

**MODERN TRENDS IN
PLANNING AND DESIGNING
OF HOSPITALS
Principles and Practice**

“Nise Dominus Frustra”

“Without God We can do Nothing”

MODERN TRENDS IN PLANNING AND DESIGNING OF HOSPITALS

Principles and Practice

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JAYPEE BROTHERS
MEDICAL PUBLISHERS (P) LTD
New Delhi

Published by

Jitendar P Vij

Jaypee Brothers Medical Publishers (P) Ltd

B-3 EMCA House, 23/23B Ansari Road, Daryaganj

New Delhi 110 002, India

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Modern Trends in Planning and Designing of Hospitals: Principles and Practice

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First Edition: **2007**

ISBN 81-8061-912-5

Typeset at JPBMP typesetting unit

Printed at Gopson Papers Ltd, A-14, Section 60, Noida

**To
my parents
for their guidance and moral support
to my students and teachers who always inspired me
for academic excellence
to my beautiful and brilliant wife, Madhu
who provides me with unwavering love and support
and our affectionate daughter, Shilpa
for her undaunting patience and understanding
while I pursued my dreams
and to the memory of Late Sh. Om Parkash Bamba
for being my anchor and source of inspiration**

- Shakti Kumar Gupta

**To
my mother
for her lifetime inspiration and everlasting support
my lovable wife, Sheeba
for being my steady anchor and omnipresent sublime loec
our delightful daughter, Dakshita
for her radiant presence
and to the memory of my father and brother**

- Sunil Kant

**To
my mother
for her constant encouragement and belief in me.
Gowri, my ever supportive wife
for her patience and unflinching support through every stage of my life
My sons, Saurabh and Gaurav
for their vital and thought stirring inputs
and to the memory of my father**

- R. Chandrashekar

**To
my parents
for their guidance and everlasting support
all my teachers – for being source of inspiration and guiding my career
my beloved wife, Sujata whose unwavering love
has been a pillar of strength in all my endeavors
and our adorable daughters - Sylvanae and Shayna for
bringing immense joy in our life**

- Sidhartha Satpathy

Preface

Globally, healthcare systems are experiencing increasing fiscal, demographic and consumer pressure. There have been metamorphic changes in the recent past in the sphere of healthcare delivery. The planning, design and final architectural expression in healthcare is reflective of the gradual shift in outlook of healthcare institutions from merely treating the sick to a concerted approach to harness healthy living. This has been triggered by globalization, increased expectations of seekers and providers of healthcare, emphasis on ambulatory/daycare services, enhanced standards of care and the participation of private players in the health sector.

Hospitals are amongst the largest and most complex of all modern institutions. To add to these complexities are the major transformations that are occurring in the delivery of healthcare worldwide. It is thus essential that hospitals are planned and designed to meet the requirements of today and tomorrow. Winston Churchill had commented “first we shape our buildings and thereafter they shape us”. This is certainly true for hospital buildings.

The book “Modern Trends in Planning and Designing of Hospitals: Principles and Practice” provides a comprehensive and holistic view in planning and designing of hospitals. The existing best practices, emerging trends/concepts such as integrated healthcare facilities, value added services, green hospitals, healing architecture, life enhancing designs, assisted living facilities, patient focused architecture and humanizing environment have all been incorporated. The book has chapters on planning and designing of clinical, administrative, supportive services and facilities including inpatient, ambulatory, therapeutic, diagnostic and logistic support departments. Plan types, functional requirements, materials used, intra and inter departmental relationships, way finding, interiors, aesthetics, design trends, electrical systems, ventilation, air conditioning, lighting, water, circulation, environmental, energy, interface and space requirements have also been deliberated. Chapters on facilities for the aged and the disabled have also been included. The text is amply and appropriately aided by diagrams, photographs, architectural drawings and engineering designs. A chapter “Ready Reckoner” has been incorporated which will provide the reader ready access to comprehensive information related to the planning and designing of hospitals.

This book will be a useful guide and reference source that will complement the functions of policy makers, academicians, hospital planners, architects, administrators, clinicians, engineers and students associated with planning, designing, construction, maintenance and administration of hospitals. It is authored by professionals who are also qualified, skilled and experienced hospital planners and administrators. The doctor-architect author team has complemented and supplemented each other to provide an integrated approach to all the issues related to the planning and designing of hospitals. The book would facilitate planning and designing of new hospitals as well as remodeling, renovating and retrofitting existing hospitals.

We hope that the book proves valuable to those for whom it is intended. Communication of suggestions and omissions, from our esteemed and revered readers will be of immense help in incorporating the same in the subsequent editions.

We greatly acknowledge the contributions of the various institutions, hospitals and consultants for permission to use their concepts, photographs, architectural drawings and engineering designs in the book. Their contributions have definitely enabled to make the principles and practice of hospitals planning and designing more easily comprehensible and implementable.

We also sincerely appreciate Mr. Sandeep Saxena in providing the excellent secretarial assistance and Mr. F.C. Luthra and Mr. Indresh Kumar Sinha for generating Auto CAD drawings in the compilation of the book. Our thanks to the well-knit team of Jaypee Brothers Medical Publishers Pvt. Ltd under the dynamic and visionary leadership of their Chairman and Managing Director, Mr. Jitendar P. Vij for their quality adherence, professionalism and dedication. Their invaluable contribution in the completion of the book is gratefully acknowledged.

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Lt Col Sunil Kant
R Chandrashekhar
Sidhartha Satpathy

Acknowledgements

The authors sincerely acknowledge the contributions of the following:

Drawings and photo credits

- Archimedes – Healthcare Architecture, New Delhi.
- Hosmac India Pvt. Ltd., Mumbai.
- Hospital Services Consultancy Corporation (I) Ltd., Noida, UP.

Photo credits

- Asian Heart Institute, Mumbai.
- All India Institute of Medical Sciences, New Delhi.
- All India Institute of Physical Medicine and Rehabilitation, Mumbai.
- Austria India Plan and Build Consortium, Vienna, Austria.
- B M Birla Heart Research Centre, Kolkata.
- Bangalore Medical College, Bangalore.
- BSES Hospital, Mumbai.
- Dr. Ram Manohar Lohia Hospital, New Delhi.
- Dte General of Health Services, Ministry of Health and Family Welfare, Govt. of India, New Delhi.
- Fortis Hospital Mohali, Punjab.
- Godrej Memorial Hospital, Mumbai.
- Government Medical College and Hospital, Jammu.
- Incubis, Architecture Industrial Design Retail Projects, New Delhi.
- Institute of Cytology and Preventive Oncology, ICMR – Noida, UP.
- Johnson and Johnson (Medical), India.
- Max Devki Devi Heart and Vascular Institute, New Delhi.
- Max Super Speciality Hospital, New Delhi.
- MGI (India), Gurgaon.
- Nizam Institute of Medical Sciences, Hyderabad.
- Parmanand Hospital, New Delhi.
- Prime Site, A Division of Mudra Communications Pvt. Ltd., New Delhi.
- S. B. Group (Rockland Hospital), New Delhi.
- Saifee Hospital, Mumbai.
- Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow.
- Sri Satya Sai Institute of Higher Medical Sciences Puttaparthi, Andhra Pradesh.
- Sri Venkateshwara Institute of Medical Sciences Tirupati, Andhra Pradesh.
- Trivandrum Medical College, Kerala.
- Wockhardt Hospital and Research Centre, Mumbai.

Walk through CD

- Trauma Center, Bir Hospital, Kathmandu, Nepal.
(Courtesy: Hospital Services Consultancy Corporation (I) Ltd, Noida, UP)

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CD Contents

A Walkthrough Trauma Center

Abbreviations

A and E	Accident and emergency	EOI	Expression of interest
AERB	Atomic energy regulatory board	Exam	Examination
ABST	Antibiotic sensitivity testing	FHC	Fire house cabinet
ACHR	Air changes per hour	FIFO	First in first out
AGA	American gas association	FIS	Financial information system
AGSS	Anesthetic gases scavenging system	FMT	Forensic medicine and toxicology
AHU	Air handling unit	FRLS	Fire retardant low smoke
ALS	Average length of stay	Ft	Feet
ANC	Ante natal care	GFCIS	Ground fault circuit interrupter systems
ANSI	American national standard institute	Gynae	Gynaecology
ASHRAE	American society of heating, refrigeration and A/c engineers	HAI	Hospital associated infection
ASI	Archeological society of India	HDU	High dependency unit
ASME	American society of mechanical engineers	HEPA	High efficiency particulate air (filters)
ASPE	American society of plumbing engineers	HIS	Hospital information system
ASTM	American society for testing and materials	HIV	Human immunodeficiency virus
AWS	American welding society	HRD	Human resource development
BARC	Bhabha atomic research center	HTM	Hospital technical memorandum, UK
BGSF	Building gross square footage	HVAC	Heating, ventilation and air conditioning
BMW	Bio-medical waste	I/O Chart	Input-output chart
BPW	Bed pan washing	IAQ	Indoor air quality
BTS	Blood transfusion services	ICD	International classification of diseases
BTU	British thermal unit	ICU	Intensive care unit
CAT	Computerized axial tomography	IDMR	Integrated digital medical records
CCTV	Closed circuit television	ISO	International standards organization
CEO	Chief executive officer	IT	Information technology
CGA	Compressed gas association	IV	Intravenous
Ch	Change	Kg	Kilogram
CIS	Clinical information system	KVA	Kilovolt amperes
Cm	Centimeters	KW	Kilowatts
CMO	Chief medical officer	LAMA	Left against medical advise
Consult	Consultant	LAN	Local area network
COPP	Committee on plan projects, India	Ibs	Pounds
CSA	Canadian standards association	LIS	Laboratory information system
CSSD	Central sterilization supply department	m²	Square meters
CU	Clean utility	M/m	Meter
Cu m	Cubic meters	M and E	Machinery and equipment
Cu cms	Cubic centimeters	Max	Maximum
DBE	Design basis earthquake	MCB	Miniature circuit breaker
DC	Direct current	MCE	Maximum considered earthquake
Derm	Dermatology	Med	Medicine
DIS	Department information system	Min	Minimum
DGSF	Department gross square footage	MIS	Management information system
DU	Dirty utility	MLC	Medico legal case
ECG	Electro cardio graph	mm	Millimeters
EDB	Electrical distribution board	MRD	Medical record department
EMS	Emergency medical services	MRI	Magnetic resonance imaging
EOS	Emergency oxygen supply	MRO	Medical record officer
EPC	Engineering procurement construction	MSS	Manufacturers standardisation of the valve and fitting industry
EPR	Electronic patient record	MTP Act	Medical termination of pregnancy act, India
ER	Emergency room	NACO	National aids control organization, India

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NBC	National Building Code of India, 2005	STP	Standard temperature and pressure
NEMA	National electrical manufacturers association, USA	Sec	Seconds
NFPA	National fire protection association, USA	SOP	Standard operative procedures
NIS	Nursing information system	SPECT	Single photon emission computed tomography
NS	Nursing station	Sqm	Square meters
NSF	Net square feet	Surg	Surgery
NSI	Needle stick injury	TPR	Temperature, pulse and respiration
OPD	Out patient department	TR	Tonnes of refrigeration
OT	Operation theater	TTI	Transfusion transmissible infection
PACS	Picture archiving communication system	UCA	Ultra clean air
PAHO	Pan American health organization, USA	UPS	Uninterrupted power supply
Pat	Patient	VESDA	Very early smoke detection apparatus
Ped	Pediatrician	VIE	Vacuum insulated evaporator
PET	Positron emission tomography	VOC	Volatile organic compound
PIS	Pharmacy information system	VSAT	Very small aperture terminal
PNDT Act	Prenatal diagnostic techniques act, India	WAN	Wide area network
Psy	Psychiatry	WC	Water closet
RFP	Request for proposal	WIC	Walk-in cooler
RIA	Radio immune assays	WHO	World Health Organization
RIS	Radiology information system	Yds	Yards
		Z	Zone factor