CORE DESIGN

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MOVING PEOPLE - PLANNING A VT SYSTEM

- How many people need to be transported in a 5 min period? Arrival rates as % of the population
- How long do passengers have to wait for a lift? AWT
- How long do passengers take to get to their destination?
- How many lifts are needed?
- How big do the lifts need to be?
- How fast do the lifts need to be?
- How many journeys per year will the lifts make?

CHOOSING THE RIGHT EQUIPMENT

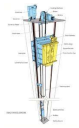
Hydraulic Lifts are best for:-

- Heavy Loads > 2000kg
- Low travel < 18metres
- Low number of starts per hour max 120
- Temperature stable environments
- Slow travel speeds max 1 m/sec
- Life expectancy < 20 years
- Some Machine room less versions

CHOOSING THE RIGHT EQUIPMENT

Traditional Electric lifts are best for:-

- Busy lifts with >180 starts per hour
- Fast performance up to 18m/sec, (64.8km/Hr)
- Excellent ride quality
- Longer travel
- Loads up to 5000kg
- Life expectancy 25 to 40 years!



CHOOSING THE RIGHT EQUIPMENT

Machine Room Less (MRL) lifts

- Do not need a machine room and so save space
- Limited to about 40m travel
- Limited to 180 starts per hour
- Limited to 3.5m/s
- Limited to 3000kg
- Efficient gearless drives are best
- Life expectancy <20 years

VERTICAL CIRCULATION

- Vertical circulation
- Configuration
- Floor-plate design
- The function of Service Core
- Service core types & placement
- Service Core & Building Economy
- Elevator design & configuration
- Population density
- Traffic analysis
- Quality of ride
- Service-core layout & space requirements

VERTICAL CIRCULATION

- Cores = service cores = risers
- Contains:
  - Elevator shafts
  - Elevator lobbies
  - Main & escape stairways
  - Riser-ducts
  - Toilets
  - Other service rooms
- Elevators = MAIN vertical circulation system

CONFIGURATION

At initial design stage, designer DETERMINES:

- Buildable net rentable areas (NRA)
- Gross floor areas (GFA)
- Typical & a typical floor-plates
- Prepare a diagram + propose elevator configuration:
  - No. of banks
  - No. of stops
  - Transfer floor(s)

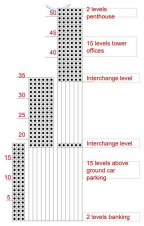
No. of elevators:

3 car park zone lifts

6 banking and lower offices zone lifts

6 upper offices zone lifts

• = Lift opening



DESIGNER'S CONSIDERATION:

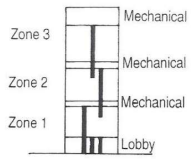
- Typical floor plate sizes
- Typical floor plate efficiency
- Staircase positions
- Tenancy options
- View outward
- M&E risers and routes
- Structural system options etc

FLOOR PLATE DESIGN

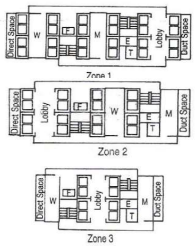
- Staircase usually grouped with elevators
- As means of escape & accessibility
- Same goes with M&E riser ducts
- Aspects that affect the floor-plate design: –
- Direction of best views out
- Permissible ground floor plinth are
- Car-parking grids in relation with floor-plate structural configuration

Floor-plate efficiency should not be less than 75%

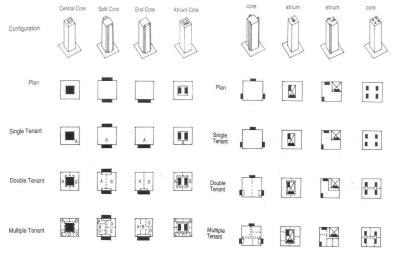
FUNCTION OF SERVICE CORE



- Diagram of Elevators (three zone system in which users have to change floors after each zone)



SERVICE CORE TYPES & PLACEMENT



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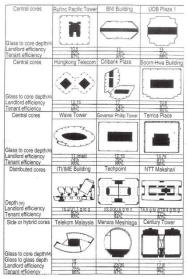
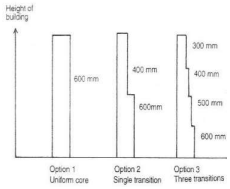


SERVICE CORE & BUILDING ECONOMY

- Minimization of material costs
- Optimization of core geometry
- Minimization of core area
- Minimization of construction time



BENEFITS OF A PERIPHERAL CORE POSITION:

- No fire-fighting pressurization duct is needed
- Good view out
- Natural ventilation
- Natural sunlight
- A safer building in the event of total power failure
- Solar-buffers & energy savings

REQUIREMENTS FOR ELEVATOR SELECTION SERVICE

2 common performance criteria:

•Average waiting interval (AWI, in seconds)

•5-minute handling capacity (in %)

	EXCELLENT SERVICE	GOOD SERVICE	FAIR SERVICE
COMMERCIAL BUILDING			
Up-peak interval	28 secs	30 secs	35 secs
5-minute up-peak handling capacity	14 - 15%	13 - 13.5%	11 - 12%
HOTEL BUILDING			
2 way lobby traffic	35 - 40 secs	45 - 50 secs	55 - 60 secs
5-minute up-peak handling capacity	14%	13%	12%
APARTMENT BUILDING			
2 way lobby traffic	50 - 55 secs	60 - 65 secs	70 - 75 secs
5-minute up-peak	7%	6%	5%
CAR-PARK BUILDING			
2 way lobby traffic	35 secs	40 secs	50 secs
5-minute up-peak	13.5 - 14%	12.5 - 13%	11 - 12%

ELEVATOR DESIGN & CONFIGURATION

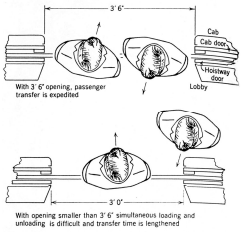
Elevator design should give optimum:

- Number of elevators
- Types of elevators
- Elevator capacities
- Arrangement o elevator

DESIGN CONSIDERATIONS

Door openings

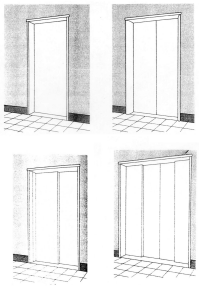
- **>3'-6" for simultaneous loading/unloading**
- **<3'-6" for singular loading**



DESIGN CONSIDERATIONS

Doors

- **single slide (24-36")**
- **center opening (42-60")**
- **two-speed, side opening (42")**
- **two-speed, center opening (60")**

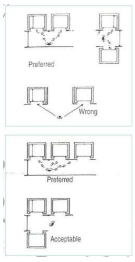


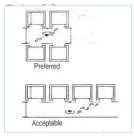
TWO-CAR GROUPING

- A side-by-side arrangement is best
- Passengers face both cars & can react immediately
- AVOID separation of elevators
- EXCESSIVE separation destroys advantages of group operation

THREE-CAR GROUPING

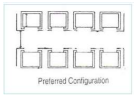
- 3 cars in a row are PREFERRABLE
- 2 cars opposite 1 are acceptable
- PROBLEM: location of the elevator call button





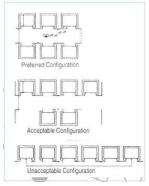
FOUR-CAR GROUPING

- commonly in large, busier buildings
- The 2-opposite-2 arrangement is the most efficient



EIGHT-CAR GROUPING

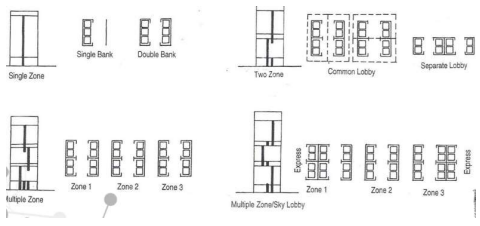
- the largest PRACTICAL group
- 4-opposite-4 arrangement



SIX-CAR GROUPING

- found in large office buildings, public buildings & hospitals
- provide quantity & quality
- The 3-opposite-3 position is PREFERRED
- dimension of the LOBBY must not be less than 3m or 3.6m if function as a passageway

SERVICE-CORE LAYOUT & SPACE REQUIREMENTS



QUANTITY OF SERVICE

- It is measured in terms of the total number of passengers handled during the peak five-minute period of the day.
- This is calculated by determining the number of trips made by the lifts over the peak 5 minute period and then multiplying it by the average number of passengers carried in each trip.
- The target handling capacity as a percentage of the building population is usually the estimated value of passenger arrival rate for the 5-minute up-peak period.
- The minimum recommended quantity of service is given in Table 2.

Table 1 Occupancy area per person in office buildings
(*Clause* 4.2.2)

Building Type	Open plan	Cellular
Premium	10 m²	12 m²
Regular	8 m²	10 m²
Low end	5 m²	8 m²

Table 2 Recommended Quantity of Service in office buildings
(Clause 4.2.3)

Type of Occupancy	Quantity of service
Multi Tenancy	10% to 20%
Single Tenancy	15% to 25%

QUALITY OF SERVICE

- It is very difficult to get real indications of passenger waiting time and lobby queuing from the classic calculation models.
- Therefore, interval is considered as the measure. During peak traffic, the interval or the average time between successive arrivals of the lift cars at the main lobby is generally considered as an indicator of passenger waiting time.
- Table 3 gives the quality of service based on interval

Table 3 Recommended Quality of Service in office buildings
(*Clause* 4.2.4)

Quality of service	Interval (sec)
Excellent	< 25
Very Good	25 to less than 30
Good	30 to less than 35
Fair	35 to less than 40
Poor	40 to less than 45
Unsatisfactory	45 and above

LIFT SPEED

For passenger lifts in a residential building the following general recommendations can be followed:

Sl No.	No. of Floors	Speed m/s
i)	Upto 15	1.0 to 1.5
ii)	16 - 20	1.5 to 1.75
iii)	21 – 30	1.75 to 2.5
iv)	31 - 45	3.0 to 4.0
v)	46 - 60	4.0 to 6.0
vi)	Above 60	6.0 and above