Hospitals for tomorrow

4th Dec, 2015

"We shape our buildings and afterwards, our buildings shape us"

-Winston Churchill

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Hosmac India Private Limited, India

Hospital Planners and Management Consultants

About HOSMAC

HOSMAC
PERFECTING HEALTHCARE

- 19 years in healthcare consulting in India & Middle East
- In-house Multi functional team of doctors, architects, engineers, bio-meds, MBAs (100 people strong)
- Designed more than 18 million sft of hospital space
- Project managed more than US$ 500 million capex
- Advised more than 500 hospital projects





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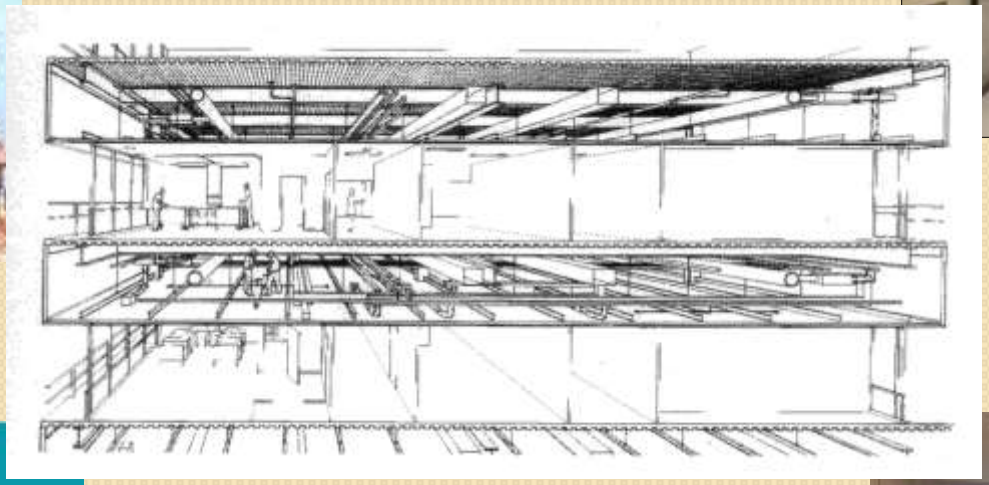
ENGIEERING THE HOSPITAL FOR TOMORROW



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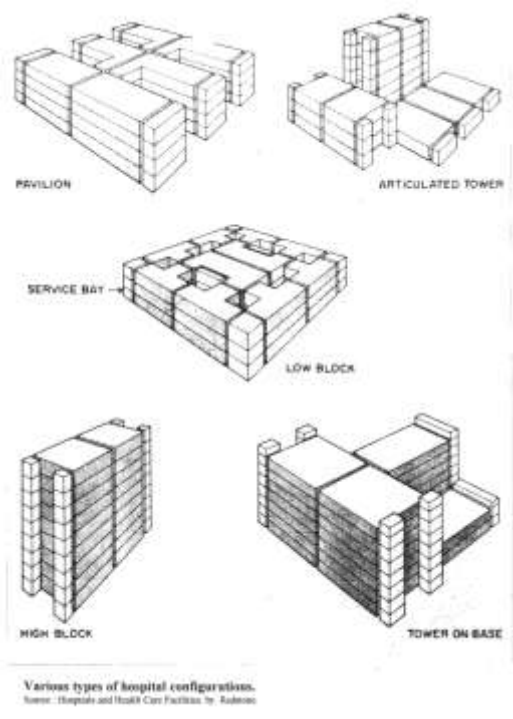
FORM SHOULD FOLLOW FUNCTION !!!!



Various types of hospital configurations.

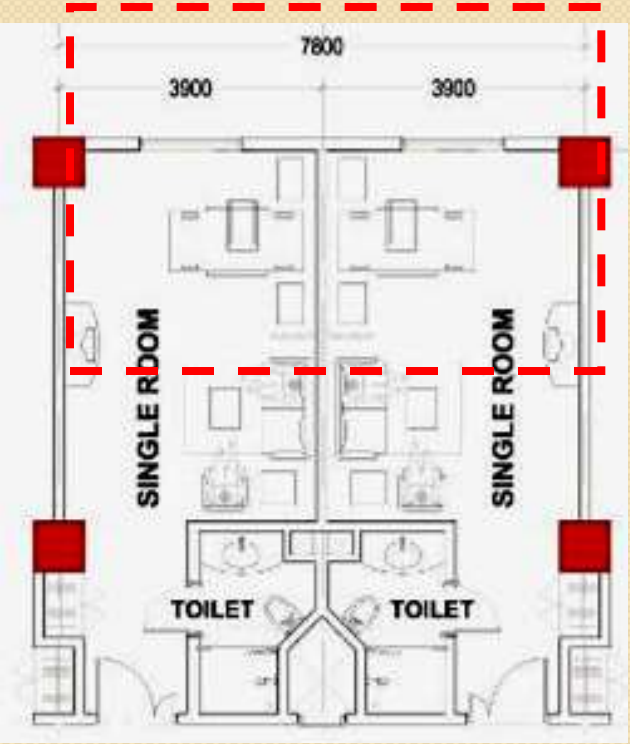
John Weeks, an architect in Britain who first grasped the need for flexibility in the design of hospitals, made the then revolutionary point that user studies of function are by themselves not a sound basis for hospital design

Functions change so rapidly that designers should no longer aim for an optimum fit between building and function

The real requirement is to design a building that will inhibit change of function least, and not one that will fit specific function best

The Grid Matrix:

- Framework for design
- Styles of network
- Inpatient room design
- Ideal configuration for the room grid
  - 6.5m X 7.5m (Teaching Hospital)
  - 7.5m X 7.5m (Private Hospital)
  - 7.5/7.8m X 8.0m (Tertiary Care Hospital)
  - 8.0m X 9.0m (International Configuration)
- Permutation & combination of room typologies
  - Single Room Configuration
  - Double Room Configuration
  - Wards – 4/6/8 Bed Wards
- The grids filters to the clinical floors
  - Radiology Dept./ OT Suite/ ICU/ OPD/ ACS
- Structural grids accommodated in planning grid



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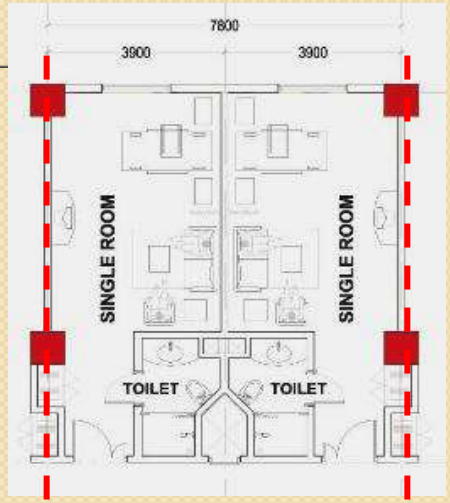
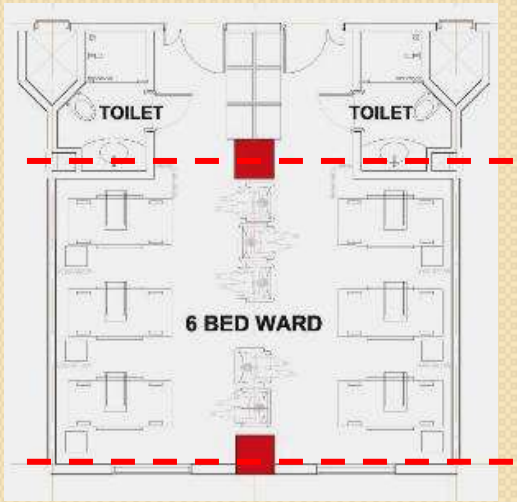
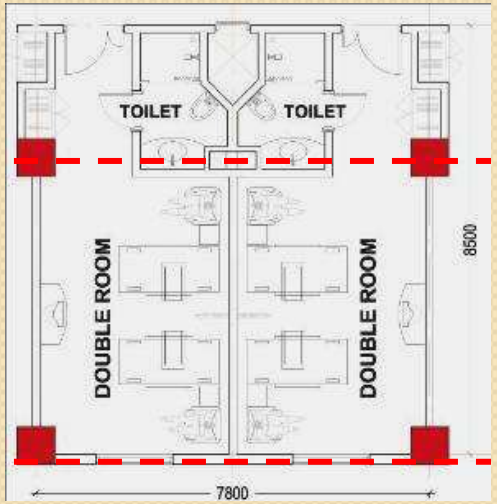
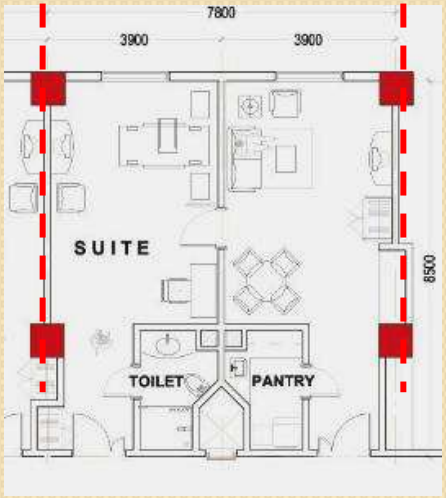
Accommodating through Design







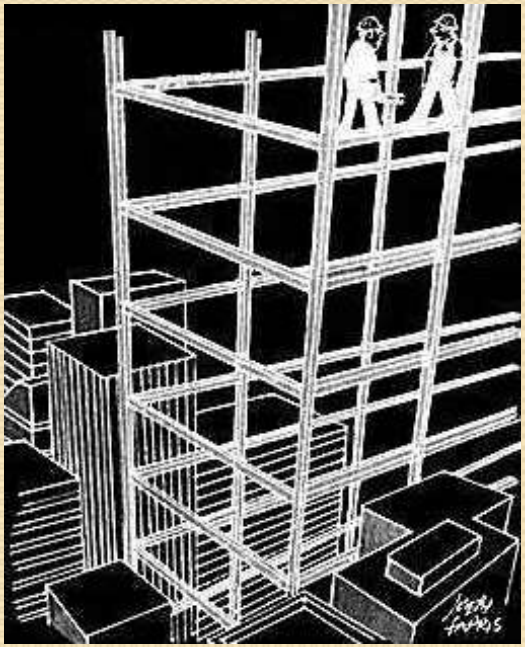


- **DESIGN FLEXIBILITY**
- **MODULARITY**

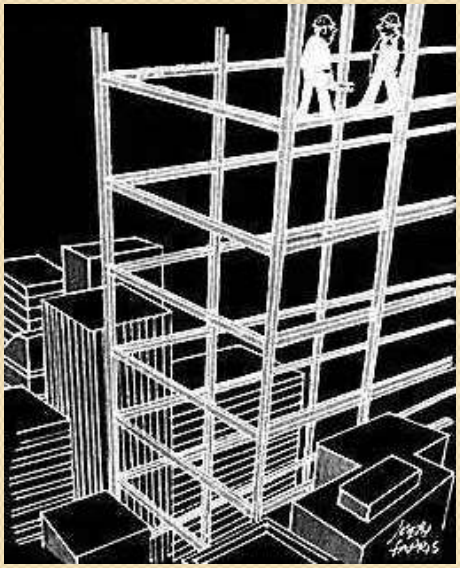
A PROPER PLANNED GRID CAN ACCOMMODATE ALL KINDS OF ROOM TYPOLOGY – VIP SUITES, SINGLE ROOMS, DOUBLE ROOMS AND EVEN WARDS.

Electrical Design Basis

- Load Calculations (Medical & Non Medical)
  - Number of electrical points
  - Supply as Raw, Emergency (D.G. Set), UPS
  - Air Conditioning electrical load (@ 1.5 kw per ton)
  - Load on DG/UPS
- Planning Factors:
  - Data - Identification of Nodes/ Voice
  - Lighting - Lux Level Calculations
  - Cabling routes, exposed v/s concealed, trenches
  - Building Automation systems
  - **Room Data Sheet**
  - **Follow standards**
  - **COST : INR 450-550/- PER SQ FT**



HVAC Design Basis



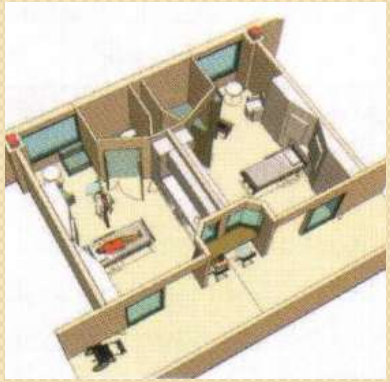
Planning Brief:

- Heat Load Calculations
  - Occupancy, Equipment Heat Load, Lighting Load
  - Glass façade factor
- Thumb rule = 1Tr per 150-200 sq mt
- Indian costs = INR 80,000 – 120,000 per ton
- Evaluation of Life Cycle Costs
- *(water cooled v/s air cooled v/s VRV v/s gas fired)*
- Indoor Air Quality – Healthcare Outcomes
- Zoning – Unclean to Clean to Sterile
- Filtration - Pre-filters, Microvee (5 Micron), HEPA (0.3 m)
  - HEPA - Three-Stage Filtration
    - Operating Theatres
    - CSSD Sterile Stores
    - Isolation Room (+ve / -ve)

Plumbing Design Basis

Planning Guidelines

- May require 500-800 lts of water/bed/day
- Cold Water, Hot Water, Steam requirements
- W.T.P./S.T.P.
- RO Plant for dialysis
- Rain Water Harvesting
- Toilet location (mechanical ventilation issue)
- **COST: INR 250-300/- PER SQ FT**



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Pre-Engineered Building

Time has come to imbibe these ideas in healthcare

Steel Structure: Dr. Ram Manohar Lohia Hospital, Delhi

- 80,000 sft of g+5 floors, planned for an emergency block.
- Planned to be built in 200 days
- We used pre-fabricated steel structure design
- External walls : large panels of Polysterene foam with meshed steel
- Internal dry walls used for fast erection
- Deck sheets for permanent shuttering of slabs
- Vinyl flooring systems
- Centrally air –conditioned
- Probable answer for rapid development of healthcare infrastructure in India to meet the huge deficit of beds

THOUGH A LITTLE EXPENSIVE (20%), PAYBACK ON INVESTMENT WILL BE FASTER AS PROJECTS CAN BE COMMISSIONED IN HALF THE TIME THERE GENERATING EARLY CASHFLOWS.

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STEEL STRUCTURE: DR RAM MANOHAR LOHIA HOSPITAL

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DRY WALL SYSTEMS:

- Lighter in weight so reduces structural load and thereby cost
- Quick & Easy to fix with no brick masonary work involvement
- Ease of running services in wall cavities without chasing walls
- Less cumbersome during modification of floor in long run
- Can take cladding, washbasin, monitor stands etc with additional reinforcement in framing
- Smooth finish with zero requirement of POP punning
- Environment friendly

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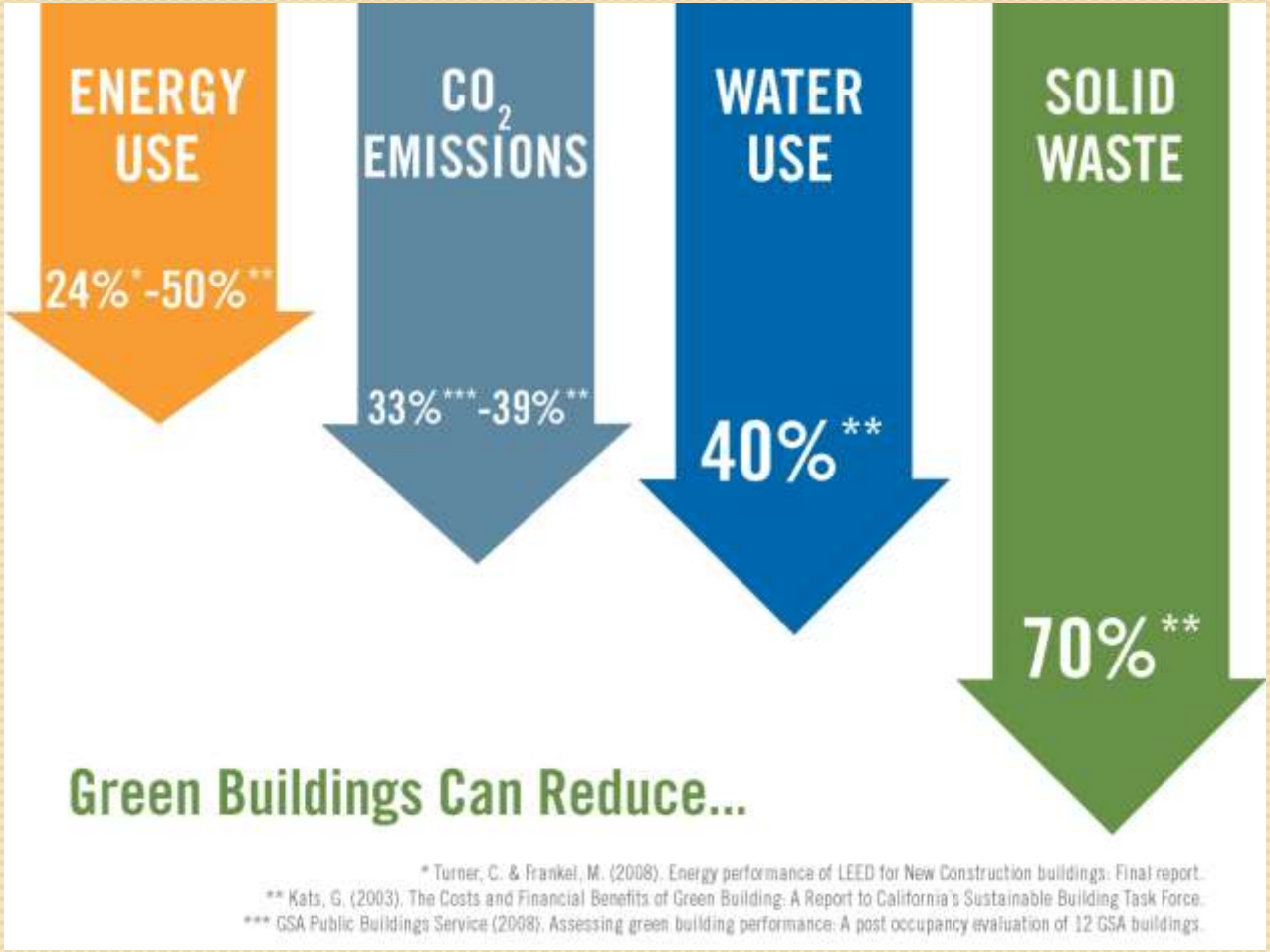
Energy Efficient Green Hospitals

Planning for Energy Efficiency in Hospitals is a must as these buildings are guzzlers of electricity and operate 24 x 7 x 365

Why go green?


ENERGY USE
24%*-50%**
CO2 EMISSIONS
33%***-39%**
WATER USE
40%**
SOLID WASTE
70%**
Green Buildings Can Reduce...
* Turner, C. & Frankel, M. (2008). Energy performance of LEED for New Construction buildings: Final report.
** Kats, G. (2003). The Costs and Financial Benefits of Green Building: A Report to California's Sustainable Building Task Force.
*** GSA Public Buildings Service (2008). Assessing green building performance: A post occupancy evaluation of 12 GSA buildings.

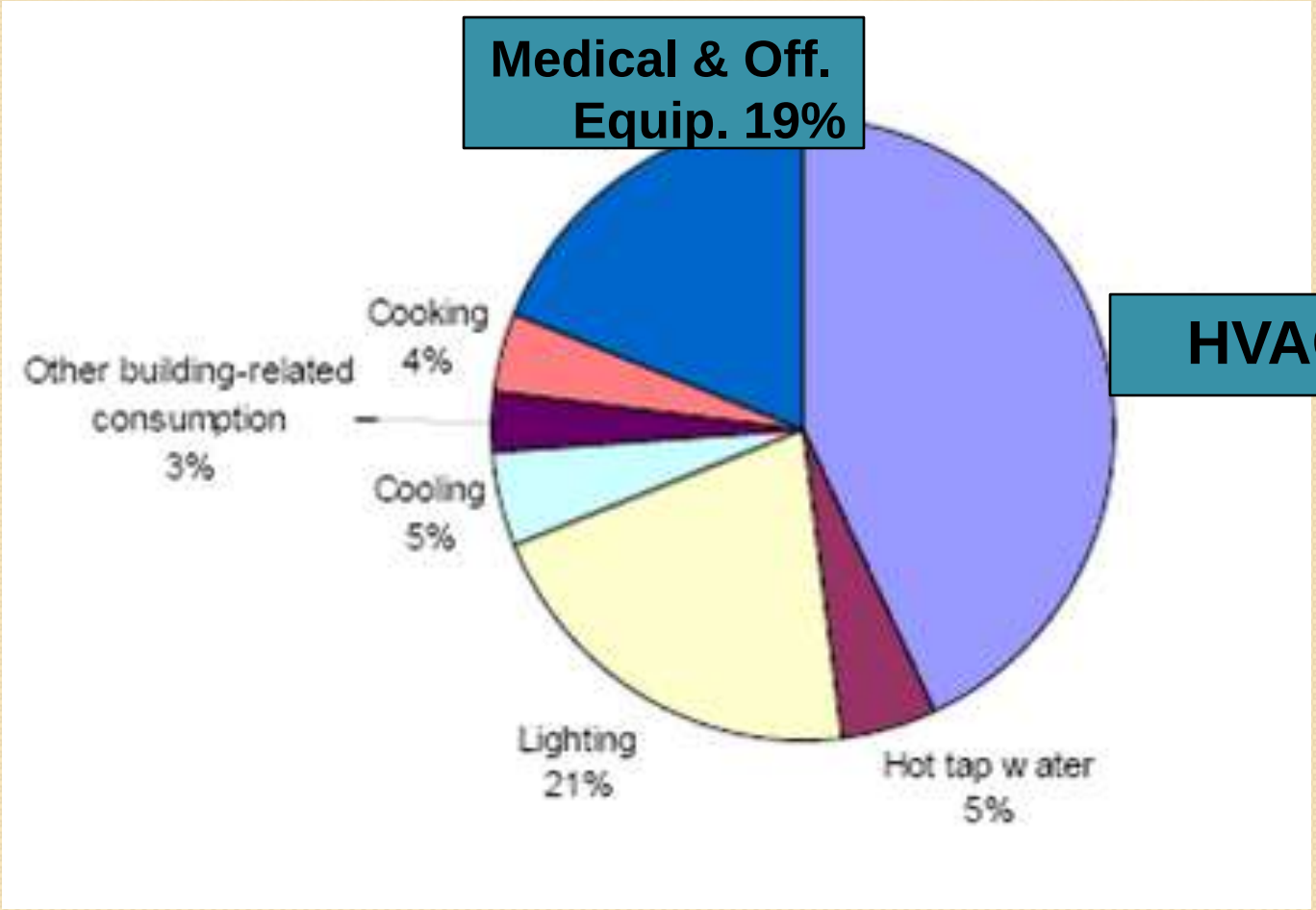
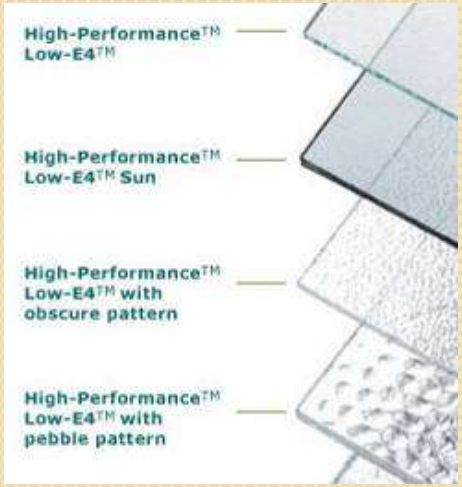


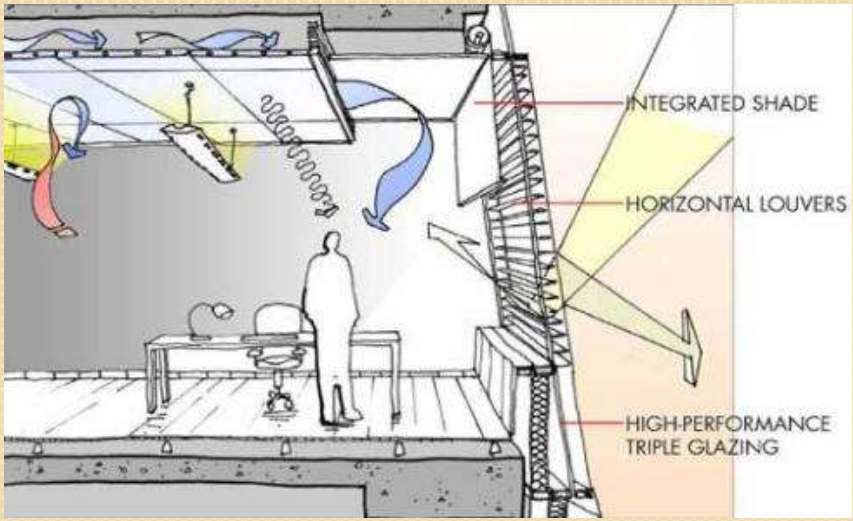
Figure shows that HVAC/lighting account for a large part of the energy Consumption.

High performance glass

Energy Conservation

- By reducing ingress of heat
- By allowing good penetration of daylight
- Energy savings @ 35-40%
- Environmentally friendly
- **COST : INR 700-900 per sq ft**





Examples Of design

High Performance GLASS – PEAK TEMP 52C IN SAUDI ARABIA

STONE – PEAK TEMP 45C IN NAGPUR

GREEN TERRACES FOR BUFFER

Water Conservation System

Water Recycling and Sewer Mining

•Treating both the blackwater (toilet) and greywater (showers and basins) waste produced by the building saves water. Sewerage is usually made up of 95 per cent water ….. STP helps regenerate upto 70% of the water used…

- Water cooled chillers use the STP water
- RO plant reject to be used for irrigation instead of discarding same
- Waterless urinals…
- Electronic sensors…
- Less-water flushes….

REDUCE, REUSE, RECHARGE

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Planning for Tomorrow : Some Examples

OPERATION THEATRE DESIGN (40 – 100 sq mt)

PLENUM SIZE

PENDANT

Metal ceilings

LCD

HERMATICALLY SEALED DOOR

BUILT IN SS STORAGE

SEAMLESS FLOORING WITH COVING

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Specialized Care in Patient Areas

Intensive Care Unit Rooms

- Outside view to avoid icu-psychosis
- Power column
- Movement around the bed – 150 s.Ft.
- Hand-washing outside every cubicle
- Visibility from nurse station
- Sound proof cubicle
- Negative / positive isolation rooms

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Specialized Care in Patient Areas

Pediatric Inpatient Room

- Design for 1 + 1 People
- Aesthetics are Important
- Bring the Child, Close to Home Environ
- Customized Beds and Toilet Accessories
- Ceiling LCD Screens
- Play Areas
- Designing for the Parent

Specialized Care in Patient Areas

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Neonatal Intensive Care Units

- Progressively Clean Zoning
- Needs Three Stage Filtration
- Father's Waiting Area
- Breast Feed Room
- Separate Areas for In-house Delivery v/s Outside Referrals
- Stringent Temperature Control
- Open Layout v/s Cubicles

Specialized Care in Patient Areas

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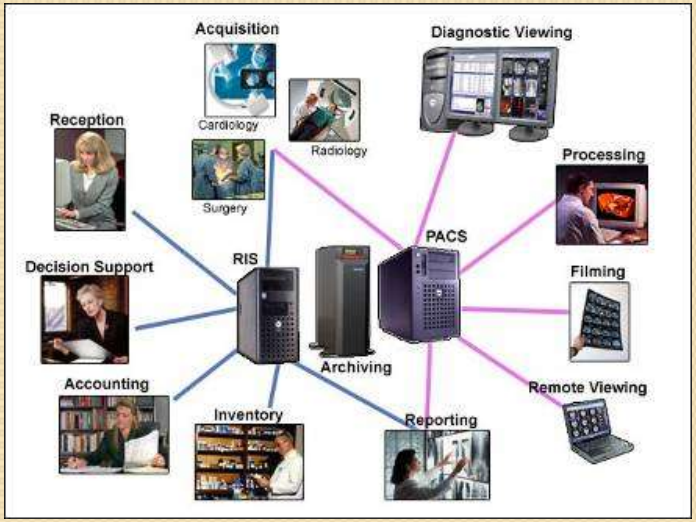
LDRP Suites

- Labor Delivery Recovery and Post-Partum
- Homely Environ
- Family present during delivery
- Capability of conversion into delivery room
- Jacuzzi for under water delivery
- Hidden accessories
- Over bed OT Lights
- Care for Newborn

Information Technology

Use of PACS:

- Ease of clinical information relay
- Filmless/paperless hospital
- Telemedicine made easy



Web Based Apps:

- Navigate your hospital like GPS
- Know your doctor/Nurse/Janitor
- Connect through social media
- Manage your appointments
- Pay your bills through phone/iPad
- Phone/iPad based electronic controls

Challenges for Design of the Future

- **Growth is inevitable.** Rising requirements will imply similar rise in space constraints.
- **Technology** will always improvise……so design will have to work in tandem
- 'Compact well planned **value for money**' hospitals are the need of the hour

As Mies Van Der Rohe famously stated 'Less is More'

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THANK YOU !!!!

Feel free to contact

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