

GOVERNMENT OF MAHARASHTRA

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CIRCULAR

Sub: Guidelines for Fire Safety of Parking Structures Provided as per the Unified Development Control & Promotion Regulations-2020 & Maharashtra Fire Prevention & Life Safety Measures Act, 2006.

With reference to above subject, meetings were held between the members of CREDAI-MCHI, PEATA & Architects in the office of the Directorate of Maharashtra Fire Service to resolve hardship faced by Developer / Builder / Architect while implementing the Unified Development Control & Promotions Regulations -2020 for providing parking within the plot, which includes one of the major point regarding the height of the Parking Structure.

2. As per Chapter 8 of the UDCPR, following provisions are given for the parking structures.

3. As per Table 8B, minimum parking space required for car parking (in residential) is 01 car for each tenements having carpet area more than 30 sq. mtr up to 40 sq. mtrs. + 5% for visitors parking. Though for various cities, different multiplying factors are there but cities like Thane, Pune etc. it is 1.00. the minimum space required for single car is 12.5 m² in common parking. Minimum size of parking space in mechanized / puzzle parking system is 13.34 m² for big cars and 10.5 m² for small cars.

4. The above space required for parking is beside the minimum marginal open space required all around the space. Mechanical / Hydraulic / Stack parking / Parking tower may be permitted at 1.5 m. in side and rear margin provided Minimum 6.0 m. drive way shall be kept clear from all kind of obstruction for easy maneuverability of fire and rescue appliances & ambulance.

5. Parking requirement as stipulated in Table-8 B and Table- 8 C of the UDCPR further recommends that parking to be provided full permissible potential of the plot even though Building permission is sought for and sanctioned for only part of the full potential. Thus, even if the parking requirement is comparatively less at the initial stage but then provisions is to be made even if project is coming at later stage, may be 5 yrs or so.

6. In National Building Code of India-2016, Part III and Part IV, following is elaborated on parking structure.

7. As per Annexure A of the Part 3 of the NBC -2016, minimum car parking requirement is 01 per tenants having residential flat of built up area for more than 200 sq. mtr in cities having population more than 1,00,000 populations. The size required for one such each car shall not be less than 13.75 m² for common parking.

8. In major cities like Mumbai, Thane, Pune, Pimpri-Chinchwad etc. car parking has been the most concern issues faced by each individual. Looking at the number of high rise building including structures like malls and multiplexes being constructed, the issue of providing car parking on the plot has become challenging for development. Though, UDCPR stipulate the norms for car parking as 01 car parking per tenement but in actual reality, every flat owner has at least 2 or 3 cars. Though, minimum provisions are met by the developer / builders for providing parking space but then if designated spots are not allocated for extra / visitors car parking, these are then either accommodated in free open space of the building or in the lanes or by lanes of the building. This, in turn however jeopardize the fire and rescue appliances movement resulting in delayed response time in case of emergency.

9. As such organization like CREDAI, NAREDCO, PAETA etc. has been requesting this office to increase the height of the car parking structure which at present for the podium is up to 30 m and for Multi-Level Car Parking (MLCP) is 45 m. already, the basement line has been extended up to 1.5 m till plot boundary on all side except front side which is up to 4.5 m. With latest development in Mechanized Parking i.e. Mechanical / Hydraulic / Stack Parking / Parking Tower where there is no man-movement but automatically cars are parked with software management system, such parking height may be increased.

10. In order to resolve the issue of parking in urban local bodies area, some solution needs to be derived so that cars can be parked safely without being obstacle to fire fighting and rescue operation or risk been to fire fighters as well as to the occupants of the building.

11. Considering the above difficulties, following guidelines are issued by this Directorate for fire safety of car parking areas.

a. Parking provisions can either be made in a building as under:-

- i) Basement Car Parking
- ii) Stilt Car Parking
- iii) Podium Car Parking
- iv) Multi-Level Car Parking Building (Standalone structure)
- v) Mechanical Parking Tower (standalone Steel Structure or attached to the dead wall of the building – RCC or in the basement)

b. The parking can either be

- i) Surface Car Parking.
- ii) Stacked Car Parking (not in mandatory marginal open space).
- iii) Automated / Mechanical Car Parking in stilt, on dead wall of the building

c. Parking arrangement can be done as per following provisions:-

- i) **Parking in Basement** – as per the provisions made applicable in UDCPR-2020
- ii) **Parking in Stilt Level** – as per the provisions made applicable in UDCPR -2020
- iii) **Parking in Podium Level** as per the provisions made applicable in the UDCPR -2020 and permissible up to height of 30 m
- iv) **Multi-level Car Parking** in independent parking structure up to 45 m
- v) **Parking in Mechanized Tower** – which can either be standalone steel structure or adjacent to building on the dead wall. When it is standalone steel structure mechanized car parking, then such structure shall not be permissible above 100m, when it is adjacent to building / RCC structure attached to the dead wall, such structure can be permissible up to height permissible for the building as per Clause 6.10.1 of the UDCPR-2020 subject to maximum of 100 mtrs. in Municipal Corporation area or height of the building approved for the building in the said premise.

Following fire safety challenges can be faced while dealing with car parking structures

Fire and Smoke Spread

Vehicles are located in close proximity both horizontally and vertically, with a high potential for rapid fire spread.

Often the entire car stacked portion of the building is a single fire compartment containing a large number of vehicles (very high fire load).

Potential risk for total smoke filled compartment, limiting ability for access and intervention in case of fire emergency leading to extensive property damage.

Considered to be a challenging environment for fire services operations due to excessive heat, smoke and access difficulties.

Car stacking spaces may be totally or partially installed below ground, leading to severe smoke logging and access issues, and leading to hazardous condition to firefighters.

Very difficult to access vehicle bonnets/boots and other enclosed spaces for fire extinguishment and hazard isolations or removals. (e.g. LPG / CNG cylinders, battery, etc.)

Where electric vehicles are to be accommodated in a car stacker system, particularly in systems which enable charging, particular consideration must be given to the specific behaviour and hazards associated with electric vehicle fires. The design operational duration of various fire safety systems and/or additional fire safety provisions may be required. The charging facility for electric cars shall be provided in ventilated area.

The hazard associated with parking of vehicles, structures, nature of fuels etc. and guidelines are formulated keeping in view all potential fire risk as described below.

1. A vehicle fire shall be limited to that particular vehicle to limit the impact on the surrounding structure by:-

- a. Assess car parking potential fire size, given that single vehicle in the order of 5-8 MW peak heat release rate;
- b. Review bounding and fire resistance of the construction and potential to contain heat and smoke in the structure;
- c. Automatic fire suppression best solution;
- d. Automatic fire sprinklers most commonly applied, however, other systems may suit specific enclosure geometries.

2. A vehicle fire can generally be safely extinguished by firefighters through:-

- a. Providing means of safe access;
- b. Adequate ventilation and smoke hazard management;
- c. Provision of a fire hydrant system (internal/external as required);
- d. Readily accessible and identifiable sprinkler control and boosting facilities.

3. The presence of electric vehicles within a car stacker require particular and specific design consideration to address the potential associated fire and explosion hazards. (same also elaborated in Annexure A attached with these guidelines)

To bring clarity among Architect/ Developers and Regulators of the buildings these fire safety guidelines are issued for various types of onsite car parking structures on the plot. These guidelines are enclosed as Annexure A with this circular.

This is for information and implementation for better fire safety of car parking areas.

(S S Warick)

Director
Maharashtra Fire Services.

Copy submitted to the Principal Secretary (1), Urban Development Deptt., Mantralaya for favour of information, please.

Copy submitted to the Principal Secretary (2), Urban Development Deptt., Mantralaya for favour of information, please.

Copy to:

1. CREDAI
2. PAETA
3. All Chief Fire Officers, Municipal Corporations & Special Planning Authorities in Maharashtra.

ANNEXURE – A

GUIDELINES FOR VARIOUS STRUCTURES USED AS CAR PARKING

FIRE PROTECTION & FIRE FIGHTING REQUIREMENTS

1. GENERAL

- a) Where both parking and repair operations are conducted in the same building, the entire building shall comply with the requirements for Group H occupancies as per National Building Code of India -2016, Part 4, unless the parking and repair sections are effectively separated by separation walls of 120 min.
- b) Floor surfaces shall be non-combustible, sloping towards drains to remove accumulation of water.
- c) Those parts of parking structures located within, immediately above or below, attached to, or less than 3 m away from a building used for any other purpose shall be separated by fire resistant walls and floors having fire resistance rating of not less than 120 min. This shall exclude those incidental spaces which are occupied by cashier, attendant booth or those spaces used for toilets, with a total area not exceeding 200 m².
- d) Vehicle ramps shall not be considered as exits unless pedestrian facilities are provided.
- e) Other occupancies like fuel dispensing, shall not be allowed in the building. Car repair facilities, if provided, shall be separated by 120 min fire resistant construction. In addition to fire protection requirements as per Table 7 of NBC-2016, Part 4, appropriate fire detection and suppressions systems shall be provided for the protection of hydraulic oil tank and pumps located below ground level for operation of car lifts.
- g) Means of egress shall meet the requirements specified in Life Safety Measure recommended in Part 4 of NBC-2016.
- h) Achieving complying sprinkler coverage and minimising obstruction of spray patterns is difficult to achieve within a car stacker space and consideration needs to be given to location of sprinkler heads, water shielding and utilisation of side wall heads where appropriate.
- i) Charging of electrical vehicles shall not be provided in basement / on upper levels of automated car parking facility.

2. OPEN PARKING STRUCTURES (INCLUDING MULTI-LEVEL CAR PARKING (MLCP) AND STILT PARKING)

These include parking arrangement provided inside the building and may be Stilt, Podium below any building. Such structure shall only be permitted up to 30 m height. Multilevel Car Parking shall be permitted up to 45 m height

- a) The term open parking structure specifies the degree to which the structure's exterior walls must have openings. Parking structures that meet the definition of the

term open parking structure provide sufficient area in exterior walls to vent the products of combustion to a greater degree than an enclosed parking structure.

b) A parking structure having each parking level wall openings open to the atmosphere, for an area of not less than 0.4 m² for each linear meter of its exterior perimeter shall be constructed as open parking structure. Such openings shall be distributed over 40 percent of the building perimeter or uniformly over two opposite sides. Interior wall lines shall be at least 20 percent open, with openings distributed to provide ventilation, else, the structure shall be deemed as enclosed parking structures.

NOTE: A car park located at the stilt level of a building (not open to sky) can be considered an open or an unenclosed car park if any part of the car park is within 30 m of a permanent natural ventilation opening and any one of the following is complied with towards the permanent natural ventilation requirement:

i) 50 percent of the car park perimeter shall be open to permanent natural ventilation.

ii) At least 75 percent of the car park perimeter is having the 50 percent natural ventilation opening.

c) All stilt / podium parking is required to be provided with sprinkler system in accordance to Indian Standard IS:15105 Design & Installation of Fixed Automatic Sprinkler Fire Extinguishing System. However, IS:15105 does not cover Car Stackers. For Stacked Car parking, Sprinkler System with K factor of 115, Quick Response Sprinkler designed to operate at 1 bar, delivering 12.2 LPM/Sq. mtrs. minimum pressure over 260 Sq. mtrs. shall be considered. Every Vehicle shall be protected with a minimum of 2 Sprinklers one above the Bonnet and one above the rear boot. Sprinkler coverage shall not exceed 3mtr x 2.4 mtrs. – 7.2 Sq.mt. One dedicated Riser shall be required for every 24 mtrs., to facilitate Isolation and maintenance. Area of Operation shall be less than 260 Sq. mtrs.

d) Open parking structures are not required to be provided with compartmentation.

e) Open car parking (open to sky) within building complex having fire hydrant system shall also need to be protected with yard hydrant installation system in accordance to IS:13039.

A. SURFACE CAR PARKING

- i. Horizontal car parking shall be permitted in an open space on ground as shown on the plan.
- ii. Drainage of the car parking area of all the level shall be laid independent from that of the building and it shall be provided with catch pit before connecting the building drainage or city drainage.
- iii. Drainage of the car park areas shall be so laid as to prevent any overflow in staircase, lift shaft etc.
- iv. The parking area shall not be used for dwelling purpose and repairing / maintenance of vehicles, storage, trade activity etc. at any time.
- v. Dwelling, use of naked light / flame, repairing / maintenance of vehicles shall be strictly prohibited in the parking areas.

- vi. The drive ways shall be properly marked & maintained unobstructed.
- vii. Appropriately illuminated signage's for escape route shall be provided at prominent locations.

B. Open Parking Structures.

Open parking structures shall be of Type I or Type II construction as defined in Table 1 of Part 4 of NBC 2016, in Types of Building Construction. Type of construction based on fire rating is given in Table 1 of Part 4 of NBC 2016.

Hazards

Lighting and Power.

Electric wiring for light, power, heat, and signal or control circuits and for electrically operated tools, portable appliances, and devices shall be in accordance with the provisions of NBC 2016 and relevant Indian standards recommended there under.

Areas where flammable liquids are stored, handled, or dispensed shall be delineated and classified for the installation of electrical equipment in accordance with Oil Industry Safety Directorate, Guidelines.

C. PODIUM / CAR PARKING FLOORS: (M.L.C.P.)

- i. The driveways shall be properly marked and maintained unobstructed, proper illuminated signage shall be provided for escape route, ramps etc. at prominent location.
- ii. After a 40 m length of continuous ramp, a flat surface of minimum 6.0 m length shall preferably be provided (Ref Annexure B - Fig. - 01).
- iii. If podium is accessible to fire tender, minimum 7.5 m wide ramp shall be required for fire engine access with maximum slope of 1 in 10.
- iv. For buildings having floor area less than 10 000 m², fire tenders shall have access to at least one-third of the perimeter of building which shall be minimum 6.0 m wide and having 9.0 m turning radius. The refuge area shall be proposed in the fire tender access area.
- v. For buildings having floor area more than 10,000 m², fire engine shall have an access to at least to half of the perimeter of building which shall be minimum 6.0 m wide and having 9.0 m turning radius. (Ref. Annexure B - Fig. - 02). The refuge area shall be proposed in the fire tender access area.
- vi. If more than one building is proposed on a podium than each building shall have access by the fire tender on at least / minimum one side, the refuge area shall be proposed in the fire tender access area. (Ref. Annexure B - fig -03)
- vii. If podium is not accessible by fire tender, the podium may be such that it is not extended beyond the building footprint to an extent more than 11.0 m on the side where fire tender access is provided (Ref Annexure B - Fig. 03). Such restriction shall not apply in case podium is accessible by fire engine.
- viii. Car parking shall be provided at parking level. Podium parking floor shall not be enclosed except for parapet walls not more than 1.20 mtrs. height.

- ix. Ventilation cut outs /mechanical ventilation shall be provided at each podium levels having area more than 20,000 sq.m.
- x. Minimum 75% see through opening area of proposed peripheral area shall be provided.
- xi. The fin with material such as alco bond / fibre / aluminium sheets / FRP plastics / wooden panels shall not be provided.
- xii. The fins with RCC, brick work, hollow blocks or any such construction materials shall be permitted.
- xiii. Drainage of car parking areas shall be so laid as to prevent any overflow in staircase/lift lobby.
- xiv. Appropriate illuminated signage's for escape routes shall be provided at prominent locations.
- xv. Automatic sprinkler system for each podium floor car parking area of the podium floor shall be provided.
- xvi. However IS15105 does not cover Car Stackers. For Stacked Car parking, Sprinkler System with K 115, Quick Response Sprinkler designed to operate at 1 bar, delivering 12.2 LPM/Sq. mtrs. minimum pressure over 260 Sq. mtrs. shall be considered. Every Vehicle shall be protected with a minimum of 2 Sprinklers one above the Bonnet and one above the rear boot. Sprinkler coverage shall not exceed 3mtr x 2.4 mtr – 7.2 Sq.mt. One dedicated Riser shall be required for every 24 mtr, to facilitate Isolation and maintenance. Area of Operation shall be less than 260 Sq.mtr.3.

3. ENCLOSED PARKING STRUCTURES

- a) Those car parking structures which are enclosed on all sides and on top, not falling within the definition of open car parking [see 2(B) above] and also those situated in the basements shall be known as enclosed car parking structures.
- b) All sprinklers in car parking shall be standard response type with minimum coverage of 9 m² and designed as per IS 15105
- c) For basement car parking, compartmentation can be achieved, with fire barrier or with water curtain nozzle (K-23) or with combination thereof. Automatic deluge system comprising deluge valve, piping, nozzles, etc. shall be used to zone the compartment in case of water curtain system. In case of water curtain, existing water storage shall be supplemented by water demand for water curtain nozzles for 60 min considering the largest compartment's perimeter out of all compartments of car parking in any of the basements.
- d) The water curtain shall be operated by the actuation of flow switch actuating sprinkler system.
- e) For smoke ventilation requirement of car parking, see clause 4.6.2 of NBC-2016-Part 4
- f) All fire exit doors from the car parking to exits shall be painted green/ red and shall display exit signage.

4. FULLY AUTOMATED MECHANIZED CAR PARKING (FAMCP) UTILIZING MECHANICAL OR COMPUTERIZED / ROBOTIC MEANS.

These structures are fully automated car parking structure where an owner drives the car in designated slot in the automated parking structure and once the person is out of the car, the car is parked automatically based on computerized robotic means.

These structures can be standalone steel structure (MS Steel with 2 hrs. Fire Rated Spray Coating for Stability & Integrity) or attached to the dead wall of the building - RCC structure. Standalone structure or structures attached to the dead wall of the building, shall be as up to height permissible for the building as per Clause 6.10.1 of the UDCPR-2020 subject to maximum of 100 mtrs. in Corporation area or height of the building approved for the aforesaid project in the said premise

- a) Automated car parking structure can be of open parking type or enclosed types.
- b) Automated car parking facilities pose more hazard compared to manual parking due to following reasons:
 - 1) High density of cars due to close stacking- one over another.
 - 2) Lack of provision on fire separation/ compartmentation-horizontal or vertical leading to rapid fire spread.
 - 3) Non-availability of any person to notice/ control the fire in initial stages.
 - 4) Limited access to firefighting personnel.
 - 5) Extensive height and depth involved with highly combustible load.
- c) Fire escape staircases, at least 1 250 mm wide shall be provided at appropriate locations so that no place is more than 45 m from the nearest staircase. (access from regular staircase is also permissible). Horizontal walkways, at least 1 000 mm wide for access to all the areas shall be provided at every parking level. (this should be given only if the length of parking structure is more than 45 m.)
- d) Travel distance and means of egress shall be governed as per National Building Code of India -2016, Part 4.
- e) The hazardous areas like DG sets, transformers, HT/LT panels for the parking lot shall be suitably segregated from other areas as per requirements given in this Code and all such areas shall be protected by suitable automatic fire suppressions systems.

Note: refer Annexure C for some option for layout of FAMCP

Additional Special Safety Requirements for Fully Automated Parking Systems

In case of fully automatic Systems, there shall be a separate maintenance / service door (on all floors) in addition to the main door at ground level. This door must open only from the outside by authorized persons with a key. A provision should be made to open the door from inside without a key. Maintenance doors must not open inwards into the working area and must be self-closing. When this maintenance door is opened, the parking equipment should be automatically stopped by a safety switch or other equivalent device. In such circumstances, restarting of the automatic parking equipment shall only be possible when the service door is closed and shall be allowed to operate only by authorized personal.

In order to avoid accidents due to the change from manual to automatic control or vice versa, the parking system shall be provided with one or more key-operated mode selector switches which shall be mutually interlocked or alternative means providing the same level of safety.

Beside this, following guidelines shall also be followed for Enclosed / Mechanized Car Parking

General Requirements.

- a. Parking structures shall be built using non-combustible material having fire resistance of at least two hours. Please refer clause 3.3 i.e. Type of Construction of Part 4 of NBC 2016 and conforming to IS 3808 Method of test for non-combustibility of building materials. IS 3809 Fire Resistance Test of structure. IS 1642 Code of practice for safety of buildings (general) Details of construction.
- b. The cuboid of such mechanized car parking shall not be more than 12,000 m³
- c. Those parts of parking structures located within, immediately below, attached to, or less than 3.0 m from a building used for any other purpose shall be separated by walls, partitions, floors, or floor-ceiling assemblies having a fire resistance rating of not less than 2 hours.
- d. Those portions of an open parking structure located within or immediately below a building used for another purpose shall have the principal supporting members and bearing walls in all levels of the parking structure protected to provide a fire-resistive rating equivalent to that required for the other occupancy.
- e. All the structural steel members of the car parking tower / block i.e. columns, beams, external cladding with coated steel sheets etc. shall be protected with the fire resisting / retardant materials and methods as stipulated under relevant I.S. specification.
- f. Each car shall be parked on non-perforated steel pallets, to prevent spread of fire from one level to next level. This is to minimize direct impingement of flame to the car in the upper deck and also to prevent dripping of any possible leaking fuel to the lower deck.

- g. The car parking block has door at the bottom and louvered opening at the top to create natural drafts, to prevent spreading of fire. In absence of natural ventilation, parking blocks shall be provided with mechanized ventilation
- h. The electrical cables used internally shall be fire retardant, and heat resistant of 105 degree centigrade.
- i. Emergency Stop switch shall be installed inside the auto parking system, at the top of the tower, near the driving unit, outside the tower on operation panel & on the main control panel for activation in case of any emergency, for the power cut off to the main motor and all operations to stop.
- j. Stopper shall be installed on each pallet for the maximum position to which the car can be driven onto the pallet.
- k. Lamps indicating whether system is ready to accept the car shall be installed at the entry point of the car.
- l. Fire detectors to be installed.
- m. Elements of the stacked car parking structure shall have 1 hr. fire resistance.
- n. Each car parking deck shall have 1 hr fire resistance.
- o. Parking area shall be accessible by trained staff when carrying out the maintenance work.
- p. The Parking system is to be ceased during the maintenance operation.
- q. Stack car parking shall be protected with Automatic sprinkler system.
- r. Stack car parking shall be protected with Automatic sprinkler system/ Medium velocity water spray projector.
- s. Water spray projector system conforming to the standards laid down relevant I.S. specification shall be provided covering each level of car parking.
- t. Wet riser of internal diameter of 10 cms. G.I. 'C' class pipe shall be provided on external platform on alternate level with hydrant outlet and connected to the fire service outlet on the external face of the building directly fronting the courtyards shall be provided to connect the mobile pump of the fire service to the wet riser.
- u. The car engine shall be shut off at ground level before parking at higher level.
- v. Only trained operator certified by company installing car tower shall operate automatic car parking.
- w. The said mechanized car parking tower will be segregated from the attached building by 2hrs. fire resistant wall.

Internal Subdivision.

Offices or other similar spaces that are related to the operation of the parking structure and are less than 300 m² in area shall be separated from parking areas by walls or partitions that resist the passage of smoke.

Floor surfaces shall be of non-combustible material.

Asphalt shall be permitted on grade.

Floors shall be graded and equipped with drains.

Openings in Fire Walls and Fire Partitions.

Doorways and other openings in fire walls and fire partitions shall be protected with approved fire doors installed in accordance with Indian Standards 3808 Method of test for non-combustibility of building materials and IS 3809 for fire Resistance Test of Surface for Fire Doors and Fire Windows.

Where ducts pass through fire walls or fire partitions, the openings shall be protected in accordance with Indian Standard 12458 Method of test for fire resistance test for fire stops and IS 3614 – Part -1 Specification for fire check doors Part – 1 Plate, metal covers and rolling type for the Installation of Air Conditioning and Ventilating Systems.

Vertical Openings in Enclosed Parking Structures.

Vertical openings through floors in buildings four stories or more in height shall be enclosed with walls or partitions having a fire resistance rating of not less than 2 hours. For buildings less than four stories, such walls or partitions shall have a fire resistance rating of not less than 1 hour.

Exception: Ramps in enclosed parking structures, shall not be required to be enclosed if either of the following safeguards are provided:

- (a) An automatic sprinkler system should be provided for the entire parking structure.
- (b) An automatic fire detection system should be installed throughout the parking structure using detectors sensing products of combustion.

Fire Protection

1. Automatic Sprinkler Systems confirming to IS 15105 should be installed.
2. Installation of Fire Hydrant and hose reel hose as per IS 3844.
3. Smoke detection and fire alarm system as per IS 11360.
4. Fire alarm systems, where required, shall conform with IS 2189.

Automatic Fire Sprinklers

Automatic fire sprinkler systems are expected to form an integral part of car parking system where fire protection systems are concern.

Achieving complying sprinkler coverage and minimizing obstruction of spray patterns is difficult to achieve within a car stacker space and consideration needs to be given to location of sprinkler heads, water shielding and utilization of side wall heads where appropriate.

IS 15105 shall be followed for the installation of the automatic sprinkler system for protection to each car parking in the bay, at roof level as well as intermediate sprinklers within the car parking.

The function of sprinkler protection is to limit the maximum fire size, reduce temperatures and thus the impact of fire exposure to structural steel members and other load bearing parts.

The sprinkler control valve should be located adjacent the main loading bay entry point or the primary entry point for fire service access to the car parking. This control valve will serve the car parking installation only, be clearly labelled and shall have boosting provisions.

Note: refer Annexure D for sprinkler systems of FAMCP

Maintenance and Supervision of Fire Detection and Fire-Extinguishing Systems.

Where an automatic fire alarm or automatic fire-suppression system is installed as per code, the system shall be supervised adequately to ensure reliable operation in case of emergency.

The extinguishing or alarm system shall be electrically connected, either directly or through a central station facility or by another approved method, to the fire department legally committed to serve the area where the building is located. System actuation shall initiate the alarm sequence as well as smoke management system.

Where a system might become inoperable due to closing of valves, interruption of power, or other reasons, adequate supervision shall be provided to sound at least a local trouble alarm when the system is disabled.

Where building fire alarm facilities are provided, actuation of the fire detection or fire extinguishing system shall cause the building alarm to sound.

Every automatic fire alarm or fire extinguishing system provided shall be continuously maintained in reliable operating condition at all times.

Automatic fire sprinkler systems and hydrant systems shall be inspected, tested, and maintained in accordance with relevant Indian Standards as mention above for the Installation, Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.

Ring Hydrant System around the Parking Building

The ring hydrant system shall be provided around the building for external firefighting of the building in case of fire emergency. Water Monitors should be provided diagonally apposite to each other around the parking building.

Automatic Smoke Exhaust

Due to the risk posed from smoke filling of large compartments with respect to firefighter internal access it is expected that mechanical smoke exhaust will be provided where reliance upon natural ventilation is deemed to be insufficient or ineffective.

The extent of open façade and type of louvers/mesh paneling (where provided) shall be taken into consideration when assessing firefighter access provisions.

The smoke exhaust fans may be activated off the detection system or, where deemed appropriate, off the sprinkler pressure switch signal.

Manual controls of any installed mechanical exhaust shall be provided at the main car parking entry point and/or on the fire indicator panel as appropriate.

Make-up air provisions will need to be carefully assessed with respect to below ground installations and the extent of openings in the building façade.

Ventilation.

The Mechanical Ventilation for Parking Tower shall be provided confirming to National Building Code, Part-8, Building Services, Section-3, Mechanical Ventilation.

The Lightning Protection for Parking Tower shall be provided confirming to National Building Code, Part-8, Building Services, Section – 2, Electrical installation. As per IS 2309 Code of practice for protection of building and allied structures against lightning.

ELECTRIC VEHICLES

Electric vehicles are a relatively recent and rapidly growing market for passenger vehicles. The lithium-ion battery systems are typically found in the floor pan of the vehicles, comprising thousands of individual cylindrical lithium-ion battery cells, and presenting a very high-density fuel source. Lithium-ion batteries typically ignite due to a chemical reaction referred to as thermal runaway. The challenge with these types of battery fires is that they continue to burn until the compounds contributing to the chemical reaction are exhausted and these fires cannot simply be extinguished by “usual” means.

There is also a high risk of explosion during these reactions, which occur unpredictably. As these battery systems are made up of many individual battery cells, once the system starts to burn and break apart, individual burning cells can be ejected from the floor pan of the vehicle, starting fires elsewhere.

On top of the prolonged fire and explosion risks, the reactions involved produce a variety of toxic gasses, such as hydrogen fluoride, which present a significant risk to firefighters and others in the vicinity of the resultant smoke products. Some of the toxic gasses (e.g. hydrogen fluoride) can be water soluble, meaning that any fire water runoff also becomes contaminated and must be managed.

Internationally, electric vehicle fires are proving to be challenging to extinguish. Recommended firefighting response is for the application of very large amounts of water directly to the outside of the battery pack, potentially for several hours.

This Directorate is aware of automated mechanized car parking system manufacturers that are developing their systems to incorporate the ability to connect and charge electric vehicles when stored in the car parking system. Given the challenges and prolonged nature of electric vehicle fires, there is significant concern around the resultant impacts on the surrounding building structure as well as the ability of the installed firefighting systems to operate for the likely duration of an electric vehicle fire. Thus, this Directorate discourages such charging system in the mechanized car parking system.

If at all, such charging provisions are made, then this Directorate feels that additional assessments and fire safety provisions not detailed in this Guideline be included in buildings where the storage and/or charging of electric vehicles is reasonably anticipated to occur.

But as of now, no Electric Vehicle charging point/station shall be allowed in the Automated car parking tower, Puzzle car parking and basement car parking.

Instruction.

Employees of all parking structures shall be instructed with respect to the importance of transmitting fire alarms promptly and shall be trained in the use of available private fire-fighting equipment.

Housekeeping.

To eliminate fire hazards, good housekeeping, both inside and outside the building, shall be strictly maintained by the occupants and/or the owner of the building. Daily inspections of the parking structure shall be made for the removal or repair of any hazardous condition. Equipment and safety devices shall be maintained, and hazardous accumulations of combustible material shall be removed from the structure.

Clear aisle space shall be maintained to permit ready access to, make use of, fire-fighting equipment.

Metal dustbins with self-closing covers shall be provided for the storage or disposal of oil-soaked waste or cloths. Covered metal containers shall be used for combustible trash. Floors shall be kept clean and free of oil and grease.

5. BASEMENTS :

a. Where basement is used for car parking and also there is direct approach from any occupancy above to the basement, door openings leading to the basement shall need to be protected with fire doors with 120 min fire rating, except for exit discharge doors from the basements.

b. Each basement shall be separately ventilated. Vents with cross-sectional area (aggregate) not less than 2.5 percent of the floor area spread evenly round the perimeter of the basement shall be provided in the form of grills, or breakable stall board lights or pavement lights or by way of shafts.

Alternatively, a system of mechanical ventilation system may be provided with following requirements:

i. Mechanical ventilation system shall be designed to permit 12 air changes per hour in case of fire or distress call. However, for normal operation, air changes schedule shall be as given in Part 8 Building Services, Section 3 Air conditioning, Heating and Mechanical Ventilation. of the National Building Code-2016.

ii. In multi-level basements, independent air intake and smoke exhaust shafts (masonry or reinforced concrete) for respective basement levels and compartments therein shall be planned with its make-up air and exhaust air fans located on the respective level and in the respective compartment. Alternatively, in multi-level basements, common intake masonry (or reinforced cement concrete) shaft may serve respective compartments aligned at all basement levels. Similarly, common smoke exhaust/outlet masonry (or reinforced cement concrete) shafts may also be planned to serve such compartments at all basement levels. All supply air and exhaust air fans on respective levels shall be installed in fire resisting room of 120 min. Exhaust fans at the respective levels shall be provided with back draft damper connection to the common smoke exhaust shaft ensuring complete isolation and compartmentation of floor isolation to eliminate spread of fire and smoke to the other compartments/floors.

c) Due consideration shall be taken for ensuring proper drainage of such shafts to avoid insanitation condition. Inlets and extracts may be terminated at ground level with stall board or pavement lights as before. Stall board and pavement lights should be in positions easily accessible to the fire brigade and clearly marked "AIR INLET" or "SMOKE OUTLET" with an indication of area served at or near the opening.

d) Smoke from any fire in the basement shall not obstruct any exit serving the ground and upper floors of the building.

e) The smoke exhaust fans in the mechanical ventilation system shall be fire rated, that is, 250°C for 120 min.

f) The smoke ventilation of the basement car parking areas shall be through provision of supply and exhaust air ducts duly installed with its supports and connected to supply air and exhaust fans. Alternatively, a system of impulse fans (jet fans) may be used for meeting the requirement of smoke ventilation complying with the following:

1) Structural aspects of beams and other down stands/services shall be taken care of in the planning and provision of the jet fans.

2) Fans shall be fire rated, that is, 250°C for 120 min.

3) Fans shall be adequately supported to enable operations for the duration as above.

4) Power supply panels for the fans shall be located in fire safe zone to ensure continuity of power supply.

5) Power supply cabling shall meet circuit integrity requirement in accordance to IS - 16246 : 2015 Elastomer insulated cables with limited circuit Integrity when affected by fire .

g) The smoke extraction system shall operate on actuation of flow switch actuation of sprinkler system. In addition, a local and/or remote manual start-stop control/switch. shall be provided for operations by the fire fighters.

h) Visual indication of the operation status of the fans shall also be provided with the remote control.

i) No system relating to smoke ventilation shall be allowed to interface or cross the transformer area, electrical switchboard, electrical rooms or exits.

Smoke exhaust system having make-up air and exhaust air system for areas other than car parking shall be required for common areas and exit access corridor in basements/underground structures and shall be completely separate and independent of car parking areas and other mechanical areas.

j) Supply air shall not be less than 5 m from any exhaust discharge openings.

h) The staircases of the basement shall be of enclosed type and entry to basement areas shall be through two hours fire resistance self-closing door provided in the enclosed wall of the staircase and through smoke check / cut off lobby. The smoke check / cut off lobby shall be mechanically pressurized.

- i) The ducts of the mechanical ventilations system shall be of substantial metal gauge as per the relevant I.S. standard.
- j) The operating switches of the mechanical ventilation shall be located in the control room with appropriate zonal indications.
- k) Exhaust duct shall be provided to draw out exhaust at ground level of the basement.
- l) The certificate of approval for entire mechanical ventilation systems in the entire building issued shall be produced at the time of obtaining compliance of fire safety requirements by this department.
- m) Automatic sprinkler system shall be provided in entire basement. All sprinklers in car parking shall be standard response type with minimum area coverage of 9 sq. mtrs and designed as per IS 15105.
- n) Smoke check lobby, Staircases, common passages & escape routes of the entire building shall be painted with fire retardant paint. Certificate to that effect shall be produced at the time of obtaining compliance remarks of fire department.
- o) One Dry Chemical Powder fire extinguisher ABC type of 06 kgs. capacity each shall be kept for every 100 sq. mtrs. area in each basement.
- p) Staircase and lift lobby shall have illuminated by inverter operated exits signs with IP 54 enclosure. Luminance of the signage's shall be such that they are visible from a distance of 12 to 16 meters.
- q) The staircase of the basement & the associated lift lobbies shall be pressurized in the event of fire. The pressure in this enclosed staircase and enclosed lift lobbies shall be maintained not less than 5m.m. W.G. & 2.5 mm W.G. for lift lobbies.
- r) The upper basement beyond building line shall be paved, suitably to bear the load of fire engines weighing upto 48 m. tones each with point load of 10 kgs./sq. cms.
- s) Basement area shall be divided in compartments as per NBC regulations.

Annexure – B

Figures

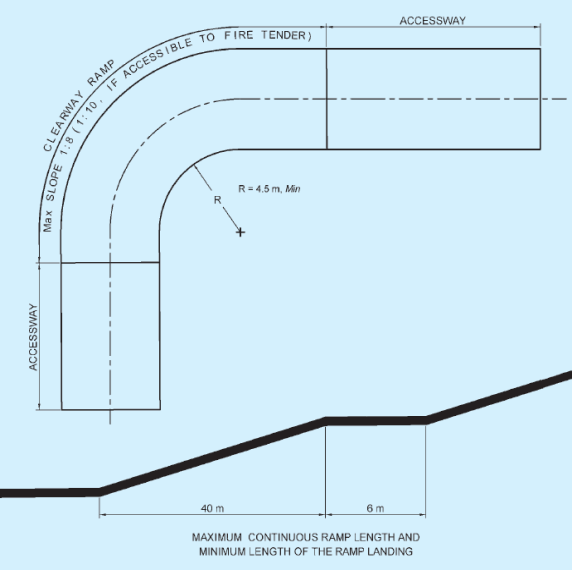


Fig. – 01
Podium accessible to Fire Engine

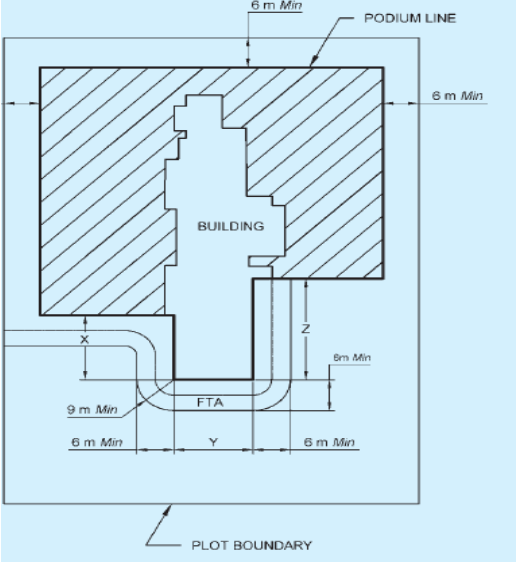


Fig. –02
Podium not accessible to Fire Engine

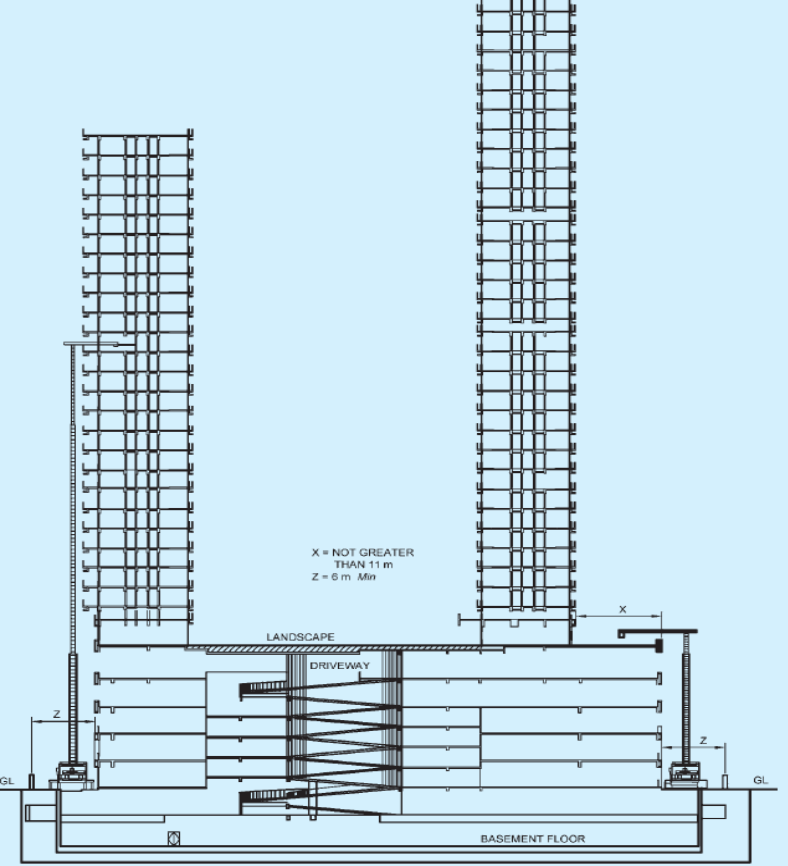
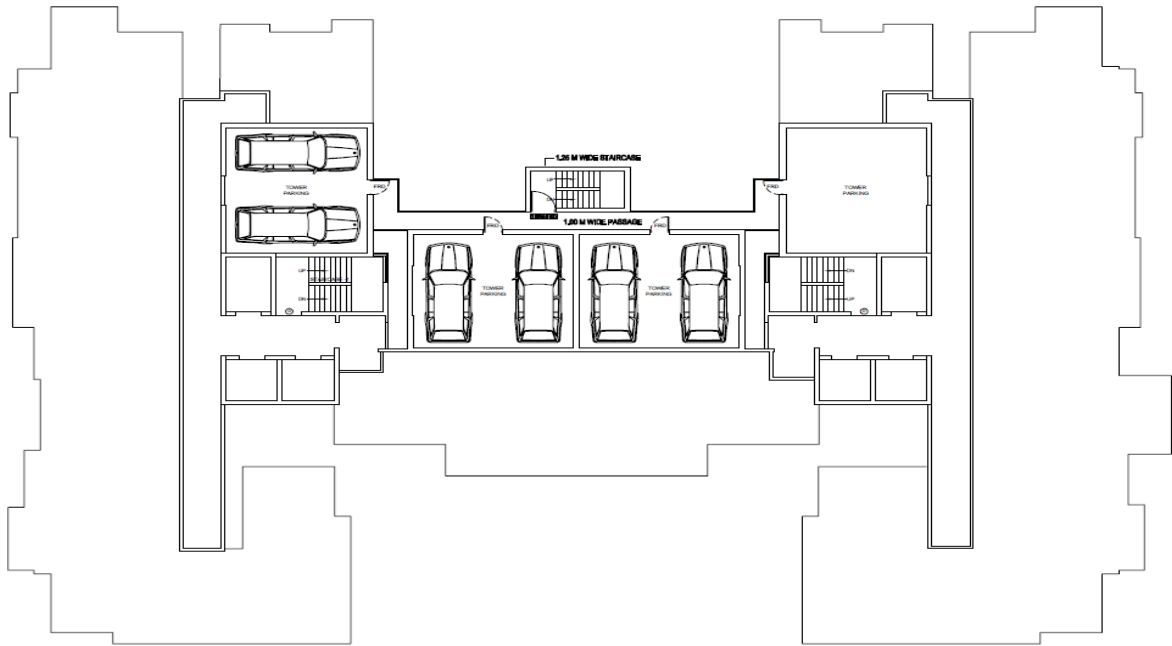


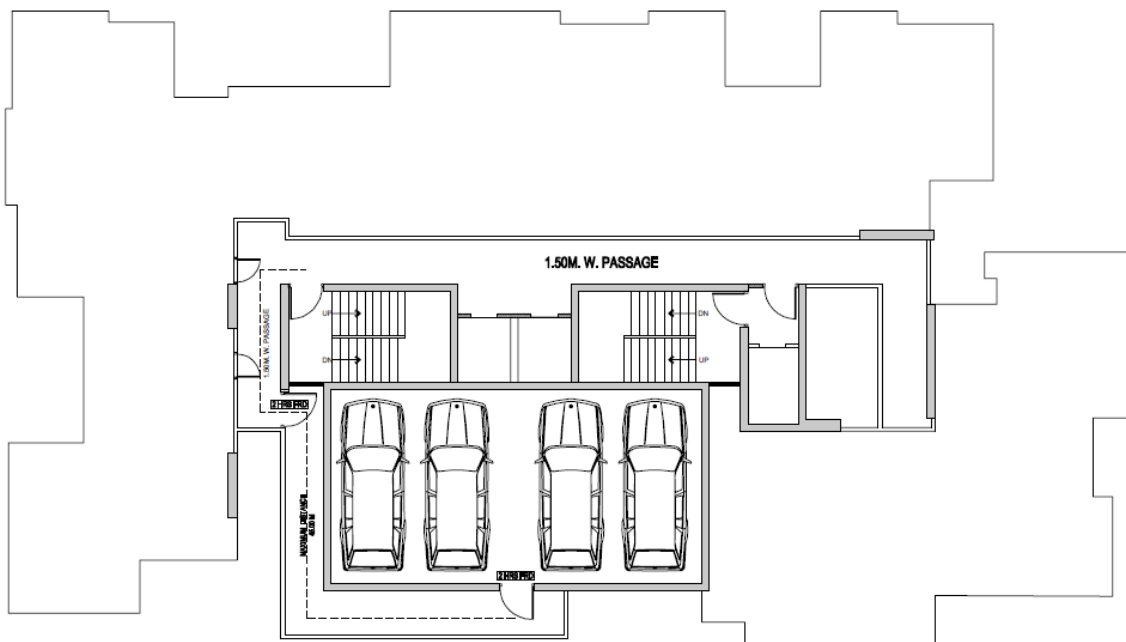
Fig. –03
Extent of Podium when Podium not accessible to Fire Engine

Annexure – C

Example of Automated Mechanized Car Parking Tower / Structure



Option – I



Option – II

Annexure – D

Figures for Automatic Sprinkler System for FAMCP

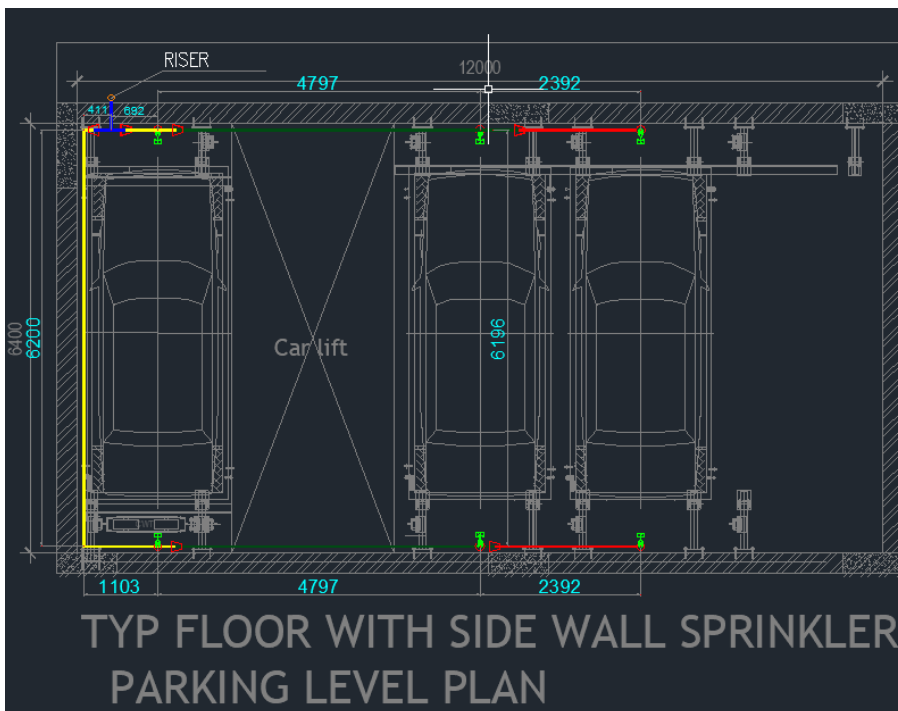
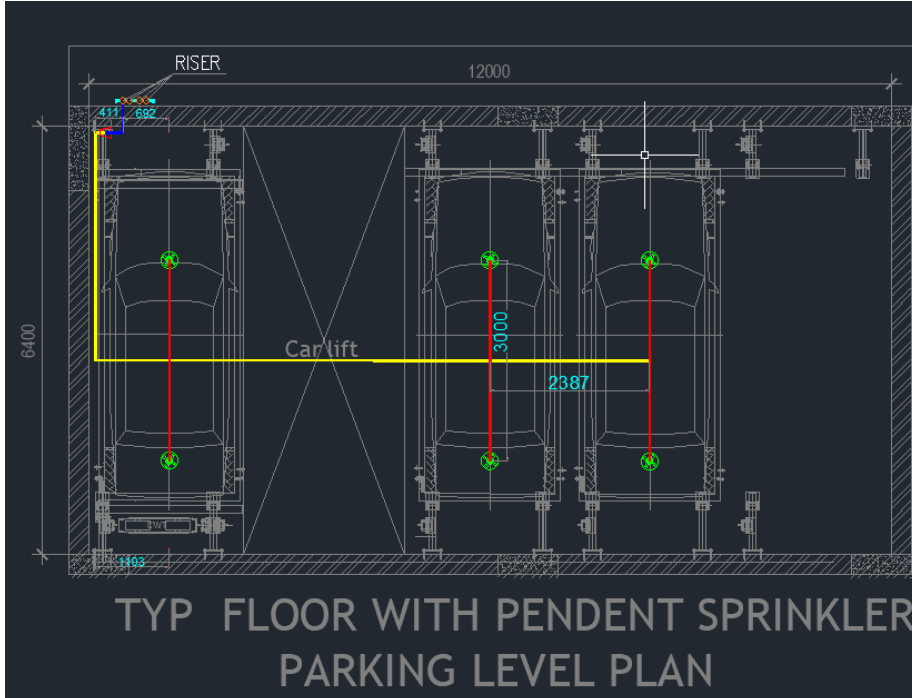


Fig 01 – layout of sprinkler system for FAMCP (option 1)

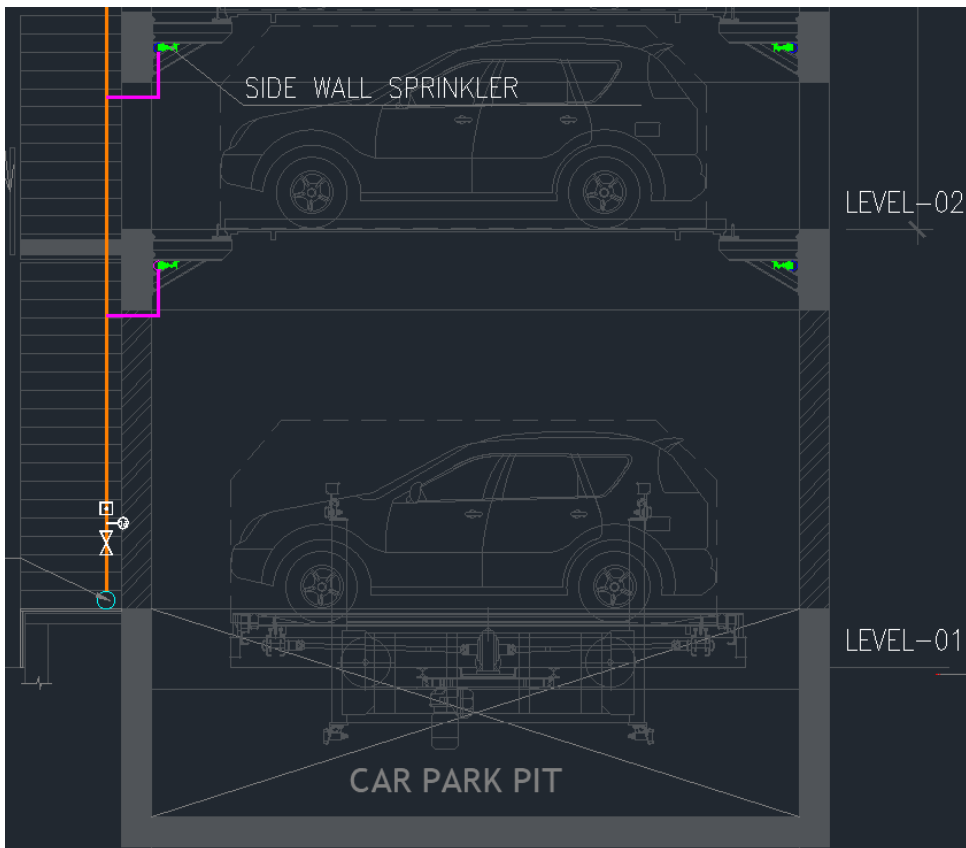


Fig – 02 - Section layout of side wall sprinkler facing the car bonnet / engine