUAKE LOADS, FURNITURE
- **INDUCED LOADS** LOAD DUE TO PRESTRESSING.

BUILDING DIVIDED INTO TWO PARTS .



FRONT ELEVATION



OFFICE SPACE .

ENTRANCE, SERVICE AND CIRCULATION .

LANDSCAPED TERRACE OF LOWER FLOOR .

SECOND AND FOURTH FLOOR PLAN

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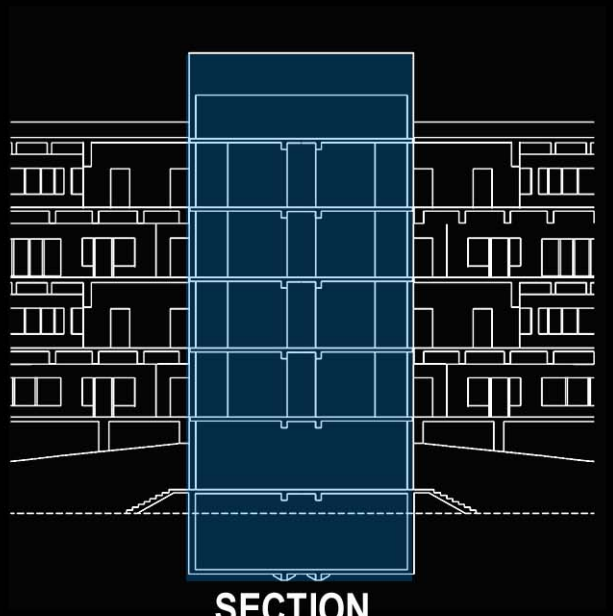
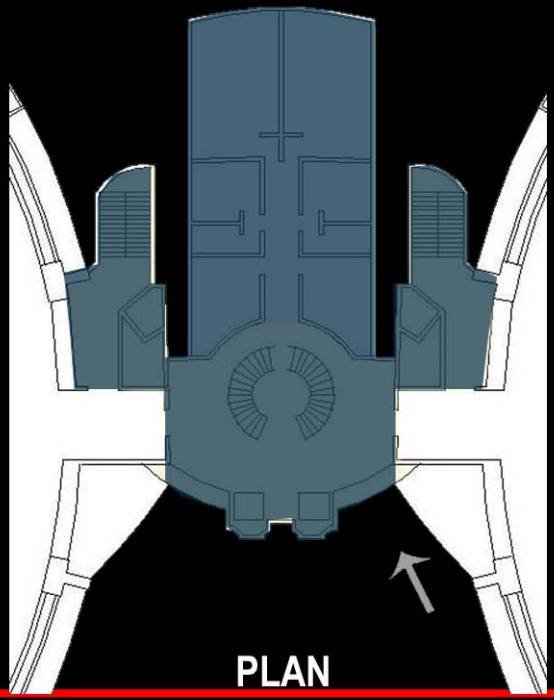
SERVICE BLOCK



SECTION

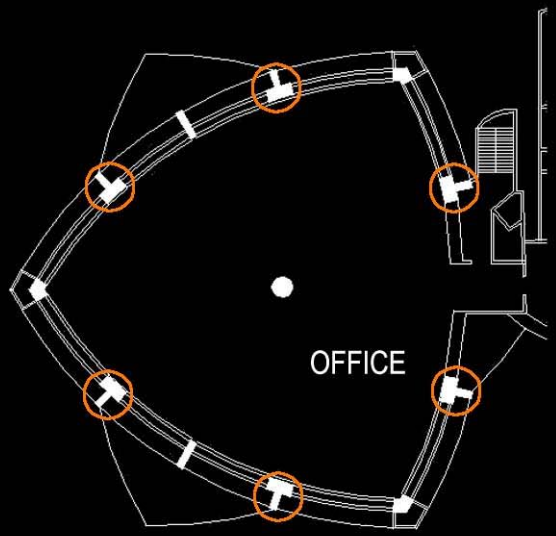


PLAN

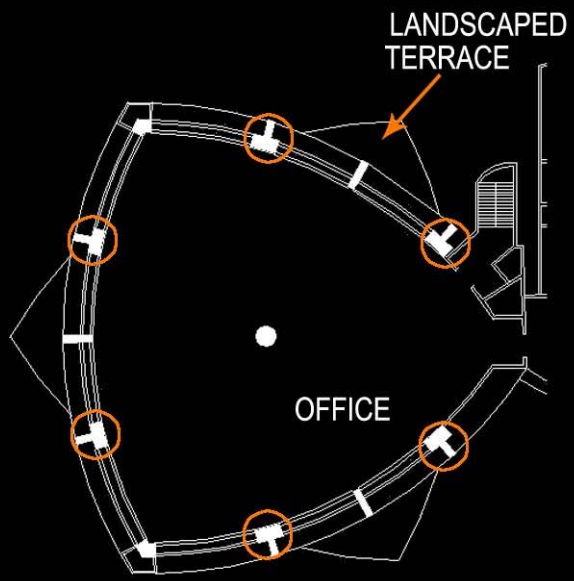
1. CONVENTIONAL RCC FRAMED CONSTRUCTION USING M35 (ISI) GRADE OF CONCRETE.
2. HOUSES THE MAIN CIRCULATION, UTILITIES, STORE ROOMS, TOILETS,CONFERENCE ROOMS ON UPPER LVLS.
3. ENTRANCE AT FIRST FLOOR LVL.
4. HELICAL RCC STAIRCASE.
5. RAFT FOUNDATION.
6. STRUCTURALLY ISOLATED FROM THE MAIN OFFICE BUILDINGS BY MEANS OF EXPANSION JOINTS.

RCC HELICAL STAIRCASE

OFFICE BLOCK



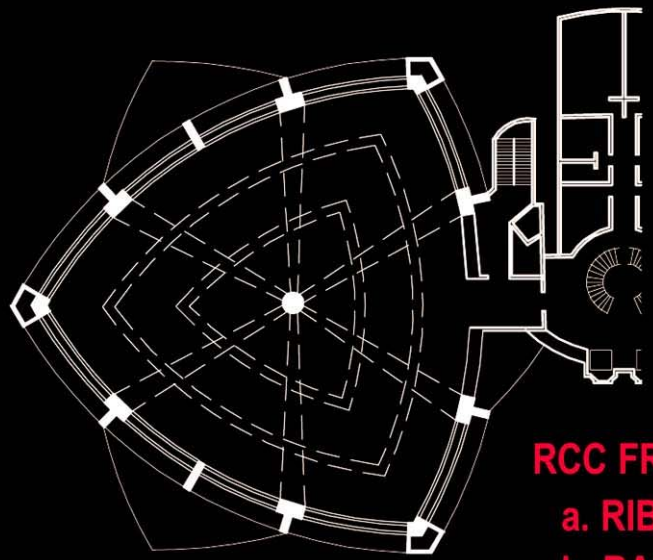
SECOND & FOURTH FLOOR PLAN.



THIRD & FIFTH FLOOR PLAN.

1. DESIGNED AS INDEPENDENT STRUCTURES.
2. ALTERNATE FLOORS ROTATED WITH RESPECT TO EACH OTHER AT 30 DEGREES .
3. THE JUNCTION OF TWO CONSECUTIVE FLOORS FORM LOACTIONS OF FLOATING COLUMNS.
4. THE OVERHANGS RESULTING FROM ROTATION OF FLOORS FORM LANDSCAPED TERRACES.

OFFICE BLOCK



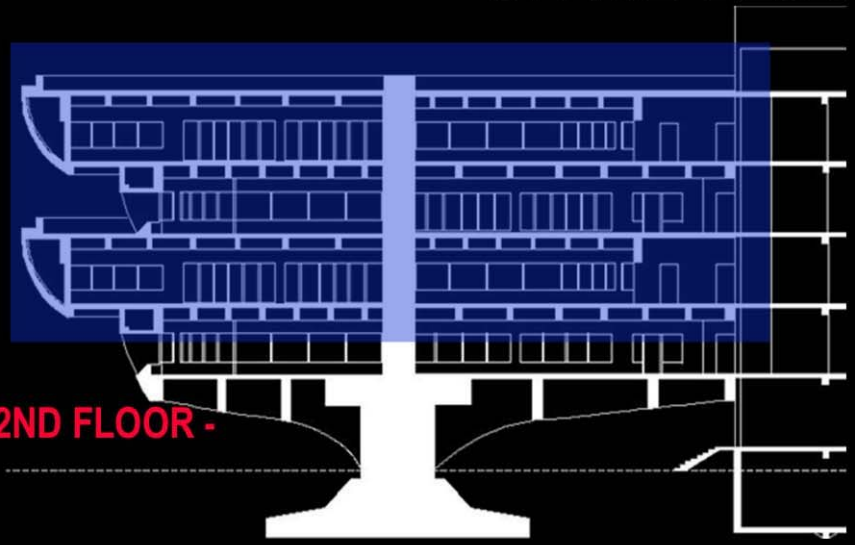
SECOND & FOURTH FLOOR PLAN

RCC FRAMED 5TH FLOOR - 2ND FLOOR -

a. RIBBED FLOORS

b. RADIAL BEAMS

c. FLOATING COLUMNS



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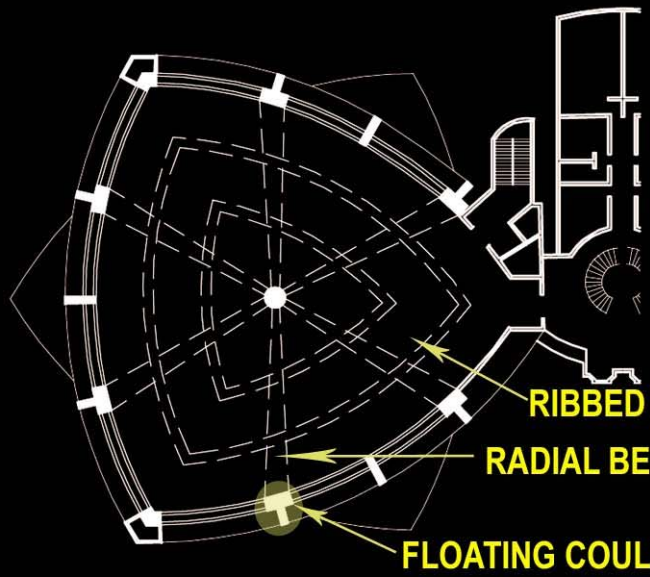
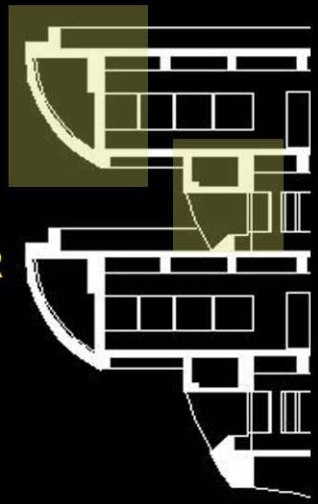
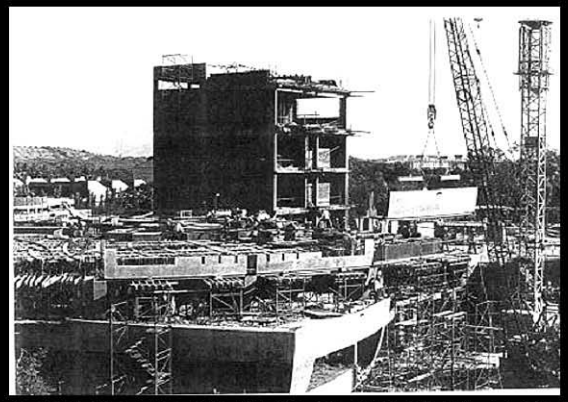


THIRD & FIFTH FLOOR PLAN

PERIPHERAL WINDOWS RECESSED BY 0.6MT DEEP
OVERHANGS MADE OF PRECAST CONCRETE ELEMENTS





PRECAST ELEMENTS OF WEATHER SHADES
BEING LIFTED TO POSITION

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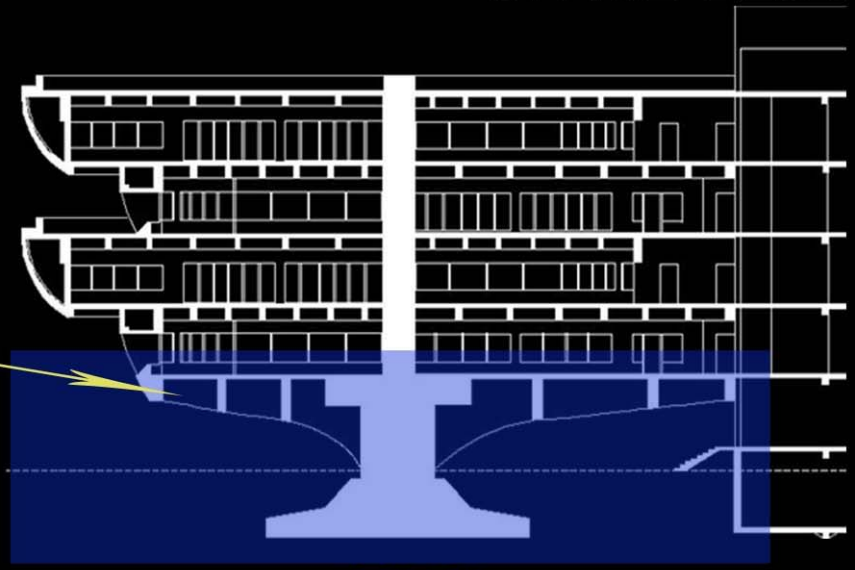
OFFICE BLOCK

FIRST FLOOR SLAB:

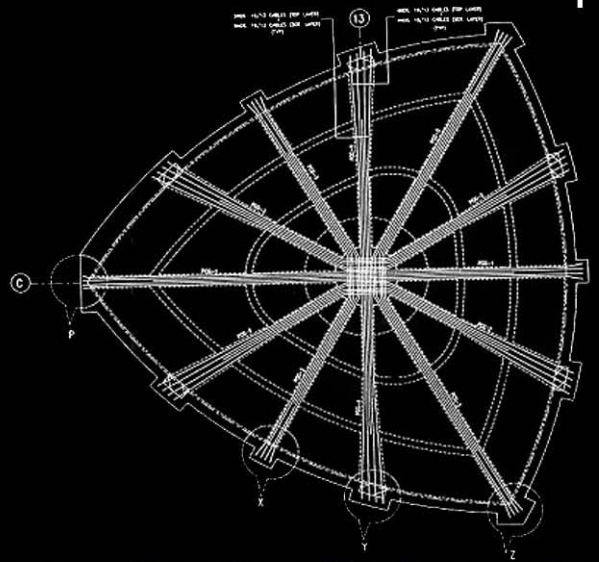
- LOAD FROM FLOATING COLUMN TRANSFERRED TO FIRST FLOOR SLAB
- DUE TO THIS PECULIAR LOADING CONDITION SLAB HAS TO CARRY CONSIDERABLE LOAD
- HENCE PRESTRESSED TO REDUCE DEPTH
- LOAD TRANSFERRED FROM SLAB TO CENTRAL COLUMN BY PRESTRESSED POST TENSIONED RIBS
- EXCESSIVE 'PUNCHING STRESS' AT JUNCTION OF SLAB AND CENTRAL COULMN - HENCE PRINCIPLE OF MUSHROOM COLUMN USED.



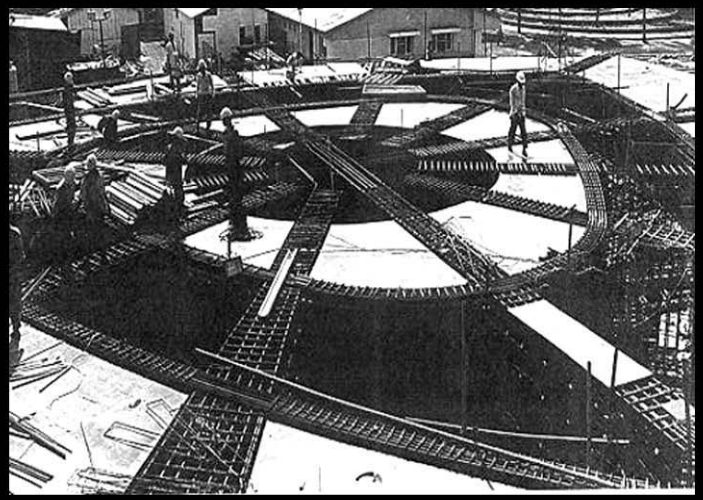
SECTION

PRESTRESSING OF FIRST FLOOR SLAB

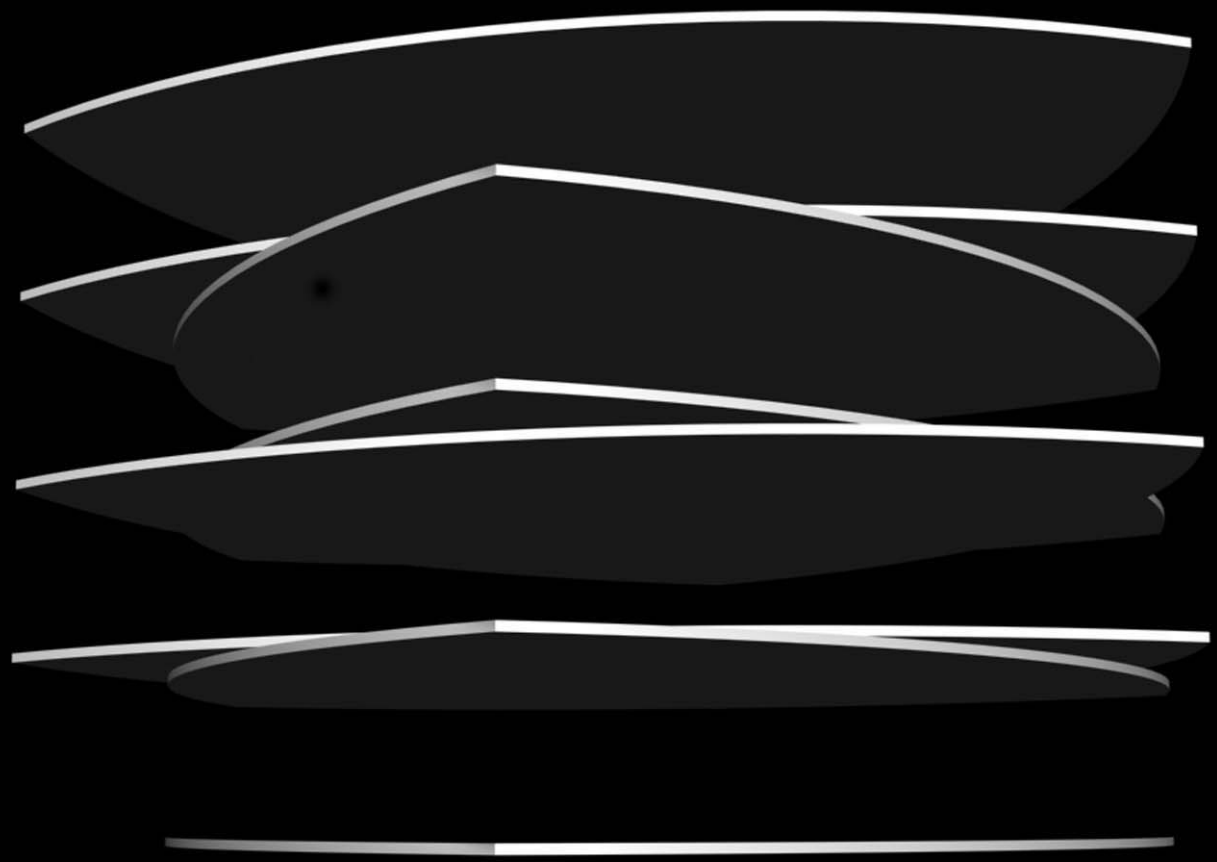
- SPECIFIED AMOUNT OF DEAD LOAD REQUIRED TO COUNTERACT EXCESSIVE PRESTRESSING LOADS
- PRESTRESSED IN 2 STAGES
- HALF CABLES INITIALLY STRESSED
- ONLY AFTER THE SECOND FLOOR WAS CAST AND SUFFICIENTLY SET WERE THE REST OF THE CABLES STRESSED



DETAIL OF FIRST FLOOR SLAB PRESTRESSING



DURING CONSTRUCTION



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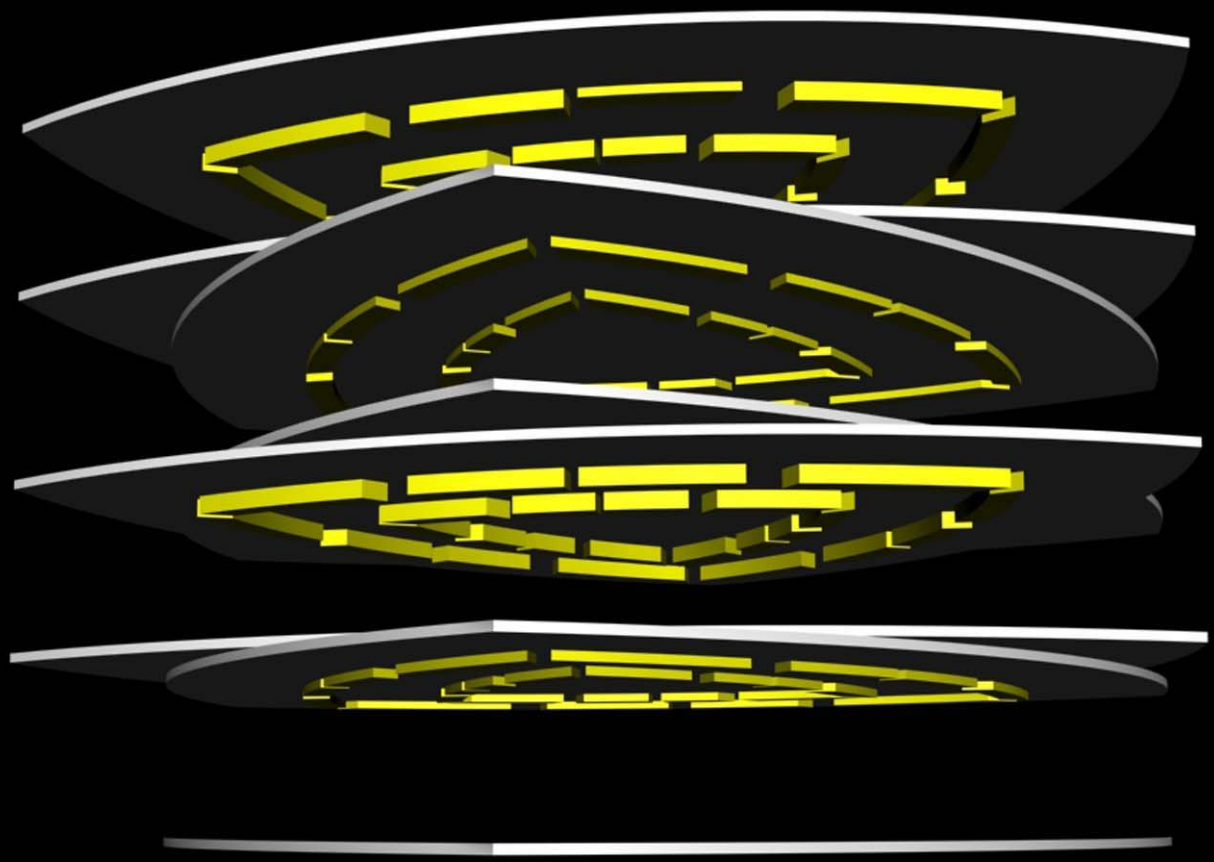

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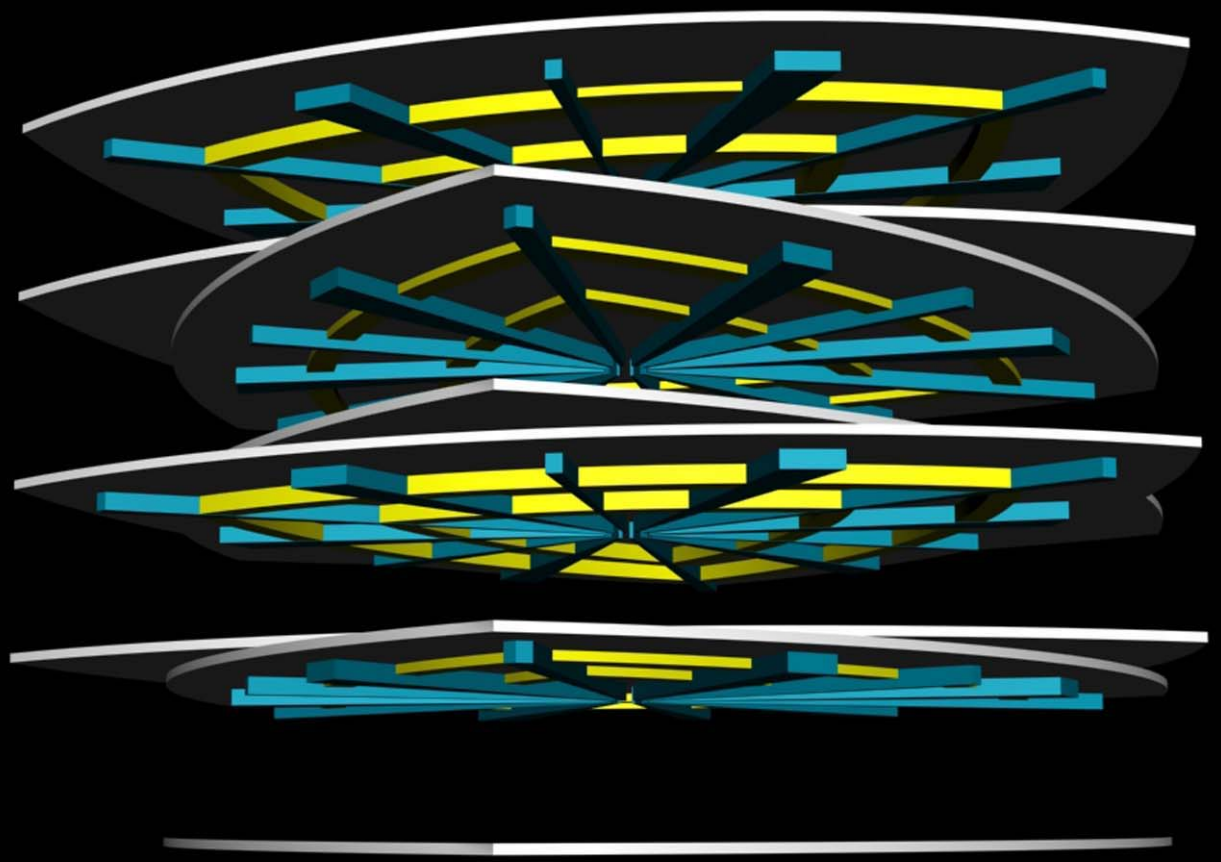

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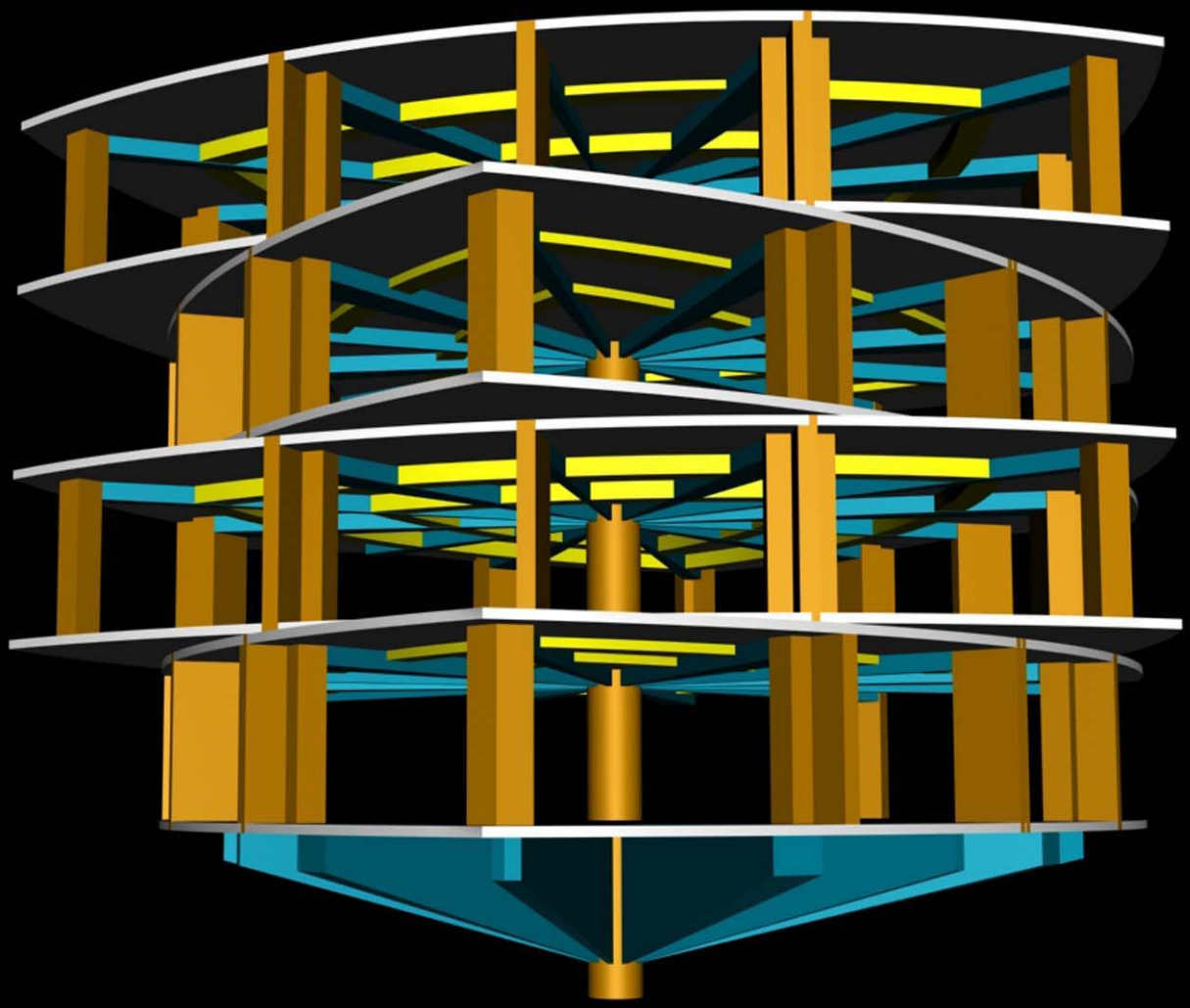

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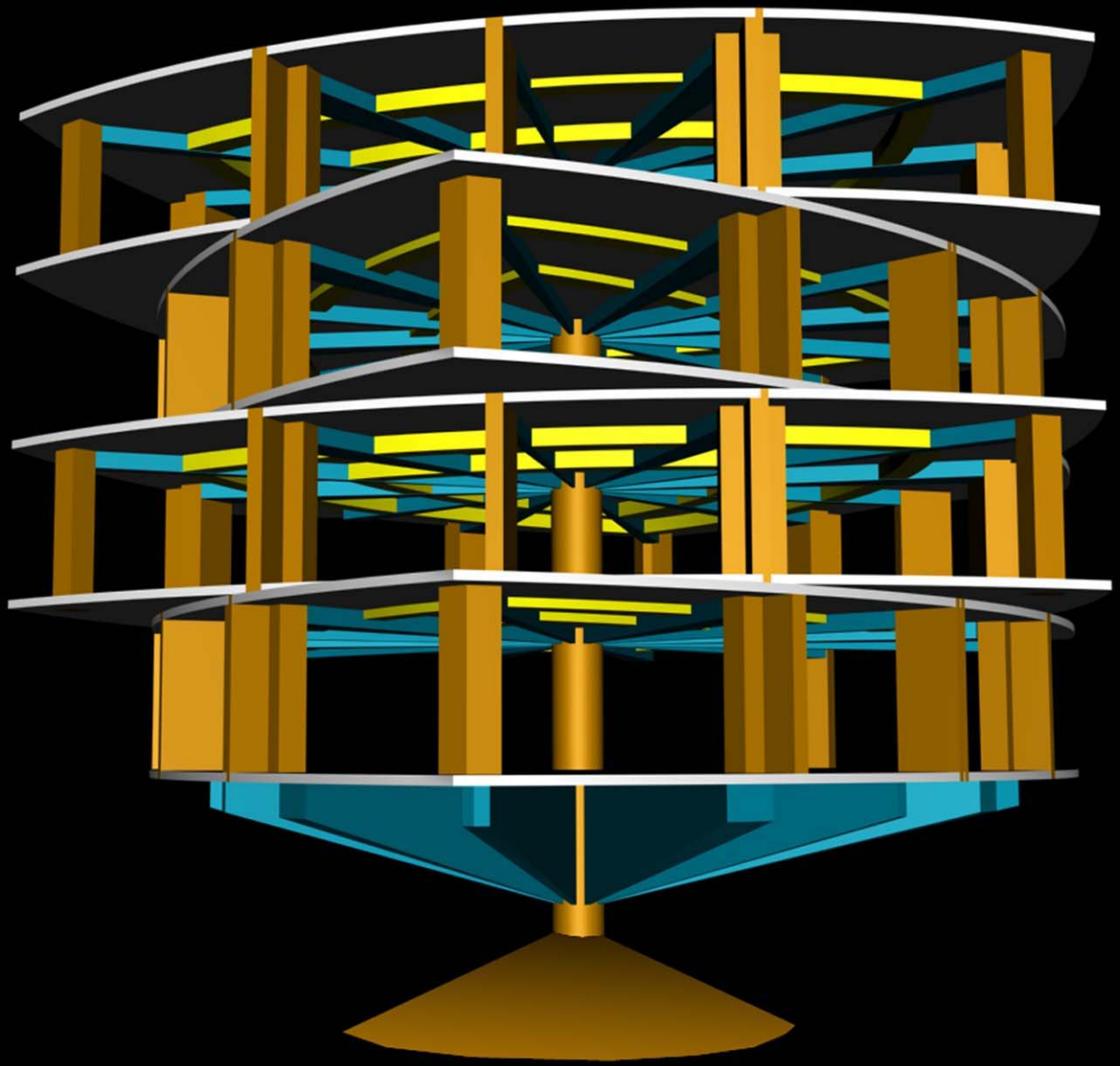

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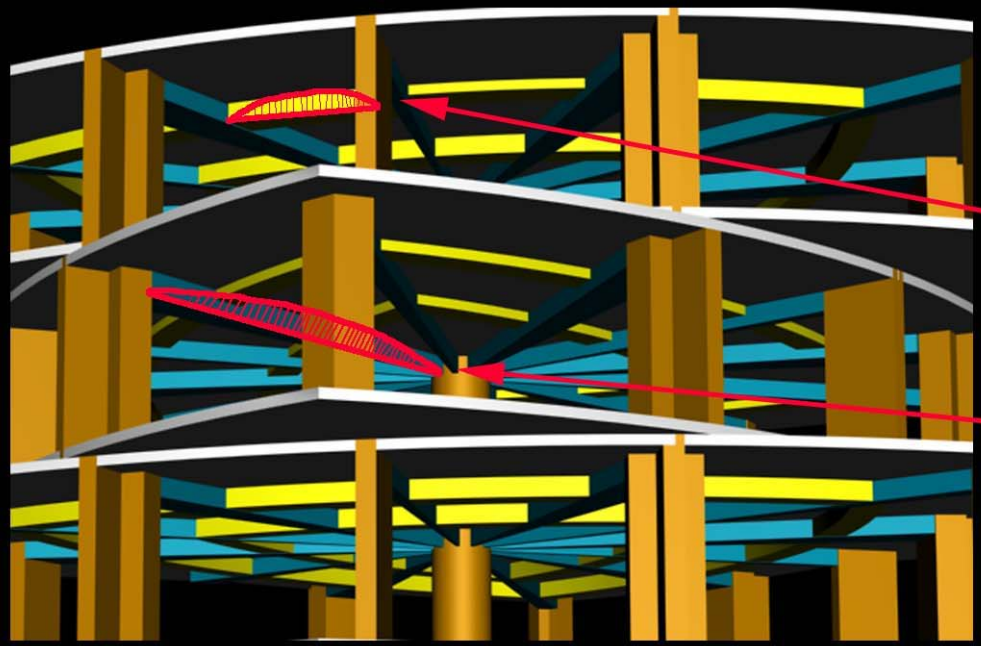
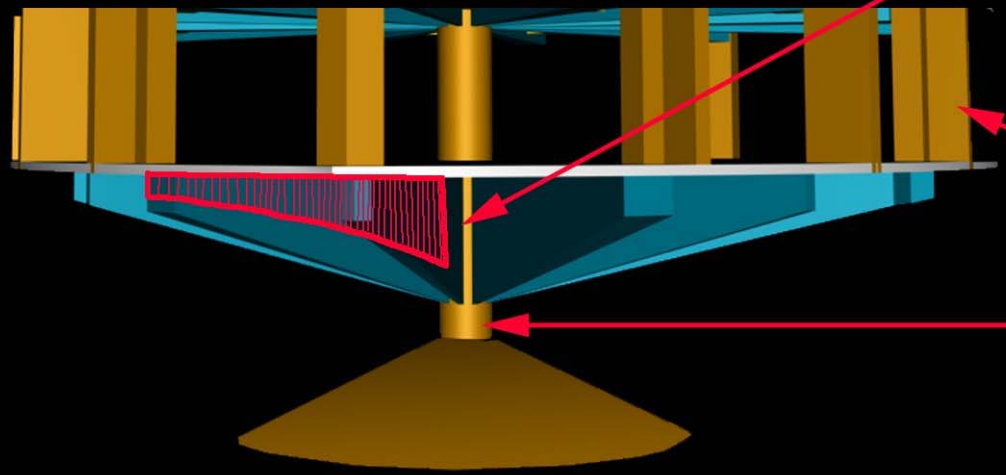
BENDING MOMENTS



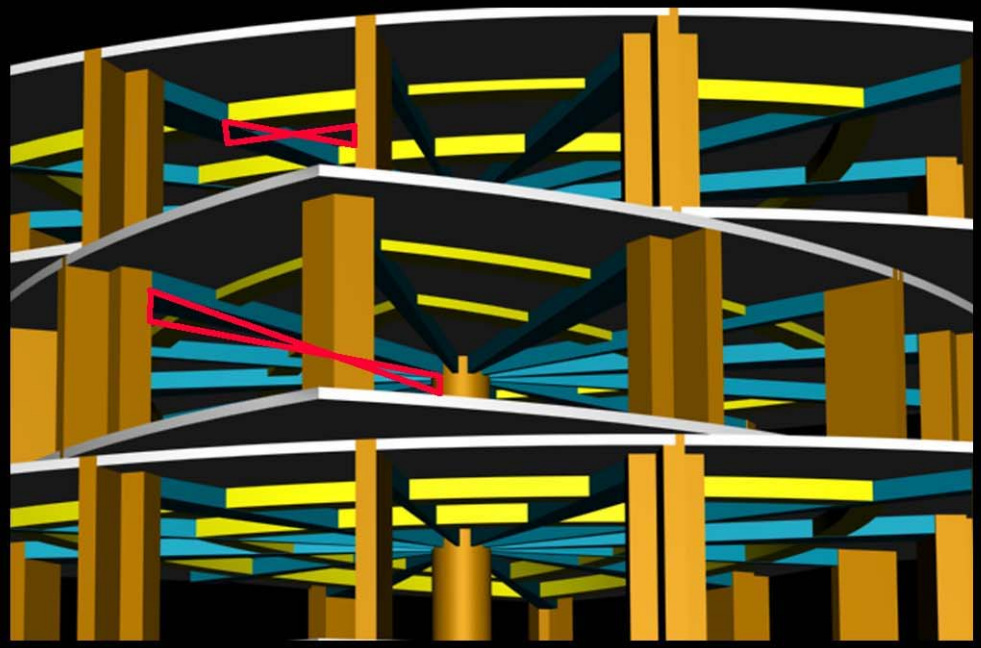
RIBBED FLOOR BEAM FOR STIFFENING

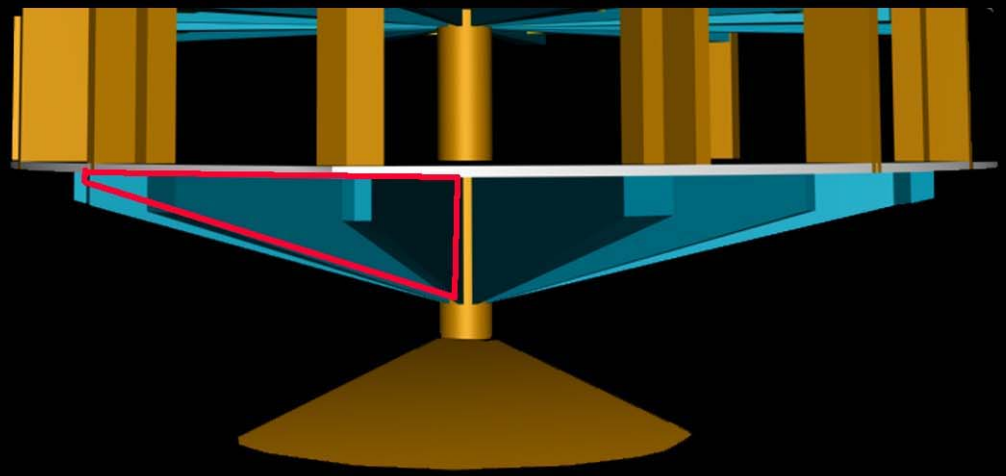
RADIAL BEAM

PRESTRESSED CANTILEVER BEAM



- STUB COLUMNS USED TO DISTRIBUTE LOADS
- CENTRAL COLUMN MADE THICK TO COUNTERACT BENDING.

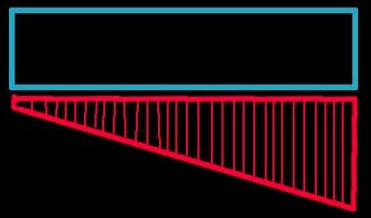




SHEAR FORCE

RIBBED FLOOR BEAM FOR STIFFENING

RADIAL BEAM



PRESTRESSED CANTILEVER BEAM

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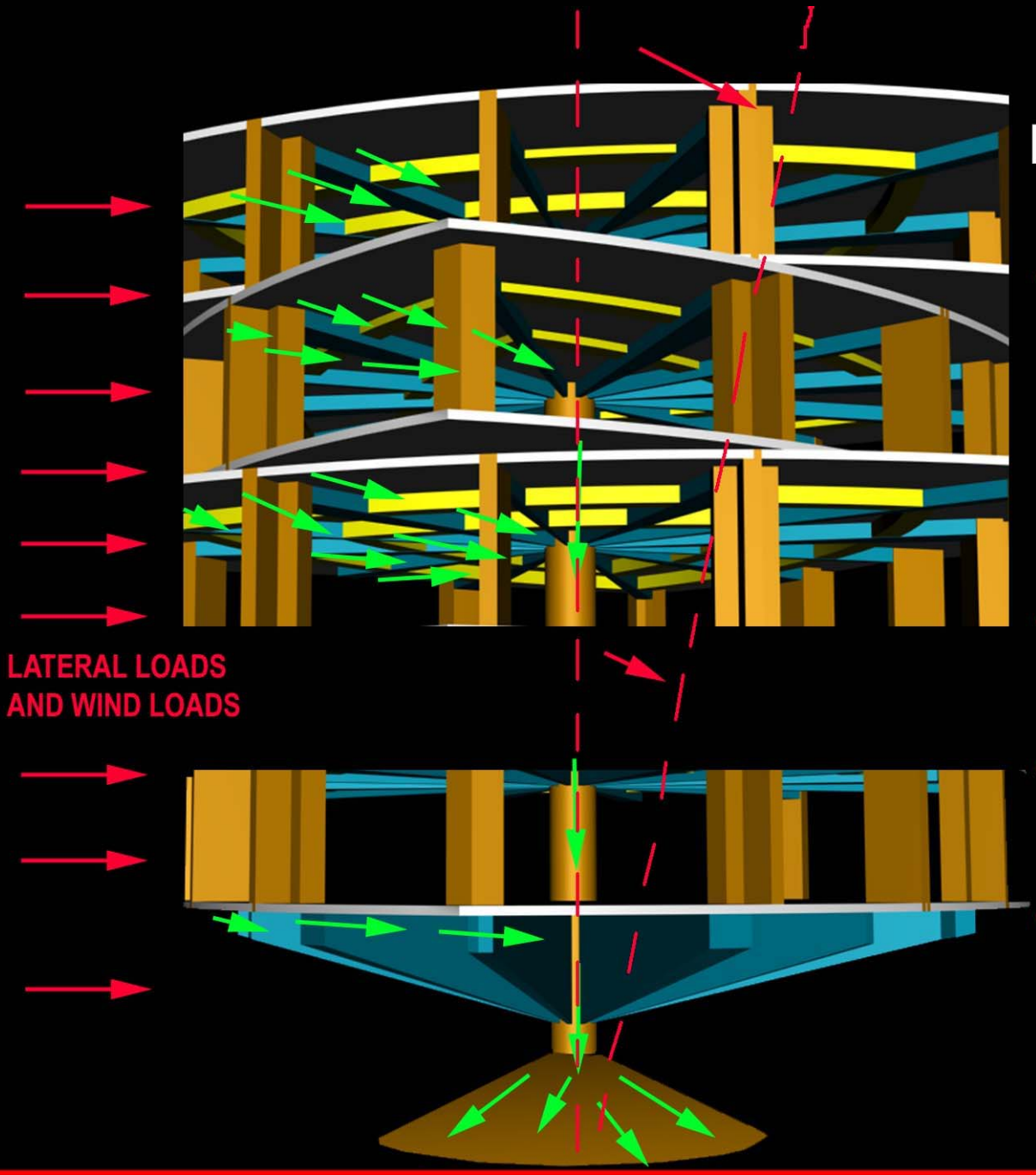
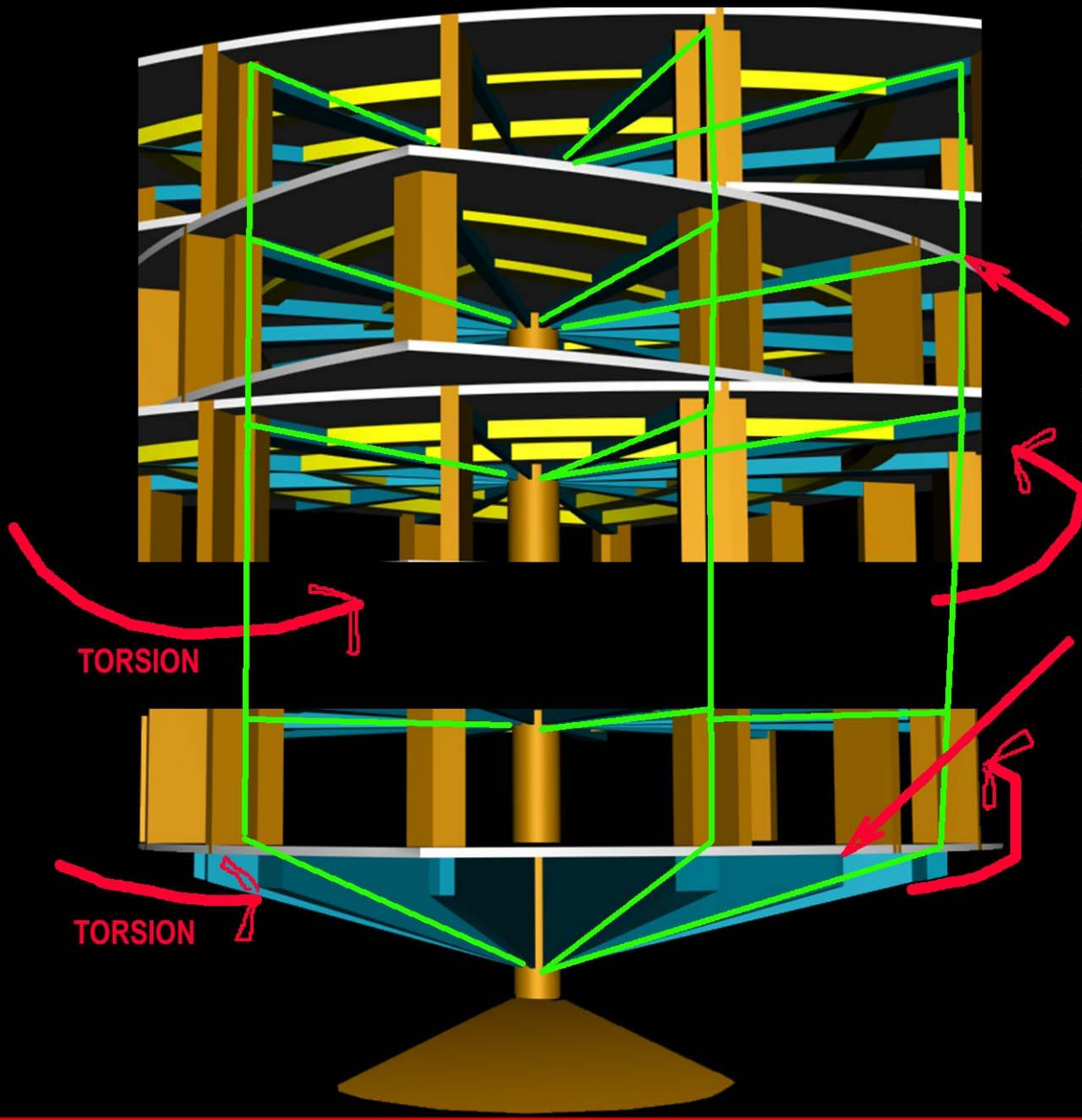


LATERAL LOADS / WIND LOADS

- LATERAL LOADS AND WIND LOADS TRANSFERED THROUGH THE FLOOR SLABS AND THE RIBBED BEAMS TO THE CENTRAL COLUMN ; THIS COMBINATION ACTS AS A DIAPHRAM
- THE RADIAL BEAMS ACT AS STIFFENERS
- THE CENTRAL COLUMN TRANSFERS THE LOADS TO THE FOUNDATION.
- THE CENTRAL COLUMN RESISTS BENDING IN THE DIRECTION OF THE LOAD.



TORSION

THE SYMMETRICAL FRAMING OF THE STRUCTURE PREVENTS TWISTING.

THE RADIAL BEAMS LINK TO THE STUB COLUMNS AND THE CENTRAL COLUMN, FORMING A RIGID FRAME .

THE PRESTRESSED CANTILEVER BEAM TIES THE FIVE FLOORS TO THE CENTRAL COLUMN AND FORMS THE FUNDAMENTAL SOURCE OF RIGIDITY.

CONCLUSION