CHAPTER 2 ELEVATOR SERVICE INDUSTRY

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CHAPTER 2

ELVATOR SERVICE INDUSTRY

2.1 Introduction:

Product and service are closely related elements of Marketing Strategy. Depending on the nature of the Product offering and needs of firm composing the target markets, after Sales Services may be indispensable in winning and holding customers. In a strategic sense service can be defined as an activity undertaken for the express purpose of aiding customers while this is a rather nebulous (Not distinct) statement, it does exclude such activities as frequent sales calls, Local availability of inventories, and warranties which of course aid customers but are seldom undertaken expressly for that purpose. What does fit in to this concept are such activities as Pres-sale engineering studies, technical consultation, and Performance testing, as well as such conventional Post-Sale aid as financing, operator training, installation and maintenance. Despite the high cost and the abuse, which so often accompany it, customer service is core element in the strategic plan.

After sales service is very important and strategic part of capital Equipments sale. If customer's ultimate customer don't get timely preventive or break down service then entire capital investment can go in to Drain.

Basically in Elevator Equipment industry buyer is not user and ultimate users are real buyers of Elevator Equipment. So any dis-satisfaction from ultimate customer have double effect on seller.

The last decades have seen a profound change in the composition of the economy. In all countries, the commercial service sector is now at
least double the size of the manufacturing sector in terms of GDP, three times the size if you include social and public services (e.g. health, education) in that figure. That trend is set to continue. For the Internal Market to function efficiently it is essential that the regulatory framework develops in tandem with these changes.

2.2 HISTORY OF ELEVATOR INDUSTRY:

Experts believe that as early as 2000 B.C., the Egyptians used hoists of some type to build the pyramid is over 500 feet tall and has many building blocks weighting more than 200,000 pounds.

In Rome, about 80 A.D., wild animals and gladiators rode crude elevators up to the arena level of the Roman Coliseum. The oldest known hoisting machine till recently in existence is in the Abbey of Mount St. Michel on the French seacoast. Installed in 1203, it used the large tread wheel with a donkey supplying the walking power.

In the middle of the 17th century, a resident of Paris invented the “Flying Chair”, which was cranked up and down by a servant. A hoist way was used with this device, and a cage was raised and lowered by a rope passing around to a drum and down to ahead counterweight. Similar hoists are said to have been installed in Windsor Castle for Queen Anne in 1713.

Over the next few centuries, various hoist and lifts were developed to carry people and freight. All of them used muscle power for hoisting devices. Power Hoisting devices was considered only after the invention of the steam-powered elevator to lift coal up the mineshafts.

In 1835, a steam-powered elevator called the “teagle” carried freight in an English Factory. In 1845, Sir William Thompson developed the first hydraulic elevators appeared in 1850 as steam-operated platform hoists for freight service.
The one danger in any kind of vertical transportation developed so far was obvious. Because whether a hoist, pulley, or block and tackle was used, if the rope broke, well ….you can imagine the results.

Things changed only after Elisha Graves Otis invented the safety hoist in 1852. Due to scarcity of land, elevators fall under “Must Utility”. All over the world elevator is Key Utility in any medium to high-rise building. Elevator Industry in all over the world by 5,00,000 to 5,50,000 lakhs elevators per year.

Present Status: Elevator is part of building infrastructure. As per statistics of IEEMA (Indian Electrical and Electronics Manufacturers Association) Total Elevator selling by organized and unorganized sector was 6800 elevators in 2003 and 2004 Forecast for Total Market is 8900 Elevators.

Elevator Industry is growing at 8% to 10% globally per annum. In India elevator industry is growing at 15 to 18 % per annum and Market is very competitive. Here major factor is competition from unorganized players. Maharashtra’s share in to total 8900 forecast of elevator is 2500 Units and Pune Region share in total Maharashtra in terms of elevator unit is 800 to 850 elevators. (Ref.www.elevatorworld.com)
2.3 Classification of Elevators:

Classifications of Elevator users:

A) Residential users.
B) Commercial complex.
C) Hotel industry.
D) Hospitals.
E) Shopping malls
F) Industrial users for material handling.
G) Institutional clients like gov.building, educational buildings etc.
2.4 SCATTER DIAGRAM OF ELEVATOR fig. no. 2.2)

HOIST & GOVERNOR ROPE AND ACCESSORIES
- REED SWITCH
- DOOR OPERATOR
- SAFETY SHOE / LAMBD
- CAR DOOR & HEADER ASSEMBLY
- RAVELLING CABLE
- LIMIT SWITCH ASSEMBLY,
- MAGNET ASSEMBLY,
- ROUGH, HARNESS, JB,
- FRANCE ASSEMBLY
- ADER, DOOR,
- K& BEAK, SILL

Machine Rom Equipment,

MACHINE, ARD
GOVERNOR, CONTROLLER
DEFELECTOR SHEAVE ASSEMBLY

CAR FIXTURES
INSPECTION BOX, FAN, JB, ETC...
CAR, CAR FRAME ASSEMBLY
PLATFORM & SI ASSEMBLY
CAR SAFETY BLOCK

COUNTER WEIGHT & FRAME
CWT & CAR GUIDE SHOE -
CAR & YIELDER BAIL CHAINE
FISH PLATE ASSEMBLY, BRACKI

PIT EQUIPMENT
PIT SWITCHES ASSEMBLY
GOVERNOR TENSION SHEAVE
2.5 Elevator System Design:

Good elevator system design is critical to a multi-storied building. Planning of elevator system must therefore design programs, within both new construction and refurbishment schemes. The quality of vertical transport is vital to building circulation and therefore has a profound effect on human response to a building itself. If it is correct, acceptability, reputation and a sound investment are assured. If it is incorrect, it causes disadvantages from which escapes is difficult and usually expensive.

- Typical Arrival Pattern- Commercial Office.

Building elevator system must be configured to match the expected traffic requirement, both present and future. This means that accuracy in predicting expected building population and how and when it will move is critical, for it is on this principle that fundamental elevator system design decision must be based. Key decisions, such as the number of elevator shafts, cannot be easily modified in the later stage of building development.

Predicting population flow and patterns is pattern a difficult and uncertain task, needing a unique expertise. Using data predictions in the process of producing an optimum elevator system design, or the art of elevatoring, as it is known, is also a specialist’s task. Knowledge and experience are essential to get things right the first time.

Key Design Considerations:

There are many variables that affect elevator system design. However, the ones to be specified are:
To meet the elevator system specification, there are many design features that an elevator manufacturer can vary. Of these, the principal ones are:

- Elevator speed
- Elevator car dimensions
- Load
- Number of elevators
- Elevator design characteristics (e.g. entrances and control system).

Although design estimates can be made manually, with many variables to be included in the overall process, on larger projects it requires the use of computer techniques to obtain optimum solutions. This applies particularly to complex design.

2.5.1 Basic Elevator Planning

Basic Design Parameters

There are numerous parameters, which can be used to judge elevator system performance. The principal one is based on quality of service. Quality of service is related fundamentally to the time interval a passenger has to wait for an elevator car and how quickly
the system transports that passenger to a desired destination. To quantify the concept a standard definition is used.

**Quality of service (or interval)** is the expected average interval (in seconds) between the arrivals of elevators at the main floor.

In basic terms, this is the round trip time of one elevator divided by the number of elevators in a group.

The required **handling capacity**, or quantity of service of a system is expressed, in elevator industry design terms, as a function of the expected building population.

It is stated in units of the percentage of building's population to be transported within a five-minute period.

- **Building Types**

The guidelines below indicate the key design features for particular building types. Although some qualitative and quantitative advice is given, it should always be remembered that there is no substitute for accurate estimation of traffic patterns. Average values are quoted for guidance. However, true estimation for a particular building, including local influences, such as the location of transport terminals or stations, can alter these significantly.

**Offices**

Maximum traffic usually occurs just before the start of working hours and is known as 'up morning peak' in elevator industry jargon. Office buildings with single (unified) tenancy usually provide heavier peak flows than those with multiple (diversified) tendencies.
If more detail estimates cannot be made, the following handling capacity requirements should be used as a basis for design to meet up morning peak.

- **Unified tenancy** – 15 to 25 percent of the total building population entering in a five-minute period.
- **Diversified tenancy** – 10 to 15 percent of the total building population entering in a five-minute period.

There will be other peaks in elevator system usage, such as at lunchtime and in the evening when people leave. Peaks can also be caused by the location of basement garages, conference rooms, restaurants and similar mass use facilities. The effect of these must be taken into account individually.

Designing for a quality of service is very much dependent on the preferences and need of the owner or occupant of a building. A general guide to the acceptability of service intervals can be summarized as follows.

- **Average interval 20-25 seconds** - excellent.
- **Average interval 35-40 seconds** - fair.
- **Average interval 45 seconds** - poor.

A large prestigious office building must often meet exceptional inter-floor traffic demands, which have to be considered in planning. These demands can often be very complex and correct design decisions will be more accurate if computer aided optimization and simulation is used as a planning technique. It will usually be beneficial to involve directly in such work. Use of such techniques is essential when the final elevator system itself will be computer controlled to achieve optimum operational performance, as will be the case for most large building complexes.
Hotels

The traffic flow in hotel is dependent on the type of hotel and its layout. Traffic peaks normally occur in the early morning and in the evenings, as guests leave and enter, or access the communal facilities, such as restaurants and bars. At these peak times, traffic flow can be approximately 10 percent (5 percent in each direction) of the hotel guest population requiring elevator service in a five-minute period. In the absence of other estimates, this value is used for planning.

Hotels where large scale events are held, such as conferences and banquets, may often have periods where traffic flows substantially exceed the recommended planning figure. If a hotel's owner or developers require it, planning criteria should be amended to a higher value, to ensure the elevator system can cope with such demands. Ideally large suites should be located on lower level.

What is an acceptable service interval in hotel can vary greatly according to its type and location. In smaller, older or provincial establishments longer intervals up to 60 seconds can be acceptable. In modern, international hotels not more than 30 seconds will be acceptable.

In addition to guest elevator systems, most hotels will require provision of separate elevator systems for staff movement, catering supplies, linen and other purposes.

Residential Buildings

Traffic patterns in residential buildings, either private or publicly owned, usually resemble those of hotels. Peak traffic density usually occurs in the early morning, but peaks will vary both in time span and in intensity.
The peak traffic value for use in planning is suggested as 6 percent of total building population.

The acceptable service interval for residential buildings is a highly variable quantity and must be assessed on criteria relevant to each application. Thus it is difficult to give general guidance. However, it should not be overlooked that extended waiting due to low quality of service can antagonize and frustrate elevator users. This in turn can lead to unpleasant reaction and social problems.

If there is a requirement for a residential elevator system to access public communal areas, service levels must be given special consideration. Elevator equipment must also be designed to suitable standards for such application. Often the principal, such as a housing association or local authority will set the planning criteria.

**Hospitals**

Generally vertical transportation requirements are laid down by the operating authorities of hospitals, consultants etc, whether public or private.

Very careful research is necessary to plan each individual hospital elevator project correctly.

There will usually be a requirement to provide several elevator systems. Apart from those for specific patient and medical use in a hospital's day-to day work, elevators will be required for patients' visitors, catering, linen transport, waste disposal and similar purposes.

**Specialized buildings**

Leisure centers, shopping malls, retail developments, air terminal and entertainment complexes are typical of the kind of specialized
buildings, which require careful individual study of traffic flow and density. Often the vertical transport facilities for passengers will be a combination of elevator and escalators and there will be separate elevators for goods transport.

Panoramic elevators are often selected for use in specialized building for aesthetic reasons and to provide viewing platforms. Their use has added design implications, which do not apply to standard passenger elevator designs. Such elevators should rarely be used as the prime means of vertical transportation in a building scheme.

2.5.2 Modernization of Elevators:

In refurbishment projects, the problems will usually be to upgrade within the physical constraints of an old system or add an elevator system where non existed. The design of a system should still be based on projected traffic flow, but the realities of each situation many have greater influence on design.

There will be a greater need to use more innovative arrangements, such as adoption of the latest microprocessor based VF control system for improved operational traffic handling.

Hydraulic elevator systems can be used in low raise situation. They have the advantage of minimizing disruption by requiring less construction work and with no machine above, do not pollute existing rooflines.

Modularity design enables elevators to be dimensioned to match existing wells to optimize building usage. Similarly, step-by-step replacement of parts to upgrade old control system, renew outdated entrance systems and aesthetic improvements can help provide flexibility to a refurbishment programme. Logistic considerations form an essential part of early planning.
Modernization packages can be tailored to suit specific client and building requirements, which provide inconvenience and disruption to activities in a living building and reduced shutdown periods.

Benefits of modernization:

- Greater reliability due to incorporation of latest technology.
- Savings in energy costs.
- Smoother and more comfortable ride.
- Reduced waiting time, noise and vibration.
- Accurate floor leveling.
- Optimum system efficiency.
- More pleasing aesthetics, face lifted car interiors resulting in enhanced prestige to your building.
- Comfort from the latest in elevators safety technology.
- Most importantly, satisfied building occupants.

Location of elevators:

Normally, the most efficient methods of locating elevators to serve an individual building are to group them together. A group has a lower average interval between car arrivals than a signal elevator. Groups should be located for easy access to and from a main building entrance and should normally be located centrally for generally age ease of passenger transit through out the building.

If a building is of a design with areas which gives long distances to the central elevators groups, it may be efficient to install and additional elevator for local area inter floor traffic. For complex buildings, the principles for location of elevator can be different from those indicators.

Grouping of elevators:
A group of elevators should be designed in a manner so that they are located closely to minimize the walking distance between entrances. Waiting passengers can then react quickly and access car swiftly without detrimental effects to the quality of overall service.

Lobby areas, especially the main ones, should not be in the path of passageways. Any potential for confusion between waiting passengers and passers-by should be avoided by having separate lobby areas.

There are two options for grouping two or three elevators. For four elevator, option are shown below is preferable as four elevators in line cause sufficient increase in passenger walking distances to diminish operation efficiency.

The lobby width, of twice the car depth, when elevators are placed opposite each other in a group, determines the size of the elevator machine room. If the lobby width is decrease below that specified, it could provide difficulties in machine room layout.

2.5.3 Elevator layout:

Elevator arrangements:
An elevator arrangement is a term used to describe the configuration used for hoisting and elevator car. The main criteria, which determine the lay out to be used, are

- Design of building, particularly the physical constraints imposed by dimensional are loading limitation.
- Performance of the elevator system in speed and capacity.
- Optimum utilization of available floor space.

Electric traction machine above:
1:1 roped (the rope liner speed and car travel speed are the same). An economical efficient roping system applicable to many medium and high-speed elevators systems. Of an a diverter sheave will be fitted.
Electric traction machine above:
2:1 roped (the rope linear speed is twice the care travel speed). This layout permits a machine to carry twice the elevator car load.

Electric traction machine below:
1:1 roped. Single wrap. Generally restricted to 30 meters. The headroom required above the elevator well is reduced in this lay out by having machine mounted at or below the lowest floor level served. The increased length of rope can limit travel and the method doubles the load on the building structure or elevator.

Indirect side acting hydraulic low headroom:
The elevator care is side guided and suspended on ropes in this layout. Hydraulic elevator systems provide optimum low headroom solutions for low-rise installations. They are particularly advantageous for existing buildings or other situations where loading on the structure of the building must be kept as small as possible. In addition the machine room of a hydraulic system can be located remotely, supplying power to the lift cylinder from upto 15 meters away. Hydraulic methods are not generally adopted for intensively used elevator

• Machine Room Less Elevators

The benefits of a lift that need NO MACHINE ROOM are remarkable.

FOR ARCHITECTS

It means greater design flexibility.

FOR CONSTRUCTION COMPANIES
Streamlined installation with lesser construction demands and interference.

FOR DEVELOPERS

Lower construction costs and more saleable space. With the machinery neatly placed at the top of the hoistway, it delivers all these advantages.

Equipped with variable frequency technology, it also offers vital performance benefits: a smoother and quieter ride, floor leveling accuracy and energy savings.

Driven by a machine best known for its reliability in the elevator industry is fitted with a state-of-the-art modular control system, ideal for mid-rise residential apartments. The combination ensures exceptional reliability and performance of the elevator.

ADVANTAGES OF MRL ELEVATOR

- Improved aesthetics of the building with the absence of the machine room.
- Additional saleable space for the builder.
- More comfortable trip.
- Cost saving (civil and electrical) by elimination of the machine room.
- Improved leveling.
- Energy saving.

2.5.4. Drive System:
Modern elevator systems are driven by hydraulic or electric motion. They main criteria that decide the method to be used for a specific design are:

- Elevator speed.
- Intensity of elevator usage.
- Head room constraints.
- Passenger comfort.
- Energy consumption.
- Site constraints.
- Capital and operating costs.

Machines used to provide electricity traction drive are designed with three main type of drive. Generally these are:

- **Single speed AC geared Machine up to 0.7, meters per second.**
- **Variable Voltage Variable frequency geared machine for speeds up to 2.5 meters per second.**
- **Variables voltage variable frequency gearless machine for speeds of 2.5 meters per second and above.**

**Hydraulic Systems:**

Hydraulic drive systems have a motor-pump unit which supplies pressurized fluid via flexible hoses to a hydraulic cylinder. The cylinder provides the elevator car with motion indirectly. An electric motor drives the pump. Control of the system is by electro-hydraulic valves; ascent is driven under pressure and descent under gravity using the weight of the elevator car.

They are ideally applicable to low raise non-intensive traffic and buildings with height restriction.
Single speed AC geared machine:

Simple single speed AC motors are used in economy elevator system where leveling accuracy of ± 75 m is acceptable and where passenger comfort is not an over-riding constraint. Motors in such systems are driven directly from the AC power supply. Stopping is via an electro-mechanical brake mounted on the drive motors. The fixed parameters of such systems make leveling accuracy dependent on elevator carload.

Variable Voltage Variable Frequency Geared Machines:

AC motors are recommended for most variable speed geared drive applications. High levels of control and accuracy can be achieved for medium speed elevators. Varying the frequency and voltage of the current supplied can control AC motors. It results in a system of great accuracy, very smooth ride and high operating efficiency.

Variable Voltage Variable Frequency Gearless Machines:

Gearless machines are used in high-speed elevators for high-rise application. The increasing trend is to use efficient and cost effective high-speed variable frequency AC drives. In this the drive system has been ingeniously integrated with the latest microprocessor technology. From digital signals monitoring car position, car direction, speed and load, the voltage and current output is controlled to give a smooth drive, which is aligned through electronic logic to a pre-determined speed profile.

The variable Voltage Variable Frequency system used on geared elevators provides the ultimate in performance at reduced operating costs.
Incoming main AC power is first rectified to DC and then inverted to provide controlled AC current to the elevator drive. Precision monitoring of motor speed and car direction, position and load enable the pulse width of the AC power supplied to the motor to be adjusted to ensure that elevator speed is maintained very accurately to an ideal profile.

Pulse width modulation control of AC motors has tremendous advantages compared with the older Servo control techniques, namely:

- **Total control at stages of the motion cycle.**
- **A consistent fully adjustable smooth ride.**
- **Excellent leveling accuracy under all conditions.**
- **A higher power factor.**
- **Lower starting currents.**
- **Energy saving through refused power consumption.**
- **Quieter, cooler running.**

**V^2F THE OPERATING PRINCIPLE:**

The V^2F utilizes the most efficient way to regulate the speed of an AC-motor, through electronically controlled motor voltage. A sophisticated converter / inverter system first rectifies the three phase AC voltage of the network to DC voltage. Pulse width Modulation (PWM) technique with high-switching frequency is then used to operate power transistors in a way that converts DC power back into variable voltage and variable frequency AC power to drive the elevator hoisting motor. Increasing or decreasing the motor voltage and frequency in accordance with a computed speed reference achieves the desired speed.

The compact V^2F drive module is interfaced with the elevator control computer, which issues start, stop and operating mode commands. The drive system works intelligently in all modes and phases of
elevator operation. There are different V^F models to precisely meet the requirements of elevators of different capacity/speed combinations. All of them share the same technology strengths and operating principles, ensuring the unique combination of V^F benefits.

THE V^F RANGE:

For the low speed range up to 1.0m/s elevator speed, simplicity and economy are required in addition to energy savings, low supply currents, quiet operation, precise stopping and passenger comfort. The V^F-20 system is used in this speed range. For medium and high-speed elevators up to 2.00m/s, the V^F-20 system with a high degree of sophistication in electronics is used. For such elevator applications, to meet the more demanding tenant, building and elevator system requirements, the V^F-20 is built with a number of special features.

- Velocity feedback ensures that the elevator follows precisely an optimal speed pattern, producing minimal flight times and high handling capacity, as required for medium and high-speed elevators.
- Automatic leveling compensates for rope stretch noticeable at high travels and maintains the elevator car precisely at floor level.
- Adjustable acceleration and jerk rate settings allow ride performance to be optimized depending on the nature of building occupancy.

BUILDING COST SAVINGS:

A characteristic of the V^F technology is that the drive absorbs only active current from the network. This maintains the power factor ($\cos \varnothing$) close to unit at all times. The older systems rarely reach a value better than 0.07. The high power factor and the minimal motor slip
even during start and acceleration, reduces $V^2F$ line current drastically. The low starting current of the $V^2F$ system, means power supply sizing smaller by more than 50 percent compared with traditional system, this translates into direct building cost savings:

★ Smaller mains power switch and cable.
★ Smaller standby generator sets.

Taking the example of a standard 6 passenger 0.63m/s apartment elevator, the traditional single speed drive system would require 32 Amps mains switch, 6 sq.mm cable and 30 KVA standby generator, whereas, the same elevator with $V^2F$ drive system only needs 16Amps mains switch, 2.5 sq.mm cable and 12.5KVA generator set.

REDUCED ENERGY CONSUMPTION:

Since the motor starting currents are much smaller in $V^2F$ drives, the thermal losses in the motor are reduced, which translates into substantially lower energy consumption. The savings are close to 50% compared to traditional AC and DC drives. Again taking the example of the 6 passengers 0.63 m/s elevator, the traditional single speed system, in average usage, consumes around 6000 units per year. An equivalent $V^2F$ elevator requires only around 3000 units. The energy savings can be very substantial in large capacity high-speed elevators in buildings with intense traffic.

SILENT, SMOOTH EFFICIENCY:

$V^2F$ controlled hoisting machines are extremely smooth running, eliminating noise, vibrations and jerks that could be sensed in the elevator car. The extraordinary silence, smoothness and efficiency of a $V^2F$ installation are a credit to any building. The $V^2F$ drive follows smoothly the speed reference generated electronically for each run. The acceleration, deceleration and jerk values are preset at the factory.
In the medium and high-rise versions their values can be individually set on site for an ideal balance of dynamic performance and passenger comfort.

**LONG TERM RELIABILITY:**

$V^2F$ electronics reduction gears and the cool-running, reliable AC motors are designed, engineered and manufactured exclusively for elevator application. Combining $V^2F$ with well-proven control and door systems ensures technological consistency and long service life the real payback for the initial investment.

**MODERNIZING WITH THE $V^2F$ MODPAK:**

The $V3F$ range also includes the purpose designed modernization version, the $V3F$ Modpak for upgrading of existing AC elevators. The drive machine with the AC motor, still in serviceable condition can be retained, which reduces both cost and downtime. The modernized elevator has all the benefits of a normal $V^2F$ controlled elevator.

**2.5. 5 ELEVATOR ENTRANCES:**

**GENERAL**

Because an elevator car normally spends a large percentage of its time stationary during passenger transfer, the efficiency of the entrance system is a major factor in overall elevator system efficiency. The principal elements affecting entrance efficiency are:

- Opening width
- Door configuration
- Door drive system
- Passenger protective systems
MANUAL ENTRANCES:

Manual entrances are normally provided on low speed small capacity elevators where budget is a constraint, such as low cost housing segments. Normally manual entrance arrangements provided are imperforated collapsible door in car and Imperforated collapsible doors or swing doors on landing.

POWER OPERATED ENTRANCES:

The most efficient door configuration is two panels, center opening. A usable clear opening becomes available, and passengers begin transfer, before the doors are fully opened.

Two speed, two-panel entrances are used more at hospitals and similar buildings. They are more space effective, but lack the operational efficiency of center opening type doors.

PROTECTIVE SYSTEMS:

Passengers are protected from the closing doors by two principal methods:

- **Electro mechanical pressure detection**
- **Electronic door detector.**

In the first method, sensors incorporated into the door drive mechanisms detect slight body contact pressure. Actuation will check and reverse door movement, allowing passengers to pass.

The second method is used in the highly efficient and sophisticated 'intelligent' systems.
The screen of infrared beams acting as a safety curtain across the door entrance detects an obstacle when the doors are closing the doors then revert to an open positions.

2.5.6 ELEVATOR OPERATIONS:

GENERAL:

There are three key elements to the operational control of an elevator system:

- Passengers requiring an elevator inform the system by a landing call.
- Passengers in an elevator care inform the system of their destination by a car call.
- The elevator’s operational control system responds to passenger’s demands by issuing appropriate commands to the elevator’s motion controller.

Most of control systems use microprocessors to handle system commands. They are of modular design, ranging from the simplest form of control to the most up to date and sophisticated.

SINGLE AUTOMATIC PUSHBUTTON OPERATION:-

1. The simplest system. The car rests at the last floor served. When a landing call is received, the car travels to the relevant floor. Once the passenger has boarded and indicated the destination (car call) the car is exclusive to that passenger, and will ignore other landing calls until the destination floor is reached.

2. During this time, pressing landing call buttons will illuminate the UP/DN arrows lamps and the call button will not light.
The control system does not memorize landing calls received while the car is in use. Landing call buttons must be re-pressed when the UP-DN lamp extinguishes. The system is recommended only for light traffic, and with manual entrances to a maximum of eight floors.

**DOWN COLLECTIVE OPERATION-ONE CAR (Single car):**

1. The car normally rests at the main floor. Main floor has an 'UP' call button. Floors above the 'DOWN' call buttons. The controller memorizes landing and car calls. This system is ideal for residential buildings.
   When more than one landing call is received, the car will stop at other landing calls during the descent.

2. During an 'UP' journey from the main floor, the car ignores all landing calls; stopping at car calls in floor sequence. After the highest car call floor, the car will descend, stopping at landing and car calls in floor sequence back to the main floor.

3. The system is suitable only for light traffic. Interfloor traffic is poorly served by this system and it should be used only when traffic is mainly up floor, and down to, the main floor e.g. residential buildings.

**DOWN COLLECTIVE OPERATION-TWO CARS (DUPLEX):**

4. Operates as the simplex but....

With no calls in the system, one car rests at the main floor, the other normally at the last floor served, unless that was the main floor, when the car will park at a midway point. When a landing call is received, the microprocessor calculates which car is nearest to the call. If a series of landing calls is received, a car will be dispatched to the highest call, and then work down in floor sequence.
The microprocessor constantly monitors the system and re-assigns calls when necessary.

FULL COLLECTIVE OPERATION-ONE CAR (SIMPLEX):

- ‘UP’ and ‘DOWN’ landing call buttons are provided on all floors except the lowest floor, which has an ‘UP’ button, and the highest floor which has a ‘DOWN’ button. Landing call buttons illuminate when pressed to indicate that the call is registered.

- Landing calls and car calls are memorized and handled in logical sequence according to the direction of travel of the car and independent of the order in which the calls were registered.

- The full collective system handles inter-floor traffic well and is suited to most applications within its handling capacity.

FULL COLLECTIVE OPERATION-TWO CARS (DUPLEX) OR MORE:

- Duplex operates as the Simplex but...

With no calls in the system, one car rests at the main floor, the other normally at the last floor served (unless it was the main floor, when the car will park at a midway point).

When a landing call is received, the microprocessor calculates which car is nearest to the call, traveling in the required direction. Each car responds to its own car calls in logical sequence, depending upon direction of travel, and takes landing calls as assigned by the microprocessor.

The microprocessor constantly monitors the system and re-assigns calls when necessary.
When the full collective (upto 8 elevators) Duplex principle is extended to cover more than two lifts to operate them as a co-ordinated system it becomes a full collective group.

With no calls in the system one car rests at the main floor, the others are distributed evenly throughout the other floors.

Each elevator has its own microprocessor controller and each controller has the ability to perform the group supervisory role, so that, in the event of an elevator failure, the remaining elevators continue to operate as a co-ordinated system.

2.5. 7 ELEVATOR MAINTENANCE:

The initial plans and designs for an elevator system are merely the start of a long equipment life cycle. Elevator systems will remain in operational use often long after those responsible for their initial planning and installation have left the scene for new projects. However, the long term success for new projects. System is substantially affected by the decisions for its operation and maintenance that are made during the planning and creative stages.

- **Preventive maintenance** - to ensure continuity of safe and efficient operation.
- **System monitoring** -to enable impending faults to be detected and corrected and overall system performance to be assessed.
- **Corrective maintenance** - to effect rapid restoration of service when a fault occurs.
- **Inspection and audit** -to determine that an installation is being maintained in a safe and effective manner.
- **Passenger assurance** -to make sure that the disturbance and distress to passengers is minimized should a fault occur.
Address all the above requirements through a company Maintenance. It is a modular range of services. The main components of maintenance are...

- Programmed maintenance
- Online telephone service
- Call out service
- Annual surveys, quality survey and special inspections.

**Programmed maintenance** is the corner stone of maintenance. An efficient technique, refined by year of site experience, it ensures regular preventive maintenance to check, adjust and lubricate the key components of an elevator equipment.

**Online telephone**: is a service at main centers that provides a computerized point of contact to help with difficulties or if failures occur. Customers can be sure that there is always someone to help when needed.

**Surveys and inspections** are necessary for several reasons. Safety surveys must be carried out to ensure compliance with statutory standards and certification. Quality surveys should enable regular review of maintenance and its effectiveness, and annual surveys should be implemented to keep a close eye on the overall conditions of a system and to ascertain if improvements and enhancements are necessary.

### 2.5. 8 ELEVATOR SAFETY:

### FOR MUTUAL BENEFIT:

An elevator is a life-time investment. It is a high-tech product incorporating sophisticated electronic circuitry. And so the job of
installing an elevator is a specialized one. Trained and skilled technicians facing many odds at construction sites perform it.

The customer plays an important role in enhancing technician's efficiency. By strictly adhering to the following set of guidelines, the customer will not only provide a safe working environment for our technicians but will also protect the elevator from possible damage at site. This in turn will result in controlling cost and also saving valuable time—thus mutually benefiting both the customer and company.

**MACHINE-ROOM:**

1. **Safe access way:**

The passage should be clear of any tripping hazards. The staircase to have sufficient tread area preferably of masonry construction and equipped with handrails. The machine room door to always open outwards and only inwards if the platform is less than the full swing of the door + 600mm.

*Safe entry to machine room is a prerequisite to enable technicians, engineers, inspectors (lift, building, fire) and later, technicians to move in and out freely. In an emergency it helps to quickly set things right.*

2. **Earth leakage circuit breakers:**

Provide ELCB on main 230 V-1HP input to machine-room. This will supply the hoistway light, pit lights and car light. The ELCB helps to minimize the danger of shock to elevator users and to mechanics.

3. **Lighting/ventilation:**

Adequate lighting to carry out mechanical electrical work safely and efficiently. Adequate ventilation to keep machine room temperature...
below 40°C Faultfinding and repair work can be performed quickly to minimize inconvenience to the customer. Cool machines run more efficiently with lower failure rate.

4. Trapdoor:

The trap door must be fabricated to comfortably support the weight of persons walking over it while carrying out their normal course of work. The trap door cover should not suddenly give way when two or three persons stand on it. A poorly designed trap door may suddenly collapse endangering the lives of technicians working in the machine-room.

5. Hoisting beams/hooks:

Must have safe working load as per Indian standard of elevators.

HOISTWAY:

1. Scaffolding

A Firm, stable, and sturdy scaffolding erected in the hoistway. Technicians become more confident when they step onto strong scaffolding. Their fear of falling is greatly reduced and they can concentrate better on giving you a quality job faster.

2. Barriers

Barriers should be provided across all open entrances in the form of 3 strips at 42”, 18” and a toe board 4” in highest. An adequate barrier will save any curious passerby or technicians from accidentally walking into and falling down an un guarded hoistway-avoid chance of fatal accident.
3 Separator screen

In case there is more than one elevator in a common lift well, a separator screen should be provided between the two-elevator hoistway. This could be either of masonry construction or a wire mesh stretched between the separator beams.

Note: in case of "Fire Lift", the separator must be a masonry wall.

This minimizes the risk of any elevator component accidentally protruding into the adjacent hoistway where the other elevator is running.

4. Lighting

Properly earthed lighting arrangements to be provided in the hoistway in the form of 230v, 100w bulkhead fittings at each floor level with its switch in the machine-room. The pit light should be controlled individually be a switch accessible from ground floor entrance. The line to the midway junction box that feeds the care light should also be controlled by a switch provided in the machine-room. Visibility in the hoistway is very poor especially when landing doors are of the panel type. Emergency repairs take much longer where lighting is inadequate.

5. Ladder

A steel ladder should be provided in the pit for convenient access. The ladder must extend to at least 1' above the lowest landing as indicated in the illustration. Pit-light switch and pit stop must be accessible from entrance.

A strong ladder is required to provide safe access to the pit to work on the elevator and to carry out routine maintenance of elevator components located in the pit.
6. Water Proofing

The elevator pit well must be thoroughly water proofed. If water enters the pit well it could render the traveling cables unsafe and also cause the other equipment to rust. Water in the electrical cables can cause serious malfunctioning of the elevator and in heavy rapier bills.

7. Surrounding

In the construction stage, access to the elevator and its adjacent working areas must be safe at all times. There should be no tripping hazards, loose hanging electrical wires or dangers from any falling objects.

Accidents to technicians could prove to be fatal and lead to legal complications. Serious injuries to technicians at the erection stage could disrupt installation and job completion schedules of the elevator. Such delays are better avoided for obvious reasons.

8. Amenities

Basic Amenities like safe drinking water and reasonable toilet facilities for technicians working at site must be provided. Adequate measures to control the means of mosquitoes must also be taken. In the absence of safe drinking water, technicians are prone to fall it. Contaminated water could lead to dangerous diseases. Presence of mosquitoes may cause malaria. If adequate toilet facilities are not provided technicians may have no alternative but to use corners and niches rendering the site highly unhygienic.

2.5.9 Elevator operational features:

The number of standard operational features that would be considered luxuries on most other elevators.
Anti-Nuisance

If the load in the car is less than 3 persons and the controller detects too many pressed floor buttons for the number of passengers in the car, it cancels all the car calls. This feature helps avoid unwanted elevator operation caused by mischievously or mistakenly registered car calls.

Attendant Service

An elevator attendant can perform elevator operation by using the control buttons (UP, DOWN, NON STOP) located in the service cabinet and the floor buttons on the car-operating panel.

Automatic Fan Switch Off

The fan in the car is automatically switched off if there is no hall or car calls for a fixed period of time that can be specified by you.

Car Failure Operation (Safe Landing)

In case a car stops between floors, the controller will automatically investigate the cause of failure. And if found safe to operate, the car will be controlled to travel to the nearest landing at a slow speed. Upon arrival, the doors will automatically open.

Door Failure Operation

When the door is prevented from being closed by a foreign substance caught in the threshold groove or in a door edge, the doors automatically try to remove the substance by repeated opening and closing.
It may happen that an object is caught between the opening door and the door receptacle, preventing the doors from opening fully. In that case, after a fixed period of time, the car will travel to the next floor and the doors will automatically open.

**Double Door Operation**

If both, up and down hall calls at a certain floor are registered, and they are the last call in the car direction, the car proceeds to the floor and opens/closes the doors. After that, the car reversed its travel and opens/closes the doors again unless no car calls are registered at that floor.

**Emergency Alarm**

At the gentle press of a button located in the car-operating panel, the emergency alarm is activated.

**Hall Call Detection**

If the elevator car arrives at a floor to answer hall call and the hall buttons is kept activated for longer than a predetermined period of time, the car will not be held up at the floor, but will close its doors and proceed to respond to another call.

**Independent Service**

When the independent key switch is turned on, all registered hall calls are cancelled and the elevator responds only to car calls. No hall calls can be registered during this service.

**Load Nonstop**
When the carload exceeds 80% of the rated duty load, the elevator does not answer hall calls. When the carload becomes less than 80% of the rated load, the elevator returns to normal operation.

**Motor Overheat Protection**

If an abnormal temperature in the elevator motor is detected, the car is forced to stop at the nearest floor and open the doors. It automatically reverts to normal operation as soon as the motor has cooled.

**Moderate Incoming Traffic (MIT)** – Applicable for 3 or more car group operation

This is a group function. MIT shall be initiated whenever two fully loaded cars leave the lobby within 20 seconds. All cars shall return directly to the lobby when all their registered car calls have been answered. MIT operation shall continue for 120 seconds after the departure of the last fully loaded car.

**Moderate Outgoing Traffic (MOT)** – Applicable for 3 or more car group operation

MOT minimizes long waiting intervals above the lobby. MOT shall commence on the arrival of two fully loaded cars at the lobby within a selected time interval.

**Multi-Car group Control Operation**

A computer provided for each of the elevators in a group, monitors and controls every aspect of elevator operation on a real time basis. This microprocessor control system flexibly reacts and makes elevator dispatching decisions for optimum coverage of every floor, keeping passenger waiting time to the bar minimum.

**Nudging Door Operation (with DC operator)**

When the doors remain open for more than the fixed door open time (approximately 20 seconds), a buzzer sounds and the doors will be
closed automatically. The door-sensing device is rendered inoperative, but the door open button and the safety shoe remain operative.

**Safety Shoe Gate Switch**

The doors revert to open if the safety shoe detects an obstacle when the doors are closing.

**Separate door Times**

When the car responds to only a car call, the doors are controlled to open and close in a shorter time, say 20 seconds. On the other hand, when a car stops to respond to a hall call, a longer time can be set say 40 seconds. If the door open button is pressed when the doors are closing, the doors will remain open for a shorter time than normal, say 12-15 seconds.

**Overload Warning**

When an overload is detected the car does not start and the doors open. A buzzer is activated and the sign on the car-operating panel is lit. The elevator operation resumes only upon removal of the overload.

**Automatic Rescue Device (ARD)**

This is a battery-operated device, which comes into action in case of power failure. Within a few seconds of power failure, subject to all safeties being in position, the car is moved at slow speed to the nearest landing and the doors open.

**Electronic Door Detector**

The doors revert to open if the screen of infrared beams acting as a safety curtain across the door entrance detects an obstacle when the doors are closing.
Emergency Power Operation

In case of a power failure, standby power equipment (provided by owner) enables the elevator to return to a predetermined floor for passenger evacuation and to subsequently continue operating depending on the standby power capacity.

Fire Alarm Home Landing

When a fire-detecting device installed in the building (by owner) is activated, the elevator rushes to a predetermined emergency purpose landing for passenger evacuation. After which the elevator parks at the landing with doors open and remains inoperative.

Fireman’s service

Upon switching on the fireman’s switch in the hall of a predetermined floor, the elevator rushes to that floor for passenger evacuation. After which the elevator is ready to be used for fire fighting.

Hall Lantern & car Arrival Chime

These fixtures visually and audibly notify passengers of the arrival of an elevator in advance—two chimes in the down direction and one chime in the up direction. This facility helps visually handicapped passengers.

Home Landing

The elevator automatically returns to the predetermined home landing after the last call has been answered.

Intercom Facility
A 3-way communication facility is provided, which connects the elevator car, reception area and the machine room.

Parking Shutoff

When the parking switch is turned on, the elevator proceeds to the parking floor responding to calls on the way. On arriving at the park floor, the car fan is automatically turned off and the hall position indicator displays “PARK”. Only one parking floor can be assigned.

2.5.10 EMERGENCIES IN ELEVATORS

When you are stalled in the elevator due to power failure or breakdown...

1. Push door open button to check if the doors open.
2. Push the alarm button in the car to ring the emergency alarm.
3. Press intercom button to communicate with the lobby. Remember: You are safe inside the elevator. Do not jump out.
4. Instruction for security and people outside the elevator When the intercom receiver rings, communicate immediately with the passenger trapped inside the car. Identify the floor position where the car would have halted. Go to the nearest floor where the elevator is, let the person inside the elevator feel at ease, and tell him/her the following things

- You are absolutely safe inside the car
- The car is ventilated—you will not suffocate
- We are calling company engineers for immediate help

5. Call the elevator company office to inform that someone is trapped in the elevator.
6. The elevator company staff nearest to you will come for rescue and rectify faults if any.

TO AVOID PANIC AND INCONVENIENCE—it is advisable to install Automatic Rescue Device to assist rescue during power failure.

2.6 Profile of major Elevator companies.

2.6.1 OTIS ELEVATOR COMPANY:

OTIS Elevator Company (India) Limited is a Manufacturing and Service Company formed under the Company Act 1956 in the year 1953.

Otis is the world’s largest company in manufacture, installation and service of elevators, escalators, shuttle systems, moving walkways and other horizontal transportation systems.

Otis Elevator Company (India) Limited is a wholly owned Subsidiary company of United Technologies Company, which is one of a fortune 500 company based in USA. It has been in elevator business since over 150 years and to date operates in 200 countries all over the world.

Otis invented the world’s first safety elevator in 1853; it is Worlds No.1 Elevator and Escalator Company.

Otis the pioneer in the field of elevators has since inception been the undisputed leader in the field not only in India but worldwide.

Otis is the first elevator company in India to be certified for ISO 9001 and 9002.

Otis (I) has a dedicated workforce of over 2800 people and very modern and well-developed infrastructure facilities including a well
maintained and up-to-date Plant and R & D facilities at Mumbai and Bangalore & Service centers all over the country.

### 2.6.2 Kone Elevator Company:

Established in 1910, KONE Corporation is a global service and engineering company. Its Class B shares have been listed on the Helsinki Exchanges since 1967. With a staff of approximately 30,000, KONE Corporation consists of two business divisions: KONE Elevators & Escalators and Kone Cargo etc. Kone Elevators & Escalators sells, manufactures, installs, maintains and modernizes elevators and escalators, and services automatic building doors. Now the world's fourth largest elevator company, KONE is known worldwide as a technology leader with the most innovative products and services in the elevator and escalator industry. KONE moves people and goods in reliable, innovative, dedicated and responsible ways that adds sustainable value to customers' businesses and end-users' lives. The company guarantees local service for builders, developers, building owners, designers and architects in 800 locations in over 40 countries.

During the past 90 years, KONE has proven its ability to adapt to a changing world as well as to create new opportunities for growth. Stable management by four generations of the same family has created a strong and supportive environment for continuous development.

**Market Position**

- The global elevator and escalator market, which is worth nearly EUR 30 billion a year, consists of the sale and installation of new equipment and the maintenance, repair and modernization
of existing systems. The market for the maintenance of automatic building doors is valued at EUR five billion

- With a 10 percent market share, KONE is the world's fourth largest elevator company.
- The automatic building door service business is KONE's latest growth area

Customers

- Builders, developers, building owners, designers, and architects

Long-term targets

- Profitable growth in the service business
- Growing the modernization business
- Harmonized company, strong brand
- Prerequisites for successful acquisitions

2.6.3 TOSHIBA ELEVATOR

The markings of a good high-speed elevator system are determined not only by the quality, capabilities, reliability and safety of the elevator hardware itself, but also by the quality of group control system that optimizes the operation of multiple elevators within a building. In 1977, Toshiba became the first manufacturer in Japan to introduce a microcomputer-controlled elevator group control system. Since then, we have continued to lead the industry in the development of computer-based group controls, the latest generation of which is the Toshiba EJ-1000 Series, the core of the ultimate high-speed elevator system to meet the needs of the contemporary high-rise building.

Toshiba's Standard Elevators have been upgraded with various new technologies in order to realize even smoother riding comfort, improved cage ambience, and greater cost performance. A broad range of decor variations are available in order to blend with the individual character of each building. Operation panels are ergonomically designed for greater
ease-of-use. Helical gears and inverter controls ensure efficient, economical operation. Toshiba Standard Elevators also answer the needs of the aged and handicapped with a full variety of standard feature and optional design details. *Available only in the domestic Japan market.

In step with more active role play of the physically handicapped in society, it is a matter of course that urban facilities must be better equipped to accommodate those with physical disabilities. Toshiba offers elevator systems equipped with standard specifications for wheelchairs, as well as standard Specifications for the blind, providing a complete set of features in the landings, in the cage and in terms of safety features that make the Toshiba elevator a much safer and more amenable transport means for the physically handicapped as well as for senior citizens Observation elevators provide added character to your building. In this category again, Toshiba is a frequently selected choice. One reason, for certain, is that Toshiba offers a full selection of observation elevator designs to meet a broad variety of architectural plans. For instance, Type R is designed to enhance the panoramic viewing effect of the observation elevator. Type A places greater emphasis on the exposed contour of the elevator carriage itself. Type C is designed specifically for installation at building corners. Type B is designed to create a “show window” effect on your building facade. The Basic Type observation Elevator excels in cost-performance.

Toshiba Escalators are designed to be more than just moving passages to the users. Decades worth of experience and accumulated technology have led to the current generation of Toshiba Escalators, with their smartly streamlined designs, smooth-gliding movement, and energy-efficient operation. This know-how is further applied in an array of related products answering broad variety user needs.

Toshiba India Private Limited (TIPL), the wholly owned subsidiary of Japanese Electronic giant Toshiba Corporation, is incorporated in
India on September 2001. Toshiba had a presence in India since 1985 and was represented in India through their Liaison Office. The new company TIPL is set up to provide, marketing and sales support to all Toshiba Companies (In-house & Group Companies) to enhance their business in the territory of TIPL i.e. India, Sri Lanka, Nepal and Bhutan. Mission To facilitate the business of Toshiba 10 in-house and group companies in the territory, in accordance with Toshiba's Corporate Slogan “Committed to people, Committed to the Future” and keeping in mind that we must capture customer's potential needs and grow with our customer.

2.6.4 SCHINDLER ELEVATOR

Headquartered in Morristown, New Jersey and employing more than 6,000 people in more than 245 locations, Schindler Elevator Corporation is the North American operating entity of the Swiss-based Schindler Group, Europe's largest and the world's second largest elevator company. The company is the world's leading supplier of elevators & escalators.

Schindler designs, manufactures, installs, maintains and modernizes internal transport systems for almost every type of building requirement worldwide. The company specializes in latest-technology engineering, mechanical and micro-technology products designed and rigorously tested for comfort, efficiency and reliability.

Schindler products can be found in many well-known buildings including office buildings, airports, shopping centers/retail establishments, and specialty buildings.

Schindler - After more than 70 years in India, Schindler has been encouraged by the recent economic reforms to further expand operations by establishing a 100% owned subsidiary here. The operation is headquartered in Mumbai, with another corporate office in New Delhi, and is expanding across the country to be close to our
customers.

**Services**

Schindler India will offer customers the latest models of our world renowned range of products - technologically superior to those currently on offer in the Indian market - at affordable prices. In addition to new installations, Schindler provides full modernization and maintenance services to transform and protect existing vertical transportation, as well as safeguarding owners' investment.

**Quality**

Schindler manufacturing plants worldwide are certified by the ISO 9001 quality assurance standard.

2.6.5 Thyssenkrupp Elevator: ThyssenKrupp is one of the world's biggest technology groups. More than 184,000 employees worldwide work in the Group's main areas of steel, capital goods and services, realizing sales of more than €39 billion in fiscal 2003/2004.

Alongside product manufacturing, are increasingly concentrating on system solutions and innovative services in our five segments Steel, Automotive, Elevator, Technologies and Services. We shall continue to optimize our portfolio to ensure the long-term profitability and value of the company.

The third largest elevator company in the world is buying out ECE Industries—a BK Birla group company—in their Indian joint venture.

The JV under Thyssenkrupp ECE Elevator (TEP) was formed two years ago with a paid up capital of Rs 25.9 crore. Thyssenkrupp is buying out the equity stakes of both ECE and the resident Indian shareholders making the Indian entity a wholly owned subsidiary. The Indian entity, TEP, was formed as a vertically
integrated set up for elevators and escalators including service and repair.

ECE Industries currently holds 9 lakh shares equivalent to 9% equity stake while resident shareholders, who are nominees of Thyssenkrupp, hold another 10,000 shares of Rs 10 each. The rest (90.9%) is held by Thyssenkrupp.

2.6.6 Bharat Bijlee elevator company (BBL) a public limited company, established in 1947, is a respected name in the field of electrical & Electro mechanical products. It manufactures industrial motors, p Bharat Bijlee is demerging its elevator division, which manufactures Olympus brand of elevators. This business is to be integrated with KONE Elevators's subsidiary called Tiger Elevators India Ltd umps, lifts [under the brand name of OLYMPUS] transformers etc.

2.6.7 FUJITEC CORPORATION

Company Profile

FUJITEC was founded in February 9th, 1948 and mission is to be a manufacturer of vertical and horizontal transport systems, covering the research and development, marketing, manufacturing, installation and maintenance activities. Corporate philosophy is to contribute to the world by offering reliable elevator products and services to users. Products developed, manufactured, sold, installed and maintained by FUJITEC:

- Elevators
- Escalators
- Auto walks
City Park systems

Fujitec is an ISO-9001 certified company and the revenues in 2002 were 95,657 millions yens with an increment of +17.8% compared to 2001.

FSP Elevators Pvt. Ltd is a subsidiary of Fujitec Singapore Corporation Ltd. The parent company Fujitec Co. Ltd in Japan is a world-wide provider of people-transportation systems for 56 years. Fujitec specializes in the design, manufacture, installation and servicing of a range of people-moving systems. The products include elevators, escalators, auto walks and dumbwaiters. Our key strength is our ability to offer an innovative and integrated approach to design, production, and installation and after sales service. Company was established on May 26, 2004 in Mumbai. They also have a design center in Pune, a heartbeat away from Mumbai. Pune is a prominent hub of India boasting a rich heritage and a climate conducive to industrial activity. Home to world-class educational institutions, this city is an ideal location for high-grade design and creative work that service the whole of India.

2.6.8 Mitsubishi Elevator Asia Co., Ltd.

Mitsubishi Elevator Asia Co., Ltd. (ASIA-MEC) was established in Thailand in 1991 with 100% investment supported by Mitsubishi Electric Corporation. As is well known, the Mitsubishi Electric brand is regarded in the global market as a leader in the elevator and escalator industry, with an excellent reputation for quality and performance. To expand production capacity in this industrial sector, ASIA-MEC has been granted promotional privileges by the Board of Investment of the Thai government.

India
Mitsubishi Electric exports 200 units to India per year through its distribution foothold, a joint venture currently located in United Arab Emirates. In India where investment in buildings is brisk it contemplates distributing 1,000 units per year through joint efforts with a local company.

2.6.9 OMEGA ELEVATORS:

An ISO 9001:2000 company - Capsule / Panaromic, Auto Door, Roomless, Hospital, Carlift, Goods, Service / Dumbwaiters, Escalators height : from 2 MT. TO 13 MT. Inclination : 300, 350 up to 450 Step Width : 700 MM. TO 1200 MM.,

2.6.10 EROS ELEVATOR: take pride in the fact that before we design any new product we take the time to affirm the needs of our client. Some of our major considerations remain:

- System flexibility
- Cost effectiveness (Quality at a competitive price).
- Ease of installation.
- Reliable and efficient after sales service.

The result - a lift suited to meet the unique requirements of every application at an unsurpassed level of quality and performance.

Be it a new construction or a refurbishment of obsolete equipment, our sales staff and engineers, with their many years of experience in the complex field of vertical transportation are there to guide and appraise your exact requirements, ensuring that the equipment provided is the very best obtainable today and for years to come.

2.6.11 Kare Elevator: designing, manufacturing and installing a wide range of passenger, freight, hospital, car capsule and hydraulic elevators and designed and executed various package for transforming
old and obsolete elevators to new elevators incorporating the latest features.

2.7 After sales service:

INTRODUCTION

Today we are witnessing “Capital goods revolution”- a revolution that has brought in a large array of capital goods into the Business. This tremendous proliferation of capital goods has its own spin-offs. A large number of capital goods now need after-sales service in a way unprecedented before. This phenomenon offers opportunities and poses threats as well, to the manufacturers of a capital goods.

Customer service is the set of activities performed in a company to ensure the customers satisfaction with the company's products and services. Unfortunately, the concept of customer service has not found favor with many organizations. To quote Thomas A. Gannon-“Nothing is constant but change, and today service-that step child of sales that many once regarded as a necessary evil at best –has come into its own.”

Service should start from the time customer approaches an organization/Dealer for purchasing a product. It includes providing the customers with the necessary information to facilitate his/her choice of product and other facilities the customer would like to avail. It extends to providing the necessary backup support for installing the product and reconditioning the product system when it fails. To put it in a nutshell, service begins at the stage of processing an order and continues till the end of the life of the product.

The Indian market by its very character is not a throwaway economy. Thus, we can see a plethora of products outliving their “lives”. A number of cars, scooters and motorcycles that would have adorned a
State museum or a private enthusiast’s collection still continue to serve their happy owners! Service therefore becomes a crucial factor in determining a consumer's product preference.

After sales service has thus become a potent tool in the marketing kit of a manufacturer faced with technology and market maturity.

**After sales service and Elevator Industry**

There has been tremendous change from the traditional service network, which existed in the countries till as late as a few years back and still does in certain small towns and areas. The silent features of the traditional structure that was being followed in India in the early years of the study and still as late as mid-1990’s for the service network were as has been described earlier are:

a) There was the second rung of service providers who provided repairs but were not authorized centers. These were large repair stations specializing in certain fixed companies product.

b) Then there were the unauthorized repair service stations, small, with poor facilities.

c) There was a large duplicate market of spares and accessories. These parts were much cheaper in costs, had a decent life span and were quite close to the specification but were lacking in quality. They were priced low also because they evaded the heavy duty and tax structure, which falls on genuine spares.

d) Caused the springing up of a large number of poorly trained, staffed service provider, repairs at very low costs.

e) Since the elevator market itself was very narrow, it was welcomed and supported by a majority of customers. However the major losers were the elevator manufactures.

f) The first attempt to provide quality service, using genuine parts with standardized equipment was by Otis when they set up their authorized service centers. They ushered in an era of
computerized call handling and elevator data mining. This resulted in a small decline in the profitability of the small service provider.

These and all other combined factors characterized the service network provided to elevators. However there have been drastic changes in the type, quality and quantum of service available these days. There have been several reasons for this. Unstructured market interviews of 30 Major and small service providers have indicated that

a) The service network is a major source of a sustainable competitive advantage with a definite defense potential. In addition Quality studies carried out by Otis Elevator Company for India show service coverage as an important differentiator.

b) Service network is becoming a major factor in brand choice in India as product care and support is a part of the product purchase plan. All major elevator player is using this to establish an edge over its rivals by aggressive promotion of this capability.

c) Customers are refraining from use of duplicate parts. Fabrication of such high quality duplicates is very difficult and time consuming. In addition model rotation and scraping of old models has been fast, making duplicate fabrication difficult.

d) Increasing electronic content of elevators in the form of microprocessors and chipsets increasingly being used in elevators in India after 1997-98, that makes service by untrained and under-equipped service providers a difficult and harmful thing for the elevator. It harms elevator performance and customers refraining from it.

e) Companies are moving to total elevator care and other broad-based concepts. Making service available to every buyer easily is an important stress area for manufacturers.

f) Average down time has been reduced to about 2-5 hours for most authorized workshops for different companies. This is in
difference with a minimum down time of at least 10 hours for pre 1995 levels. This was for service and minor repair of elevators not necessitating major overhauls.

g) Higher degree of automation of service content.

h) Average costs of service have risen and various manufactures are using different service-cost configurations.

i) Higher end product manufacturers are promoting packaged deals.

As a result, firms are expanding their service network, keeping it in phase with their market and region penetration. As firms try to narrow down product differentials in terms of service provided, the customer stands to gain. Firms are spreading their network. To analyze the effectiveness of the service plan of any firm we have to analyze two or three factors. Several factors like service quality and all of its associated factors though very important have to be excluded on the premise that heavy competition among firms will attempt to narrow down this particular feature. Also it is assumed that these differentials will be reflected in other quantitative parameters

**Warranty Policy**

Buyer's from a certain level of expectation from a firm or company whose product they buy. Level of expectation depends on a whole host of factors. Fulfilling of these expectation leads to repeat purchases, better image building, and more consumer amongst other things. Companies can charge a price premium for their services. All sellers are legally responsible for fulfilling a buyer's normal or reasonable expectation. Warranties are formal statements of expected product performance by the manufacturer. Product under warranty can be returned to the manufacturer or a designated repair center for repairs, replacement or refund. Warranties, whether expressed or implied are enforceable legally. Certain companies even offer Guarantees, which are general assurances that the product can be returned if its
performance is unsatisfactory. Guarantee works best when their terms are clearly stated and there are no loopholes in the statement. Certain companies also give internal guarantee wherein one division of a company guarantees its product or service to another division. Warranties are not a new phenomenon in the Indian Elevator industry; however there has been a considerable change in their offering, coverage etc. Warranties usually serve two major purposes, firstly they enhance the appeal of the product directly to the customer and secondly by re-iterating the companies concern to service they install a greater sense of security to the customer. However in the Indian market context, warranties are more often than not a sore point in promoting buyer-seller relationship. There were several reasons for this:

a) Unprofessional attitude of Elevator companies- The tight Indian economy ensured that there were always waiting lists for Elevators hence the company’s earnings from elevator sales margins were actually never threatened. Reforms changed all that, as there was an

b) influx of companies and ideas taking competition to new heights forcing a change in the company’s attitude.

c) Free service and warranties were always given the last priority. There was no effort at customer service.

d) Due to the spread of a large number of unauthorized service providers giving quality service and being more customer oriented, service earnings formed a very low part of company’s total revenue. The lack of exclusivity in service and even stocking of genuine spare parts had an effect on customer perception.

e) There were often disagreements over coverage and extent of warranties between the owner and the company about which the owner had no redressed.

f) Attitude and Quality of service post sale were not good.
These and some other factors made the elevator manufacturers an autocratic link in the business chain, a trend distributing, yet supported by a monopolistic and restricted market structure. More than often, the time involved in the realization of warranties was enough for customers to not avail it. Hence it was generally restored to and the whole purpose of the scheme, to build up a closer customer-dealer interface was defeated. After the opening of the economy, the elevator industry saw a deep influx of funds and investments with several manufacturers setting up service centers. Competition intensity suddenly grew and brought out the importance of a favorable customer perception, firms that entered the market were not customer focused and they brought in new trends in more professional service networks. Thus elevator companies are today under tremendous pressure. Customers are exploring each and every clause of the warranty scheme and it has become a major factor in performing the manufacturer decision set. Each company lays out a warranty policy, which is binding to both the company and the customer. A company’s warranty policy generally has the following elements:

Elevator warranty – the general framework of a elevator warranty include the following:

i) Warranty – the company warrants that each new elevator sold shall be free from any defects in material and workmanship, under normal use and maintenance, subject to certain conditions.

I. Period - the warranty shall exist for a certain period of time from the date of commissioning and handover of elevator to customer.

II. Coverage – except certain condition, the service centers shall either repair or replace, any genuine parts that is acknowledged by the firm to be defective in material or workmanship within the warranty period stipulated at no cost
to the owner of the elevator for parts or labor. Such defective part becomes the property of the company.

III. Not covered – the areas not covered by the warranty, generally are

- Damage or failure resulting from.
- Negligence of proper maintenance as required
- Misuse, abuse, negligence, accident, theft, flooding or fire
- Use of improper fuel, fluids and lubricants
- Use of non-genuine parts
- Any device or accessory not supplied by the company
- Direct or indirect failures caused by misuse and improper maintenance of elevator and installation of non-company parts on the elevator
- Incidental or consequential damages including without limitation, loss of time, inconvenience, use of elevator or commercial loss
- This is generally the entire scope of an elevator part replacement guarantee given by the company and no service center or his agent or employee is authorized to extend or enlarge this warranty or make any other oral warranty. The company reserves the final decision on all warranty matters.
- Owners responsibility:
  - Proper use, maintenance and care of the elevator in accordance with company’s instructions
  - Retention of maintenance service records
  - Retention of the customer’s copy of the original repair order and the invoice or bill under which the part was replaced
- Inspection—before the customer can actually take over the elevator for beneficial use, a thorough inspection of the elevator is carried out by the company staff for last
minute changes and all observation, results are noted down on a form retained with the company people.

General format of the warranty policy of almost all the companies remains the same and any include minor coverage regarding the coverage, scope, extent etc.

**Maintenance and Service Plan**

Each Company draws up a maintenance plan for its elevators. This maintenance plan is mentioned in the owner’s manual given at the time of handover of elevator to the owner. This maintenance plan specifies the general guidelines to be adopted by the owner to help them in better maintenance. Adherence to the maintenance plan entitles the owner to the company’s warranty scheme. A maintenance plan has several elements. Important to us are

- Free service schemes- to promote better maintenance, upkeep and to guide the owner into the nuances, firms provide free service and support for safe functioning of elevators. Free service book generally provide maintenance cover for about one year. Free service provided by company's service stations.
- Periodic maintenance schedule- to ensure continued reliability and safety of the elevator, certain routine maintenance of the elevator are carried out at specific mileage intervals. The elevator owner is responsible for adhering to the maintenance schedule. Non-adherence may invalidate new elevator warranty thus adversely affecting elevator safety and durability. The company recommends that all maintenance operations except daily cleaning of elevators are entrusted to the company service engineers to ensure that the latest repair and maintenance procedures and specialized servicing tools are employed and elevator serviced by authorized service stations as general-
purpose equipments cause damage to the electronic equipment and parts. Maintenance schedule must be adhered and maintenance services performed to assure good elevator maintenance.

An analysis of these various documents have shown that there is not much change in these variables over the period of time and even in between companies various products. For the period 1987-2001, the only change that have occurred is the change in certain entries regarding the checking of elevator breakdown system and the microprocessors installed in elevator systems.

Lift industry is more than 50 years old. There are mainly two types of operators: Professionally managed companies who take up the design, manufacture and erection of lifts, offer one or two years of free service, and then enter annual maintenance contracts e.g. OTIS, BBL KNONE and ECE.

Small timers and fly-by-night operators who take up the maintenance contracts for a fraction of the rates quoted by big manufactures. Building a large maintenance portfolio is the only key to survival and profitability. It is therefore a wise strategy to strengthen the maintenance portfolio and treat it as a separate business.

Loss of a contract is a clear indication that a client is dissatisfied with our service. Dissatisfaction can adversely affect future sales of new lifts through negative word of mouth publicity; loss of contract reduces revenue generation from a route/zone without any reduction in costs, making it uneconomical; with the entry of multinationals, there is greater competition due technological advances and reputation for superior service.

From the product/company: good and smooth performance of lifts, long life of the lift, minimum breakdowns, timely service, a service partner,
and a service contract to suit budget from the service person: prompt response, neat and tidy appearance, professional approach, courteous behavior, proper communication and feedback.

To retain customers and offer better customer service elevator companies taking the following steps:

- Defining customer service as philosophy and defining means to achieve this goal
- Introduction of green card servicing checklist
- Systematic definition of servicing zones and breakdown routes
- Introduction of computerized lift maintenance system for more effective customer service
- Use of mobiles, pagers and radio trucking, phones for faster and effective communication leading to prompt attendance of breakdown calls
- Introduction of computerized material accounting for spares
- Ongoing training to sharpen technical and troubleshooting skills.

Systematic servicing of lifts to ensure timely and thorough preventive maintenance, thereby reducing the breakdown rate; prompt and polite response to customer complaints and immediate and effective resolution of the complaint; satisfied users and customers recapture lost business in lift maintenance.
2.8 References

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