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Advanced Mechanised Car Parking System

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***Abstract*: A multi-storey car park (also called a parking garage, parking structure, parking ramp, parkade or parking deck) is a building designed specifically to be for automobile parking and where there are a number of floors or levels on which parking takes place. It is essentially a stacked car park.Multi-stored car parking system is very good substitute for car parking area. Since in modern world, where space has become a very big problem and in the era of miniaturization it became a very crucial necessity to avoid the wastage of space in modern, big companies and apartments etc.**

In space where more than 100 cars need to be parked, it's a very difficult task to do and also to reduce the wastage of area and this system can be used. This mechanized Car Parking enables the parking of vehicles-floor after floor and thus reducing the space used. Here any number of cars can be park according to requirement. These makes the systems modernized and even a space-saving one.

INTRODUCTION:

Multi Stored Car Parking:

A multi-storey car park (also called a parking garage, parking structure, parking ramp, parkade or parking deck) is a building designed specifically to be for automobile parking and where there are a number of floors or levels on which parking takes place. It is essentially a stacked car park.

The term multi-storey car park is used in the United Kingdom, Hong Kong and many Commonwealth of Nations countries. In the western United States, the term *parking structure* is used especially when it is necessary to distinguish such a structure from the "garage" in a house or an automobile petrol station. In some places in North America, "parking garage" refers only to an indoor, often underground structure – outdoor multi-level parking facilities are referred to by a number of regional terms:

- ***Parking garage*** is used in the Western United States and by civil engineers;
- ***Parking deck*** is used in the Southeast
- ***Parking ramp*** is used in the upper Midwest, especially Minnesota and Wisconsin, and has been observed as far east as Buffalo, New York.
- ***Parkade*** is used in English-speaking Canada and in South Africa.

Architects and civil engineers in the USA are likely to call it a parking structure instead, since their work is all about various structures, and that term is the vernacular in some of the western United States. When attached to a high-rise of another use, it is sometimes called a parking podium. In the United States building codes use the term open parking structure to refer to a structure designed for car storage (not repair) that has enough openings in the walls that it does not need mechanical ventilation or fire sprinklers, as opposed to a "parking garage" that requires mechanical ventilation or sprinklers but does not require openings in the walls. The openings provide fresh air flow to disperse either car exhaust or fumes from a fire should one break out within the structure.

Mechanized parking system:

Minimum side openings: 50% of perimeter wallsMechanization or mechanization is providing human operators with machinery that assists them with the muscular requirements of work. It can also refer to the use of machines to replace human labor or animal labor. A step beyond mechanization is automation.

In mechanized car parking, human operator with machine assists the vehicle to park in the selected stall, if the vehicle is placed in the predefined place. Owner/driver need not search and drive the vehicle to un-known parking place.

Cars are changing every minute of the day. From new designs to functions there is always something new that comes out in the market for the consumers to take advantage of. The constant improvement of technology allows consumers additional safety, comfort, value and much more. Unfortunately most parking spaces did not evolve like the cars did. Majority

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of parking spaces around the world remain the same, just a line of paint on the ground with nothing else, but did you know that there was also a technological advancement in the field of parking?

Mechanical parking offers so much more to both the users and the owners of the parking space. For example, a mechanical park lift system can easily increase the capacity of a parking lot without much difficulty. For most places it is impossible to increase the amount of space that a parking lot takes since land itself is limited but having a mechanical park lift system means increasing the number of space available without increasing the amount of land space needed

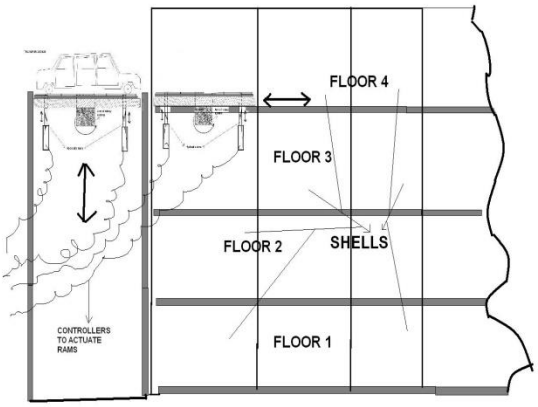
According to operation:

1) MCP with base plate and transfer device mechanism
2) MCP with hydraulic actuating mechanism

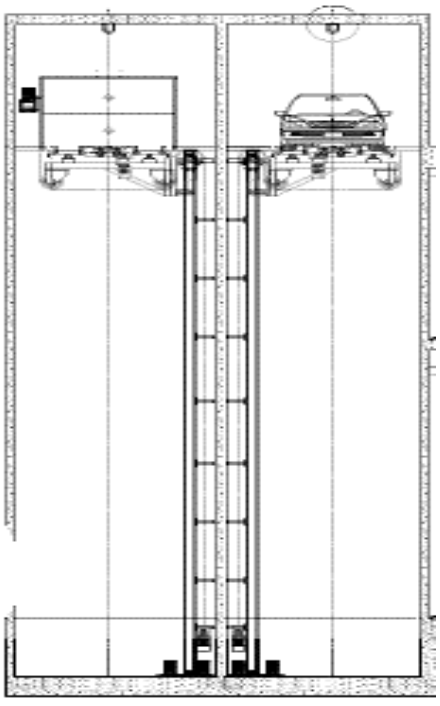
ELEMENTS OF MCP with base plate and transfer device:

Elevating System

The elevating system consists an car elevator. The elevator moves vertically in which cars are taken up and down and a '*transfer device'* on the elevator transfers the cars to the left or right.



Generally Hydraulic lifts are used to lift the vehicles, in mechanized car parking systems.



→Hydraulic elevators are classified as:

- *Conventional hydraulic elevators*. They use an underground cylinder, are quite common for low level buildings with 2-5 floors (sometimes but seldom up to 6-8 floors), and have speeds of up to 200 feet/minute (1 m/s).
- *Hole less hydraulic elevators* were developed in the 1970s, and use a pair of above ground cylinders, which makes it practical for environmentally or cost sensitive buildings with 2, 3, or 4 floors.

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- *Roped hydraulic elevators* use both above ground cylinders and a rope system, which combines the reliability of in ground hydraulic with the versatility of hole less hydraulic, even though they can serve up to 8-10 floors

Hydraulic elevators works on the principle of Pascals law. Pascal's law or **the** Principle of transmission of fluid-pressure states that "pressure exerted anywhere in a confined incompressible fluid is transmitted equally in all directions throughout the fluid such that the pressure ratio (initial difference) remains same."

$$\Delta P = \rho g(\Delta h)$$

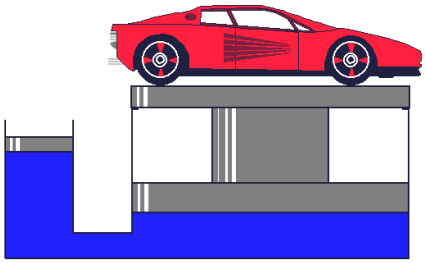
Where,

ΔP is the hydrostatic pressure (given in Pascal's in the SI system), or the difference in pressure at two points within a fluid column, due to the weight of the fluid;

ρ is the fluid density (in kilograms per cubic meter in the SI system);

g is acceleration due to gravity (normally using the sea level acceleration due to Earth's gravity in meters per second squared);

Δh is the height of fluid above the point of measurement, or the difference in elevation between the two points within the fluid column (in meters in SI).



Mini Rotary System

The mini rotary system rotates the transfer device if required and assists it to have a correct orientation. It is a very efficient system that can blend harmoniously with the surrounding. It is done by installing stepper motors.

EXPERIMENTAL WORK: (views of MCP with hydraulic actions)

Top view of the MCP with hydraulic actuations:

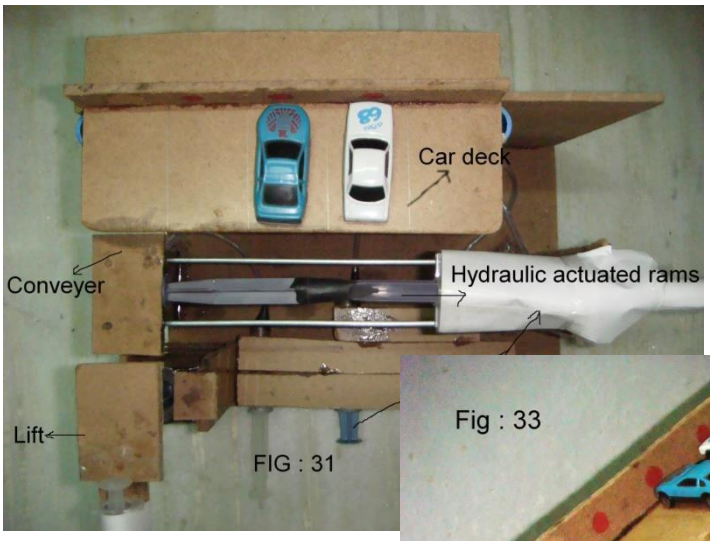


FIG : 31

Front view of the MCP with hydraulic actuations:

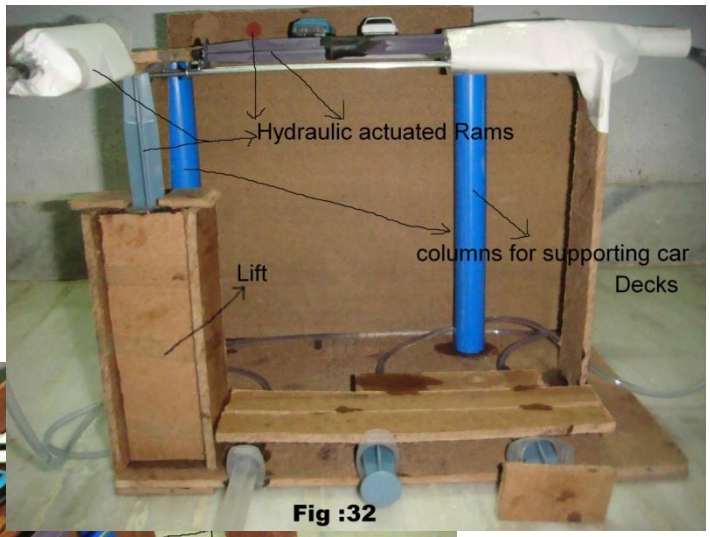
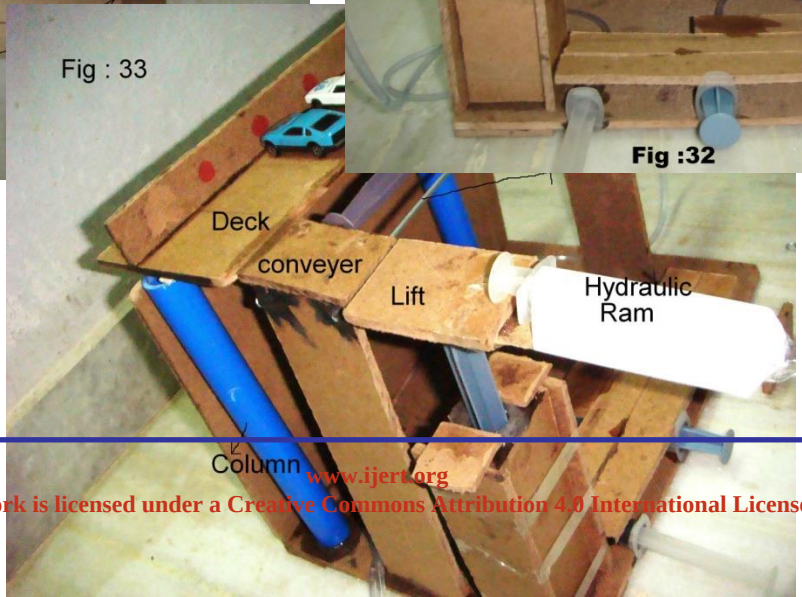


Fig :32



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NEED FOR MCP:

1) Mechanized car parking is simply economic.
Worldwide, city centers are the core of modern life, work and society. However, traffic volume has far outstripped the parking designed to handle it.

Whether for commercial or residential areas, the increasing demand for parking has brought with it infrastructure headaches for municipalities...and it frequently means lost revenue as drivers take their business elsewhere. Automatic parking systems are able to solve these core problems more economically than conventional parking garages. Quite simply, they create more parking from less space and consume fewer resources

2) Mechanized car parking is simply beautiful
As cities reinvent themselves for the future with sustainable planning and development, they keep an eye toward making their redefined landscape attractive and functional.An automatic parking system enhances the utility and beauty of a building. They offer architects and city planners more choices than just a closed facade in an existing structure. Automatic parking has advantages over conventional parking in nearly every aspect of beauty and utility. In fact, its greatest beauty is that it can often be made invisible.

3) Mechanized car parking is simply safe.
An automatic parking system protects the vehicles with clear, bright and open spaces. Unauthorized users cannot access the system and, as the vehicles are stored on racks, theft and vandalism are greatly deterred. This also contributes to the enhance quality of life of the surrounding neighborhood.

4) Mechanized car parking is simply green.
In 2007, the world's population passed a milestone: for the first time in history, more people live in cities than outside of them. By 2030, more than 60% of the world's population will live in cities.This means that cities will have to become more innovative in providing quality living and services in an ecologically sound manner. Currently, cities use more than 75% of the energy produced, and create more than 80% of the world´s greenhouse gas emissions. One way to reduce the carbon footprint of cities is by reducing the hunt for parking. An abundance of automated parking means fewer cars on the road, less congestion, and cleaner air for everyone.

Advantages of Mechanized Multi-Level Car Parking Systems (MMLCPS)
1. Optimal utilization of space: Mechanized car parking system is a method of parking and retrieving cars by using pallets and lifts. It thus removes the need for lengthy drive ways and ramps, accommodating maximum cars in minimum space.
2. Can be constructed on minimum available space: MCPS is flexible enough to solve varied parking problems. It can be sited above or below the ground or a combination of both and designed to accommodate any number of cars.
3. Lower construction cost: MLCPS are cost effective in terms of construction cost. MLCPS are delivered pre-fabricated which are assembled on site. As the system is operated automatically, added expenses of underground parking such as building structure, providing lighting and security are avoided.
4. Low maintenance and operational cost: Operating cost is low since mechanical car parking systems requires less energy to run. There is no need for energy intensive ventilating systems as the cars are not being driven inside the parking lot. Cladding can be specially selected to match the building's facade.
5. Safety of vehicle: MLCPS provide complete safety to a vehicle as parked cars are not accessible to anyone else. Damages or a dent to the car is avoided while parking through narrow drive ways.
6. Environment friendly: Environmentally, mechanized car parking has much to offer. One of the greatest benefits related to conventional underground or open space parking, is the saving of ground space. Outdoor space saved can be put to good use with gardens and landscaping or additional buildings. It also significantly reduces noise and other pollutants.

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7. Benefit to a driver: Car driving now can become a pleasant experience. Mechanical car parking systems makes parking easier and less stressful as the driver does not have to drive through the entire parking lot looking for a place to park, nor do they have to attend the car when it is parked, thus saving a lot of time. Difficulty in parking in a tight corner is also eliminated.
8. Benefit to builder: By using MLCPS, floor area and the volume of the stilt/ garage can be used much more efficiently. It reduces the space needed to park the same number of cars or allow car parking where previously there would have been no room. This in turn means more financial gains by saving precious real estate space.

FIRE SAFETY REQUIREMENTS THAT ARE APPLICABLE TO ALL THREE CATEGORIES OF FAMCP:

The fire safety requirements that are applicable to all three categories of car parks are as follows:-

a) Accessibility

Areas within the car park building shall not be accessible to the public.

b) Providing fire extinguishers

c) Means of Escape

Means of escape shall be provided where there are areas that are accessible by the public and these shall be in accordance with the requirements.

d) Separation from Other Usage

Where a separation wall or floor is required, a minimum 2-hour fire resistance rating wall or floor subject to compliance with the requirements of the elements of structure for purpose group VIII shall be provided to separate the car park from other usage.

e) External Wall

Where an external wall is required as in Cl.3.5, a minimum 1-hour fire resistance rating floor subject to compliance with the requirements of the elements of structure for purpose group VIII shall be provided.

f) Unprotected Areas in any side of a building should be avoided

g) Portable Fire Extinguisher

Extinguishers having a minimum rating of 70B, shall be provided at every entrance and exit of the car park.

h) Hose Reels

Hose reel coverage shall be provided for every entrance and exit of the car park.

i) Electrical Power Supplies

Where any such installation is required, its primary and secondary source of power supplies shall be in accordance with Chapter

j) Fire Engine access way is to be debuted.

Suggested corrosion protection systems

Surface preparation (BS 7079: Part A1)	N/A		Blast clean to Sa 2½		Blast clean to Sa 2½	
Coatings (Note 5)	Hot dip galvanize to BS EN ISO 1461 (Note 3)	85µm	Zinc rich epoxy primer High build epoxy MIO	40µm 100µm	Zinc rich epoxy primer One or two coats High build epoxy MIO	40µm 200µm
Coatings	None (Note 4)		High build epoxy MIO (Note 7)	100µm	High solid aliphatic polyurethane finish	80µm

FUTURED AUTOMATIC CAR PARKING

Automation is the use of control systems and information technologies to reduce the need for human work in the production of goods and services. In the scope of industrialization, automation is a step beyond mechanization. Whereas mechanization provided human operators with machinery to assist them with the muscular requirements of work, automation greatly decreases the need for human sensory and mental requirements as well.

The exponential upward trend in the use of cars is resulting in the need to provide a greater number of car parks. Large companies and institutions especially, have a growing need for parking facilities.

This need may be met in many cases by the use of demountable structures, to give an eminently flexible solution to the parking problem. Steel is considered to be the only practical solution that can be constructed as demountable. The car park at Luton is an example of a car park, which could be demountable with some minor modifications.

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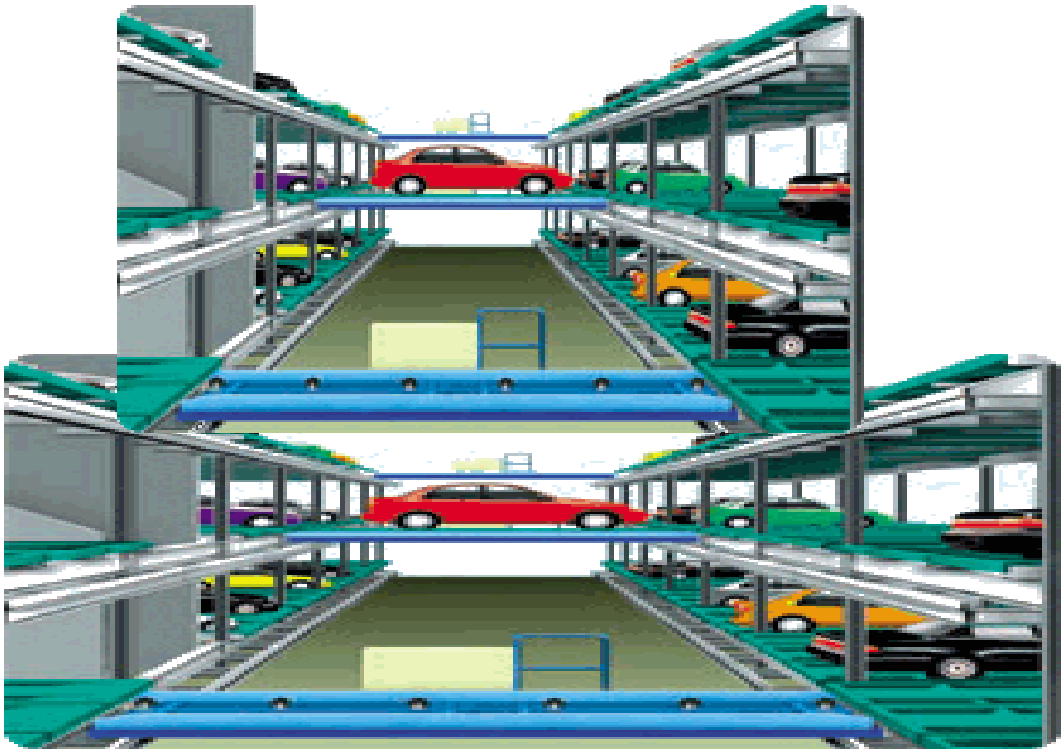
This form of car park takes half the volume of a conventional car park to store the same number of cars. This is because these steel-framed car parks do not require access ramps or roadways within the car storage area. The driver parks the cars on a robot trolley within an entrance module. From this point the trolley takes the car to an empty parking space.

When the driver wants the car back, it is retrieved by a robot trolley and returned to an exit module. Construction is simply a steel framework with cladding to match the local environment. Since this form of car park requires less energy to run, operating costs are lower than for a conventional car park. This form of car park can be built either above or below ground.



CONCLUSION:

Automatic multi-stored car parking system is very good substitute for car parking area. Since in modern world, where space has become a very big problem and in the era of miniaturization it's become a very crucial necessity to avoid the wastage of space in modern, big companies and apartments etc. Automated Car Parking System offers utmost efficiency, convenience.

And for medium stored car parking systems, mechanized car parking systems can be accommodated to reduce the economic hurdles.

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