National Highways & Infrastructure Development Corporation Limited

(Ministry of Road Transport & Highways, Govt. of India)

PART DESIGN, CONSTRUCTION, OPERATION & MAINTENANCE (For a Period of 5 Years) OF FULLY AUTOMATIC MULTI-LEVEL CAR PARKING SYSTEM AT CENTRAL CIVIL SECRETARIAT, ITANAGAR, ARUNACHAL PRADESH

Contract No: NHIDCL/AMLCP Const Work/AP/2020

VOLUME 4

OUTLINE CONSTRUCTION SPECIFICATIONS

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PARTICULAR SPECIFICATIONS

A. PARTICULAR SPECIFICATION OF CIVIL WORKS:

GENERAL

The work shall in general conform to CPWD Specifications 2019 Volume 1 & 2 (corrected up to the last date of submission/uploading of bid) as mentioned in General Conditions of Contract. Work under this Contract shall consist of furnishing all labour, materials, equipment, tools & plants and appliances necessary and required.
Contractor should spray curing water on concrete structure and shall not allow free flow of water. Concrete structures should be kept covered with thick cloth/gunny bags and water should be sprayed on them. Contractor shall do water ponding on all sunken slabs using cement and sand mortar.

GLASS DOOR

GENERAL:

Glass Door (Single Leaf) size of 2100 mm x 1050mm of 10mm toughened glass with Slim line 45mm frames clip in profiles all around the door with complete assembly.
DP45 Door Profile frame of size 45X50mm with seals with Junior Office Hinges (3nos) & Studio Gala Locks (1no) & Studio Gala lever handles in aluminum silver (EV1) finish , Euro profile cylinder and TS 89 Door closer with slide channel (as per EN 1154) and saddle plate for fixing on the Glass door and necessary seals to be provided all around the door frames.
The slim line profiles shall be suitable for Glass thickness of 10mm.
The Profile shall be matt natural anodized, the Profile Manufacturer to supply all the necessary clips, seals and fixing accessories for the system. All Profiles to be with 2 mm Gauge thickness Excluding 20 Micron of Anodizing.

PRECAUTION BEFORE INSTALLATION:

All installation materials used have been checked for compatibility.
Correct orientation of system has been identified. Inswing or Outswing.
Sill condition is understood and necessary weep system is in place where standard Doors sill is not being applied.
Frame has been sealed and joined at all points indicated in instructions
Opening checked for correct dimensions.
Frame is installed at correct depth within the opening
Frame has been installed square, level and plumb
Plastic shims were utilized under sill when required
Jambs were shimmed to prevent rolling
Shims were applied between head track and header. Only as recommended in instructions
Installation holes prepared correctly
Sealant was applied to sill installation holes prior to inserting screws & top of screw heads once applied
Correct fastener placement has been followed as directed by manufacturer
Proper operation and adjustment has been achieved

Frame has been checked for level, square and plumb. All horizontal and vertical adjustments have been made so that proper reveals are present and product is operating

as designed. Weep holes have been checked and free of obstruction and debris. All trash has been discarded. All hardware has been installed correctly and checked for proper operation. Product has been closed and locked and recommended to not be used as thoroughfare by other trades. Product is protected from damage. Final inspection of weather proofing and operation has been performed. Job has been turned over to contractor or Site engineer with approval.

INSTALLATION:

Product was installed as directed by the Manufacturer approved by the Engineer-in-charge.

B. PARTICULAR SPECIFICATION OF PUBLIC HEALTH WORKS:

1. For Nonscheduled item mentioned in SOQ shall be installed as per manufacturer's direction approved by the Engineer-in-charge.
2. Specification/brands names of fixtures to be used as per the scope of work are listed in the bid documents. The efforts should be made by the Contractor to use indigenous products. The Contractor should also consider the availability of spares parts/ components for maintenance purposes while proposing any brand/ manufacturer. The materials of any other brand/manufacturer may be proposed for use by the Contractor in case the brands specified below are not available in the market and/or Contractor intends to use some other brand better than the brands mentioned in this list. The alternate brand can be used only after the approval of Engineer-in-Charge. The list of approved makes is appended to this document.

C. PARTICULAR SPECIFICATION OF ELECTRICAL WORKS:

XLPE INSULATED HT ARMOURED CABLES

Supply & laying of Circular Aluminum conductor, conductor screened with extruded semi conducting compound ,XLPE insulated, insulation screened with extruded semiconducting combination in combination with copper tape (0.3KAfor1sec.) cores laid up, FRLS PVC inner sheathed, galvanized steel strip armored and overall FRLS PVC sheathed cable confirming to IS:7098/II/85working voltage 11KV(UE) grade to be laid 1 m below ground level including excavation, sand cushioning, covering with sand & bricks and back filling the trench etc., of the required size:-

Circular Aluminum conductor, conductor screened with extruded semiconducting compound, XLPE insulated, insulation screened with extruded semiconducting combination in combination with copper tape (0.3KA for 1sec.)coreslaid up, FRLS PVC inner sheathed, galvanized steel strip armored and overall FRLS PVC sheathed cable confirming to IS:7098/II/85working voltage 11KV(UE) grade 70sq.mm (Three Core)

D. PARTICULAR SPECIFICATION OF FIRE FIGHTING WORKS:

SPECIFICATIONS FOR FIRE HYDRANT & SPRINKLERSYSTEM.

General

Work under this subhead is time-bound and has to be completed within the time limit set in the tender. Work shall be executed in accordance with an agreed schedule which shall be submitted by the tenderers along with offer and agreed to by owners.

Scope of work

The scope of work in this subhead shall consist of furnishing all labour, materials, equipment and appliances necessary and required to completely do all work relating to the supply, installation, testing & commissioning of Fire Fighting System as described herein after and shown on the drawings. The scope of work in general shall include the following.

i. Fire Fighting Pumps & Accessories and related electrical works.
ii. Internal Fire Hydrant System.
iii. Sprinkler system in entire building.
iv. Hand Appliances.

Without restricting to the generality of the foregoing, the work shall include the following: -
A Hydrant System covering the entire complex and consisting of the following:

i. One number of Terrace Pump – One number electric horizontal end suction pump of 900 LPM at 35 M head
ii. Other piping system ancillaries such as Suction and Delivery Headers, Air Vessel, Pressure Gauges, Pressure Switches, Pump Panel etc. as required.
iii. Internal Hydrant system where required with single headed landing valves on each floor accompanied by 1 number swinging type Hose Reel, 2 numbers RRL Hoses, 1 number of Branch Pipe etc. all housed in the niche. Bidder shall provide front frame with shutter for niche.
iv. Sprinkler system for entire building.
v. Hand appliance as per Bill of Quantities.
vi. To obtain the approval of the relevant drawings before actual installation at site and to get the complete installation inspected and passed by the concerned authorities, as may be necessary as per local bye-laws. (Any fee payable to the local bodies paid by contractor).

Contractor's Experience.

Contractors shall engaged specialist agency only for this work of Fire Fighting systems.
The selected specialist agency must have sufficient experience in the execution of turnkey projects as specified.
Contractor must submit with the tender a list of similar jobs carried out by him as required along with the name of works, name and address of clients, year of execution, capacity of plant and value of work.

Technical Information.

Contractor shall submit along with the tender copies of detailed specifications, cuts, leaflets and other technical literature of equipment and accessories offered by him.

Contractor's attention is specially invited to the special conditions and other clauses in the agreement which required the contractor to: -

a. Submit detailed shop drawings.
b. Use material of specific makes and brands
c. Obtain all approvals from Fire Fighting authorities.
d. Execute the entire work on a turn-key basis so as to provide a totally operating plant.

Exclusions.

Work under the contract does not include the following work.

Electrical cable up to incoming motor control centre.

Site Accessibility.

The equipment must be carried from the goods receiving station to the site in an extremely careful manner to prevent damage to the equipment building or existing services.
Contractor must visit the site and familiarize himself with above problems to ensure that the equipment offered by him is of dimensions that they can be carried and planed in position without any difficulty.

Approvals.

The contractor shall prepare all submission drawings and obtain all approvals of firefighting works from firefighting authority.

System Description.

The Hydrant System shall comprise of Terrace pump with all required accessories including valves, special fittings, instrumentation, control panels and any other components required to complete the system in all respects.
The Hydrant and Sprinkler System shall be semi-automatic in action and shall be laid covering the all the floors internally.
The Fire Fighting System shall be kept pressurized at all times.
The Internal Hydrant System (Wet Risers) shall be provided at points as indicated on the drawing on each floor.
The hydrant point shall be directly tapped from the Riser pipes, and shall be furnished with required accessories such as –

a) One no. stainless steel single headed hydrant valves.
b) Two nos. RRL Hoses of size 63mm dia. x 15m long.
c) One no. first aid Dunlop hose reel full swinging type 20mm dia. x 40m long.
d) One no. stainless steel Branch pipe.

The hydrant risers shall be terminated with air release vale at the highest points to release the trapped air in the pipe work.

An overhead tank 10000 liters capacity will be connected to the firefighting system.

Sprinkler system shall be distributed entire building so as to cover 12-12 sqm area with one sprinkler.
Sprinkler down comer shall be provided with overhead tank of 10000 litres capacity. (overhead tank is excluded from scope of work)

A suitable drainage arrangement with bye-ass valve shall be provided to facilitate maintenance f sprinkler pipe work.

PARTICULAR SPECIFICATIONS for Pipes and Fittings

Pipes and Fittings.

Pipes for Wet Riser system shall be of MS pipe (Heavy Duty) Pipes up to 150mm dia shall be MS and conform to IS-1239. Pipes with dia. 200mm and above (6mm thick) shall be MS and form to IS-3589. All pipes shall be I.S.I. marked. Fittings for black steel pipes shall be malleable iron suitable for welding or approved type cast iron fittings with tapered screwed threads.

Jointing

Joint for black steel pipes and fittings shall be metal-to-metal tapered thread or welded joints. A small amount of red lead may be used for lubrication and rust prevention in threaded joints.
Joints between C.I. or black steel pipes, valves and other apparatus, pumps etc. shall be made with C.I. or M.S. flanges with appropriate number of bolts. Flanged joints shall be made with 3mm thick insertion rubber gasket.

Note: Joints for pipes and fittings up to 50mm diameter shall be threaded joints using Teflon Tape or equivalent bonding tape on the threads. Joints for pipe and fittings above 50mm diameter shall be welded joints.

Pipe Protection.

a. All pipes in underground masonry trenches/service tunnels, above ground and in exposed locations shall be painted with one coat of red oxide primer and two or more coats of synthetic enamel paint of approved shade.

b. Pipes in wall chases shall be protected from corrosion by 2 coats of bituminous paints.

c. Protection of Underground pipes.

The underground steel pipes shall be protected by coating and wrapping. The coating and wrapping shall be done, in general as per IS:10221-1982.

It specified in Bill of Quantities, the proprietary pipe production system shall be provided as per the Manufacturers recommendation. The proprietary system shall be of approved make.

Installation of Pipes.

All pipes shall be adequately supported from ceiling or walls by structural clamps fabricated from M.S. structural e.g. rods, channels, angles and flats. All clamps shall be painted with one coat of primer and two coats of black enamel paint. The contractor shall provide inserts at the time of slab casting or provide suitable anchor fasteners.

The pipe supports or hangers shall be designed to withstand combined weight of pipe, pipes fittings, fluid in pipe and insulation. Pipe supports shall be of steel and coated with rust preventing paint and finished with two coats enamel paint. The maximum spacing for pipes supports shall be as below:

Pipe(MM)	Spacing(MTR)	Size of support
Up to 25	2.0	6 mm
32 to 65	2.4	8 mm
75 to 125	2.7	10 mm
150 & above	3.0	12 mm

Pipes supports shall be spaced at maximum interval of 1.5 mtrs. on either side of heavy fittings and valves. Wherever piping passes through walls, pipes sleeves of diameter larger than that of piping shall be provided. Pipe sleeves shall be of steel or cast iron pipe.

Valves & Other Accessories.

General

Each valve body shall be marked with cast or stamped lettering giving the following information's:

a. The manufacturer's name or trademark.
b. The size of the valve
c. The guaranteed working pressures.

Isolating valves on the water supply lines shall be full bore ball valve type for pipe diameters up to 50mm. For 65mm dia. and above these shall be butterfly valves.

Full Way Ball Valve

The valves shall be of full bore type and of quality approved by the Project Architect / EIC. The body and ball shall be of copper alloy and stem seat shall be of Teflon.

Butterfly Valves.

Butterfly valves shall be of centric disc construction with single piece body of Cast Iron with disc of bronze/gunmetal with nitrile seat. Shaft shall be stainless steel with Teflon bearing butterfly valve shall conform to PN 1.6 rating and shall be provided with suitable matching flanges compatible with PIN 1.6 rating of valves.

Non-Return Valves.

Non-return valves are to be IS:778-1984 manufactured from gun-metal or dezincification resistant brass.

Drain Valve.

Drain Valves are to be provided at all low points in the system for draining the water. These shall be 40mm dia full way ball valve fixed on 40mm dia black steel pipe.

Pressure Switches.

Pressure switches shall be differential type for operation of all pumps and for the various duties and settings required. Pressure switches shall be for heavy duty operation and of approved make. All pressure switches shall be factory calibrated.

Internal Landing Valves.

The internal landing valves shall be Single-headed made of stainless steel and conforming to IS: 5290.Itshallbecompletewithhand-wheel, quick coupling connection spring loaded type and blank cap.

Hose pipes, Branch Pipes and Nozzles.

Hose Pipe: Hose pipe shall be rubber lines woven jacketed and 63mm in diameter. They shall conform to type-2 (Reinforced rubber lined) of IS:639- 1979. The hose shall be sufficiently flexible and capable of being rolled.

Each run of hose pipe shall be complete with necessary coupling at the ends to match with the landing valve or with another run hose pipe or with Branch pipe. The couplings shall be of

instantaneous spring lock type.

Branch Pipe: Branch pipe shall be of Stainless steel 63mm dia and be complete with male instantaneous spring lock type coupling for connection to the hose pipe. The branch pipe shall be externally threaded to receive the nozzle.

Nozzle: The nozzle shall be of Stainless steel, 20mm in internal diameter. The screw threads at the inlet connection shall match with the threading on the branch pipe, the inlet end shall have a hexagonal head to facilitate screwing of the nozzle on to the branch pipe with nozzle spanner.

Internal Fire Hose Cabinet.

Each internal fire hydrant valve shall be housed in a nitch of size indicated on drawings. Each internal fire hose Cabinet shall hold Single headed hydrant, 2 Hoses and 1 Branch pipes and 1 no. Dunlop hose reel mounted on adrum.

A. The cabinet shutters & frames shall be fabricated from boxed steel sections and MS pate 2mmthick.

B. The front glass of shutters shall be 5.0 mm thick clear glass and shall be held by means of rubber. Locking arrangement shall also be made with one number of mortice lock of approved make. A separate Key Box of 16mm thick MS sheet with glass facing shall be provided.

C. The Shutter shall be given a powder coat finish in post office red colour.

Hose Reel.

The hose reel shall be directly tapped from the riser through a 25mm dia pipe, the drum and the reel being firmly held against the wall by use of dash fasteners. The Hose Reel shall be swinging type (180 degrees) and the entire Drum, Reel etc. shall be as per IS:884. The rubber tubing shall be of approved quality and the nozzle shall be 6mm dia shut off type.

Draw out Connections.

2 ways collecting head Fire Brigade connection shall be provided at the location indicated in the drawing.

AUXILIARY PUMPING EQUIPMENT.

Scope.
This section covers the details or requirements of the auxiliary equipment necessary for the operation of the fire pumps.

The pump shall be directly driven from the electric motor. Flexible coupling and coupling guard shall be provided.

Capacity.

The discharge and head of the Terrace pump shall be as mentioned in Bill of Quantities.

The pump casing shall be of cast iron and parts like impeller, sleeve, wearing ring etc. shall be of non- corrosive metal like bronze, brass or gunmetal. The shaft shall be of stainless steel. Bearing of the pump shall be effectively sealed to prevent loss of lubricant or entry of the dust or water. The pump casing shall be designed to withstand 1.5 time the working pressure.

Motor

The motor shall be squirrel cage A.C. induction type suitable for operation on 415 volts 3 phase 50 Hz, system. The motor shall be totally enclosed fan cooled type confirming to protection clause

IP55 of IS 4691. The class of insulation shall be H synchronous speed shall be 2900 RPM. The motor shall conform IS 325-1978 and rated for continuous duty.

Sprinkler System.

Sprinkler Heads.

Sprinkler heads shall be of quartzoid bulb type with bulb, valve assembly yoke and the deflector. The sprinklers shall be approved make and type.

Types

Conventional Pattern.

The sprinklers shall be designed to produce a spherical type of discharge with a portion of water being thrown upwards to the ceiling side of wall extra. The sprinklers shall suitable for erection in upright position or pendant position.

A. Side Wall Sprinklers.

These shall be designed for installation along with the walls of room close to the ceiling. The discharge pattern shall be similar to one quarter of sphere with a small proportion discharging on the wall behind the sprinklers.

Construction

i. Bulb – Bulb shall be made of corrosion-free material strong enough to with stand any water pressure likely to occur in the system. The bulb shall shatter when the temperature of the surrounding air reaches a predetermined level.

ii. Valve assembly – Water passage of the sprinkler shall be controlling assembly of flexible construction. The valve assembly shall be held in position by the quartzite bulb. The assembly be stable and shall withstand pressure surges or external vibration without displacement.

iii. Yoke: The yoke shall be made of high quality gunmetal. The arms of yoke shall be so designed as to avoid interference with discharge of water from the deflector. The sprinkler body shall be coated with an approved anti corrosive treatment if the same is to use in corrosive conditions.

iv. Deflector: The deflector shall be suitable for either upright or pendent erection. The deflector shall be designed to give an even distribution of water over the area protected by each sprinkler.

a. Color Code.

The following color code shall be adopted for classification of sprinkler according to nomination temperature ratings.

b. Sprinkler Temperature Rating.

c. Size of Sprinklers Orifices.

The sprinklers shall be of 15mm nominal bore size.

Pipes and Fittings

Pipes for sprinkler system shall be of black steel conforming to I.S. 1239 (Heavy class).

Fittings for black steel pipes shall be malleable iron suitable for welding or approved type cast iron fittings with tapered screwed threads.

Jointing

Joint for black steel pipes and fittings shall be metal to metal tapered thread or welded joints. A small amount of red lead may be used for lubrication and rust prevention in threaded joints.

Joints between G.I. or black steel pipes, valves and other apparatus, pumps etc. shall be made with G.I. or M.S. flanges with appropriate number of bolts. Flanged joint shall be made with 3mm thick insertion rubber gasket.

Pipes Protection.

All pipes above ground and in exposed locations shall be painted with one coat of red oxide primer and two or more coats of synthetic enamel paint of approved shade.

Pipes in chase or buried underground shall be painted with two coats of hot bitumen.

Pipe Supports

All pipes shall be adequately supported from ceiling or walls from structural clamps fabricated from M.S. structural e.g. rods, channels, angles and flats. All clamps shall be painted with one coat of primer and two coats of black enamel paint. The contractor shall provide inserts at the time f slab casting or anchor fastener later.

Valves

Sluice vales of sizes 80mm and above shall be double flanged cast iron conforming to I.S.780. Check valve shall be of cast iron double flanged conforming to I.S.5312.

Valves on pipes 65mm and below shall be heavy pattern gunmetal valves with cast iron wheel seat tested to 20 kg/sq.cm. Pressure. Valves shall conform to I.S.778.

A. Air Valves

25mm dia screwed inlet cast iron single acting air valves on all high points in the system or as shown on drawings.

B. Drain Valves

50mm dia black steel pipe conforming to I.S.1239 medium class with 50mm gunmetal full way valve for draining and water in the system in low pockets.

Testing.

Testing on Completion of Installation.

The entire system shall be tested after completion of installation as per the operating sequence specified.

Standard and Codes.

1	IS-1648-1961	Code of Practice for fire safety of building (general) Firefighting equipment and maintenance
2	IS-3844-1966	Code of practice for installation of internal fire Hydrant in multi-storied building.
3	IS-2217-1963	Recommendation for providing first aid and firefighting arrangement in public buildings
	IS-2190-971	Code of practice for selection, Installation and maintenance of portable first fire appliance.
5	IS-3589	Electrically Welded Steel pipes (Medium class)
6	IS-1239	Mild steel tubes, Tubular and other wrought steel fittings (Medium class)
7	IS-780	C.I. Double flanges sluice valve.
8	IS-778	Gun Metal Valve.
9	IS-909-1965	External fire hydrant (underground)
10	IS-5290-1969	Internal Landing Valve.
11	IS-884-1969	First and hose reel.
12	IS-934-1976	Specification for portable chemical fire Extinguisher soda acid type.
13	IS-2873-1969	Specification for fire extinguisher for carbon dioxide.
14	IS-2189 & 2109	Automatic fire alarm system or BSS-3116
15	NBC-2016	National Building Code 2016

E. PARTICULAR SPECIFICATION FOR AUTOMATED CAR PARKING SYSTEMS

TYPE: SHUTTLE WITH ROBO PARKER

General Description and criteria

Automated Parking System Capacity (Vehicle storage spaces):

a. Gross Parking Spaces :108
b. Transfer spaces (service points) :02

Gross parking spaces are the total number of developed spaces in the garage. The cost of the installed system shall be based on the gross spaces because each space should be fully developed and serviced by the automated parking equipment.

Vehicle overall Length Measurement Limits:

Following should be the stalls sizes suitable to Vehicle overall measurement Limits.

Max Width outside tyres: 195 cm.
Min Width inside the tyres: 100 cm
Max wheelbase: 315 cm.
Min Wheelbase: 180 cm
Guard to ground: min.9 cm.

Maximum over all dimensions of parkable cars should be 5.2M in length, 2.1M in width and 2.10M in height, i.e. the proposed system should be capable of handling all types of cars used in India.

Weight Capacity

The proposed system should be designed to accommodate a maximum vehicle load of 2,500 kg. Dynamic testing of the system shall be conducted in accordance to standard EN14010 with a total load of 2,750Kg. The designed parameters should cover all types of cars that will fit into the parking system given the limits of the structure.

Description of Basic components of proposed automated car Parking System:

The proposed system should consists of Entrance and exit devices, Robo parker Transporters, Cantilevered Vertical Transport systems/ Vertical Transport systems (CVTS/ VTS), Shuttles capable to accept Robo parker, Electrical controls (ELEC) and parking stall, all as required to make a complete system as specified.

Entry Lobby/Exit Lobby

This is a location up to where user is allowed to enter with car or exit with the car park. This lobby is online monitored, having all proximity sensors, infra-red sensors and other controls. The lobby is accessible to car lifting and horizontal car transfer equipment. In this project, the total number of Entry Lobby is two and exit Lobby is two.

Entry Access Door to Vertical Transporter

On departure of user from entry lobby and on closing entry barrier, it automatically opens, allows the Robo parker from vertical transporter/ elevator to enter into the entry lobby/ lift, on exit of car from entry lobby/ lift onto the vertical transporter or elevator, it closes automatically. It should operate on motion sensor controls. It operates vice versa on retrieval time; it allows the car to be brought into the exit lobby and closes once car lifter cum horizontal transfer equipment is out of exit. In any case it should not open when user is within entry or exit lobby. Here the total number of Entry Door is two and exit door is two.

Robo Parker

This is a robotic car lifter and transporter transporting car in horizontal plane perpendicular to direction of movement of shuttle with a minimum thickness so that client will get maximum advantages of total building height. This Robo parker is the major device used for pickup the car, transporting to elevator or shuttle to park in stall for parking activity and vice versa for retrieval activity. The robo parker must have a car centering device to limit the width of parking space to 2.10m. Here the total number of Robo parker is two.

Elevator

This is equipment, which used to for vertical transportation of car along with Shuttle and Robo parker or with car only. This transports the car and Robo parker or only car to required floor from

entry level for parking activity and transports the cars from different floor to exit level for exit activity. Here the total number of Elevator is two.

Shuttle

This is an equipment which transports the car along with Robo parker in horizontal plane and perpendicular axis to entry and exit axis. It transports the car from one parking slot to anther at single parking level. This can be operated independently at one parking level or it can be operated along with elevator when mounted on it. Here the total number of Shuttle is two.

Parking Slots/ Stalls

These are the defined locations for parking the cars, stalls will have arrangement and sensors to allow Robo parker to bring in the cars and park it. Here the total number of Stall is one hundred eight but two will be kept empty for maneuvering.

Automated Parking System Processing Capacity:

The minimum throughput should be 60 vehicles/hour, in or out, under continuous operation. User time is assumed to be 45 sec.

The complete Vehicle storage cycle shall consist of three steps:

a. Entrance Cycle
b. Vertical transfer
c. Horizontal transfer

The complete vehicle Retrieval cycle consist of three steps:

a. Horizontal transfer
b. Vertical transfer
c. Exit transfer

Under the conditions set above, each, Vertical and Horizontal transfer should Need less time compared to Entrance or exit cycles so the last two only are critical and are considered to determine the maximum throughput.

Garage Operations shall be continuous

The proposed automated parking system should be designed and able to operate continuously and be available for 24 hours per day, 7 days per week. (Regular maintenance should be done at night hours, i.e. no operation time)

Conformance to Accepted Standards

- The system should conform to the requirements of EC- Machinery Directive 98/37 in general and the most of requirements of EN 14010- December 2003, in particular.
- The system should also complies with German Standard VDI4466, January 2001, Automatic parking system- Basic principles, to implement EN 14010.
- Electrical Control: it should be in accordance EN 60204-1.
- Availability: the system should comply with German Standard VDI 4466.
- Noise: the system should comply with German Standard VDI 4466, January2001.

Software

All software to operate the system shall have a permanent license for use. After the maintenance period upgrades shall be provided at the option of the owner based on an offering, but up to

maintenance period vendor shall provide all upgrades.

Technical specifications of various equipment:

Elevator suitable to receive the Robo parker with shuttle device

a. Counter weight frame with guiding rollers
b. Set of wire ropes or chains. Chains IWIS as per EN standard and Steel Rope: (DRAKO) or equivalent EN standard
c. Lifting devices equipped by 2 geared motors.
d. Set of steel-drawn plates as vertical guides for the guidance of the elevator platform
e. Steel platform complete with guide rollers.
f. Locking device for securing the vertical position.
g. Laser device for vertical positioning.
h. Set of photocells, sensors and mechanical switches.
i. Steel frame complete with 4 support wheels Diameter and 4 guiding Rollers.
j. Vertical movement through 2 geared Motor controlled by inverter with the following characteristics
k. Actuators committed to locking device for vertical movement

Robo parker, equipped with a cable reel

a. Actuators committed to Vehicle centering
b. Actuators committed to lifting
c. Actuators committed to Horizontal movement

Stall devices

Hot deep galvanized steel sheets for front and rear wheels rest.

Entry Bay

a. Steel frame suitable to receive Robo parker.
b. Electrical pictograph for the guidance of wheels of the vehicle during his entrance.
c. Photocells for the control of the height, length, width and presence of the vehicle
d. Micro-wave sensor to detect movement inside the entry/exit area.
e. Traffic light (red/green)

Exit Bay

a. Steel frame suitable to receive Robo parker.
b. Photocells for the presence of the vehicle
c. Micro-wave sensor to detect movement inside the entry/exit area.

BIDDERS MUST FOLLOW FOLLOWING SPECIFICATIONS IN ADDITION TO THE ABOVE

Lobby

- Must have Motorised Wheel stopper device with wheel position detection
- High speed aluminium spiral door with speed min 1 Mtr/Sec
- Car centering mechanism in the dolly
- Light Curtain type sensors to be used for length detection
- LASER type photo sensors to be used for height detection
- There must be a Touchpanel and RFID card readers as HMI in the entry and exit points

Lift

- Positioning to be done by 2 nos Digital type LASER positioning devices
- All communication to Variable frequency drives must be over Fieldbus and STO inputs to be used for additional safety.
- Lifts must have locking mechanism in all levels

Shuttle

- Positioning to be done by 2 nos Digital type LASER positioning devices
- All communication to Variable frequency drives must be over Fieldbus and STO inputs to be used for additional safety.

Robo Parker

- Lifting capacity 2500 KG
- Provision to bypass the cable reeling drum in case of breakdown
- Dolly should be able to run on concrete

Turn Table

- Positioning of turntable to be done by Absolute type Rotary encoder over Fieldbus for precise positioning.

General

- The PLC system preferably should be Siemens and “Failsafe” type CPU to be used.
- All critical low voltage devices to be protected with Micro-controller based Electronic Circuit breakers
- The system must have online connectivity in secure environment so that troubleshooting can be done remotely.
- A web-based SCADA system is required

BIDDERS TO GIVE FOLLOWING DATA

A. Prescribed Electrical Usage for one operation

The average parking and retrieving operation should not consume more than 0.50 kWh of electrical energy. Bidders to Fill the Requisite Data so as to evaluate them for Technical Qualification.

(Energy Consumption, Sizes of the Equipment, Current Ratings Etc.)

B. Average energy consumption for entry and exit cycle

Average energy consumption for an entry cycle:

Locking Device
Elevator Cycle (Consider Avg height):
Locking device
Door opening
Robo parker cycle
Door closing

Locking Device
Elevator up

Locking device
Shuttle cycle
Robo parker cycle
Shuttle cycle

Sub-Total E1

Average energy consumption for an exit cycle:

Locking Device
Elevator cycle (Consider Av Height)
Locking Device
Shuttle cycle:

Robo parker cycle:
Shuttle Cycle
Locking device:
Elevator down:
Locking device:
Door Opening
Robo parker cycle:
Door Closing
Sub-Total: E2

TOTAL ENTRY AND EXIT CYCLE = E1+E2

Approved Makes:

Specification/brands names of materials to be used as per the scope of work are listed in the bid documents. The efforts should be made by the Contractor to use indigenous products. The Contractor should also consider the availability of spares parts/ components for maintenance purposes while proposing any brand/ manufacturer. The materials of any other brand/manufacturer may be proposed for use by the Contractor in case the brands specified below are not available in the market. The alternate brand can be used only after the approval of Engineer-in-Charge. The list of approved makes is appended to this document as below:

LIST OF APPROVED MAKES OF MATERIALS- CIVIL, INTERIOR, PLUMBING, ELECTRICAL AND FIRE FIGHTING FOR MULI LEVEL CAR PARKING AT CIVIL SECRETARIATE, ITANANAGAR, ARUNACHAL PRADESH-

APPROVED MAKE LIST

LIST OF APPROVED MATERIAL FOR CIVIL WORK		
S.No.	**Material**	**Preferred Makes/ Brands/ Manufacturer**
1	Portland Pozzolana Cement	ACC/ ULTRATECH /AMBUJA / JK CEMENT / BIRLA/ NUVOCO
2	White Cement	BIRLA WHITE / J. K WHITE
3	Reinforcement Steel	SAIL/ TATA STEEL LTD./ RINL/JINDAL STEEL & POWER LTD / JSW / M/s SHYAM STEEL INDUSTRIES LIMITED
4	Parallel Threaded Couplers	DEXTRA / G-TECH
5	Re-barring Chemical	HILTI / 3M INDIA
6	Structural Steel	TATA/ JSW STEEL LTD/ SAIL/ JINDAL STEEL & POWER LTD./ RINL
7	Plasticizer, Super Plasticizer, Admixtures, Other construction chemicals	M.C. BAUCHEMIE / FOSROC / SIKA / BASF/ PIDILITE/CRYSO/ECMAS
8	AAC Block	ULTRATECH / AEROCON / BILTECH / J K LAXMI / MAGICRETE/XTRALITE
9	AAC Block Adhesive	ULTRATECH / FERROUS CRETE / BAL ENDURA / AEROCON / J K LAXMI / SIKA BLOCK JOINTING MORTAR
10	Polymer modified cementitious grout	BAL ENDURA / WEBER / MYK LATICRETE / FERROUS-CRETE
11	List of RMC producers	ULTRATECH / ACC / LAFARGE (NUVOCO) / NDCON
12	Curing Compound	FOSROC / SIKA / PIDILITE / STP / CICO / BASF
13	Expansion Joint- modular	HERCULES / Z-Tech / SANFIELD/KANTA FLEX (INDIA) PVT. LTD.

14	Shuttering Ply	MERINO / GREENLAM / CENTURY / ARCHIDPLY / KITLAM
WATERPOOFING		
1	Waterproofing Self Adhesive (HDPE) Membrane	GRACE / FOSROC / MYK SCHOMBURG
2	Single Component Liquid PU Elastomeric Membrane (spray applied) for Deck Waterproofing	BASF / SIKA / FOSROC/ MYK SCHOMBURG/ GRACE
3	Waterproofing Compound (Crystalline) and Swellable Bar	XYPEX / KRYTON / PENETRON / BASF / SIKA / FOSROC / MYK SCHOMBURG / GRACE/VENDEX
4	Polymeric Cementitious Coating	BASF / FOSROC/ GRACE/ STP/ PIDILITE
5	Elastomeric Acrylic UV resistant liquid applied coating	BASF/ FOSROC/ SIKA / GRACE
DOOR, WINDOWS & WOOD WORK		
1	Laminated Particle Board / Particle board / Laminates / Plywood	MERINO / GREENLAM / CENTURY / ARCHIDPLY / EUROPLY
2	Veneered Particle Board	MERINO / DURO / GREENLAM
3	SS Mesh	GKD / WMW
4	Flush door shutters	GREENPLY/ ARCHIDPLY / DURO / MERINO / KUTTY / JAYNA / CENTURY
5	Glass wool Insulation	UP TWIGA / POLY GLASS / LLOYDS/ OWENSCORNING
6	Rock Wool Insulation	LLOYDS / ROXUL ROCKWOOL
7	Polycarbonate Sheet	GE LEXAN / DANPALON/ GALLINA
8	Decking Steel sheet	TATA STEEL / LLOYDS / JSW
9	Natural wood veneer	SONEAR / GREEN PLY / TRUWOOD / ARCHID
10	Anti-static high-pressure laminate	FORMICA / BAKELITE HYLAM / DECOLAM MERINO / KITMICA
11	Fire Sealant	HILTI / 3M INDIA / FISCHER
12	Extruded Polystyrene Board	STP / SUPREME / OWNESCORNING, SHALIMAR
13	Wooden / Metal /Glazed/Acoustic - Fire Rated Door Shutters	NAVAIR / KUTTY / SHAKTIMAT / PACIFIC / / SUKRI
14	UPVC Doors & Windows	ALUPLAST / ENCRAFT / REHAU / FENESTA / LG-HAUSYS / DUROPLAST
15	Fire rated glass (2 hours fire rating)	SAINT GOBAIN / PYROGUARD / SCHOTT / ASAHI
FINISHING		
1	Melamine Polish	ASIAN PAINTS/ PIDILITE INDUSTRIES/ DULUX/ BERGER/
2	Polyester Powder Coating Shades	NEROLAC / BERGER / AKZONOBEL
3	Wall Putty	BIRLA WHITE / JK WHITE
4	Oil Bound Washable Distemper	ASIAN PAINTS / BERGER / NEROLAC / ICI / AKZONOBEL DULUX
5	Acrylic Distemper	BERGER / ASIAN / DULUX / NEROLAC
6	Cement Primer	BP WHITE (BERGER) / DECOPRIME WT (ASIAN) / NEROLAC / AKZONOBEL (DULUX)
7	Steel / Wood Primer	AKZONOBEL (DULUX) / NEROLAC / BERGER / ASIAN PAINT / JENSON & NICHOLSON
8	Adhesives	ANCHOR / DUNLOP / PIDILITE-FEVICOL
9	Premium Acrylic Emulsion paints	DULUXAKZONOBEL/ NEROLAC / ASIAN PAINTS / BERGER
10	Textured Exterior Finish	ASIAN (ULTIMA) / BERGER (WEATHER COAT ALL GUARD) / DULUX AKZONOBEL (ULTRA

		CLEAN) / NEROLAC (EXCEL TOTAL)
11	Synthetic Enamel Paint	ASIAN / BERGER / NEROLAC / AKZONOBEL (DULUX)
12	Epoxy Paint	AKZONOBEL (DULUX) / NEROLAC / ASIAN PAINTS / ICI/ BERGER
13	Fire Paint	ASIAN PAINT / BERGER PAINTS / SHALIMAR / JOTUN / AKZONOBEL
14	Gypsum Plaster	FERROUSCRETE / ULTRATECH / INDIA GYPSUM / ELITE (90) OF GYPROC
15	Cement based Ready Mix Plaster	FERROUSCRETE / ULTRATECH / SAINT GOBAIN
16	Pre-Cast GRC Jaali	UNISTONE / KERAKROME GRC
17	Polysulphide sealant	FOSROC / SIKA / TUFFSEAL / PIDILITE / WACKER/ DOW CORNING / GE/ STP
18	Silicone / Weather Sealant	WACKER / DOW CORNING / GE
19	Wall Paper	EGO, VESCOM, ASIAN PAINTS, MURASPEC, MARSHALLS
20	Vinly Graphic	3M, AVERY DENNISION, LUMAR
STEEL & ALUMINIUM WORKS		
1	Stainless Steel	SALEM STEEL / JINDAL ALLOYS / SAIL
2	Welding Electrodes	ADVANI-OERLIKON / MODI
3	Dash / Anchoring Fasteners	HILTI / FISHER / BOSCH / AXEL
4	Anodised Aluminium Hardware (Heavy Duty)	HARDIMA / ALUALPHA / PULSE OF LGF SYSMAC / HINDALCO / EVERITE
5	Aluminium Structural Members – Windows, Glazing and Partitions	JINDAL / HINDALCO / NALCO / INDALCO
6	Stainless Steel Railing, Accessories etc (Grade SS 316)	OZONE / GEZE / KICH / DORMA /
7	G. I Steel door frame	SYNERGY THRISLINGTON / SHAKTIMET / NAVAIR
CEILINGS		
1	False ceiling Grid system	GYPROC / GRIDLINE / RK / GRIDSYSTEM
2	False Ceiling – Gypsum Board and Sections	SAINT GOBAIN GYPROC / INDIA GYPSUM /AMF / USG BORAL
3	Metallic / Wooden Modular False Ceiling	ARMSTRONG / DURLUM / HUNTER DOUGLAS/ SAINT GOBAIN /
4	Acoustical Tile False ceiling	ARMSTRONG / SAINT GOBAIN / ECOPHON/ DEXUNE / ANUTONE / AMF
5	Calcium silicate ceiling tiles/ Board	AEROLITE / HILUX / ARMSTRONG (MYLAR) / EVEREST / NCL
6	Aluminium Composite Panel	ALUCOBOND / ALPOLIC / ALUDECOR / REYNOBOND
7	Acrylic Solid Surfaces	HANEX / L.G-HIMAC / DUPONT
FLOORING/ WALL TILES		
1	Glass Mosaic Tiles	BISAZZA, MRIDUL, OPIO, PALLADIO, ITALIA GLASS
2	Floor & Wall Tiles : Ceramic tiles	KAJARIA / H&R JOHNSON / SOMANY/ / RAK / ASIAN (AGL)
3	Floor & Wall Tiles : Vitrified tiles	KAJARIA / H&R JOHNSON / SOMANY/ / RAK / ASIAN (AGL)
4	PVC Flooring	ARMSTRONG / TARKETT / LG HAUSYS
5	Laminated flooring	ACTION / TESA / PERGO
6	Engineered stone - Marble / Quartz	ASIAN / JOHNSON / KALINGA / QUTONE
7	Chequered Tiles, Paver Block & Kerb Stone (of Non-Recycled	OVILITE / UNISTONE / HINDUSTAN / KK / ULTRA / DALAL TILES/ NITCO

	C&D Waste)	
8	Tile / Stone Adhesive / Tile Grout	PIDILITE/ FERROUSCRETE / BALLENDURA / MYK LATICRETE
9	Floor hardener	PIDITOP 333 BY PIDILITE / FOSROC / SIKA / IRONITE / FERROK / HARDONITE
10	Epoxy Flooring	FOSROC / SIKA / CICO / LATICRETE / BASF
11	Heat Resistant Tiles	THERMATEK/ NATIONAL/ THERMAX
12	Floor Trap	JAYNA / CHILLI / NIRALI
GLAZINGS		
1	Glazing Structural / Suspended / Skylight/ clear/ float/ frosted/	SAINT GOBAIN / PYROGUARD / ASAHI
2	Clear / Float / Frosted Glass / Mirror	ASAHI / MODIGUARD / SAINT GOBAIN
3	Glass Spider Fittings	DORMA / HAFELE / OZONE
4	Toughened Glass / Hermetically sealed performance glass	SAINT GOBAIN / MODIGUARD/ ASAHI / SCHOTT
HARDWARE		
1	Nuts / Bolts & Screws	GKW / HILTI / ATUL
2	Clamp system for dry stone cladding	HILTI / FISCHER / BOSCH / AXEL
3	Hinges & Brassware	EARL BIHARI / KICH / INDO-BRASS / ASSA-ABLOY/ HAFELE/ GEZE/DORMA
4	MDF Board	NUWOOD/ DURATUFF
5	Vitreous Chinaware	HINDWARE/ JOHNSON/ CERA/ PARRYWARE
6	All type of hardware and fitting for all type of glazing / doors/ windows etc. including mortise latch & lock, tower bolt, ball bearing butt hinges, friction stay hinges, sliding door bolts, lever handle, magic eye door closer etc.	DORMA / HAFELE / GEZE / GODREJ / BACKEN/HETTICH
7	Toilet Cubicles	MERINO / GREENLAM / DORMA
8	Hardware for Fire Check Door/ panic bar/ panic trim/ door closer/ hinges/ mortise lock/dead lock etc	DORMA / GEZE / HAFELE / BACKEN
9	EPDM Gasket	HANU / ANAND / OSAKA
PLUMBING & SANITARY		
1	Stainless Steel Pipes	JINDAL/RAMPART/G-PRESS/REMI
2	HDPE/HDPE DWC pipes	JAIN/KAISTA/RELIANCE
3	Polypropylene pipes	REHAU / POLOPLAST / HULIOT / ASTRAL
4	GI Pipes	JINDAL (HISAR) / TATA/ SURYA PRAKASH
5	GI Fittings	UNIK / ZOLOTO / SURYA
6	DI Pipes	ELECTROSTEEL (VEDANTA) / JINDAL / TATA DUCTURA
7	DI Fittings	ELECTROSTEEL (VEDANTA) / KALINGA / TATA DUCTURA
8	CI Double flanged sluice valve	KIRLOSKAR / SONDHI / KEJRIWAL
9	Float Valve	LEADER / ZOLOTO / KSB
10	Centrifugally Cast (Spun) Iron Pipes & Fittings	JAYSWAL NECO / RIF / SKF /RPMF
11	Centrifugally Cast (Spun) Iron (Class LA) Pipes	JAYSWAL NECO / ELECTRO STEEL / TATA
12	CI Manhole covers, Frames & GI Gratings	JAYASAWAL NECO / RIF / SKF
13	SFRC Manhole Covers &	KK / OCR / PARGATI / T-CON

	Gratings	
14	Stoneware Pipes and Gully Traps	PERFECT / PARRY / BURN / ANAND / RK / HIND
15	RCC Manhole covers & Frames	KK MANHOLE / GRATING CO. (P) LTD
16	Gun Metal Valves, Globes	ZOLOTO / CASTLE / KARTAR
17	Sanitary CP Fittings & Accessories	JAQUAR / ROCA / KEROVIT/ KOHLER
18	Vitreous Chinaware	HINDWARE/ JAQUAR / ROCA / KOHLER / KEROVIT
19	Water Meter	PRIMA / ZOLOTO / LEADER / CAPSTAN
20	Brass Stop & Bib Cock	ZOLOTO / SANT / L&K / LEADER / ASTRAL
21	UPVC/ CPVC Pipe& Fittings	AKG / ASTRAL/ SUPREME / FINOLEX / SFMC
22	Non-Return Valve (Check valve) and other kind of Valves	ZOLOTO / SANT / LEADER
23	Brass Ferrules	DHAWAN SANITARY UDYOG / KALSI / ANNAPURNA
24	Insulation for hot water pipes	KAIFLEX / ARMAFLEX / CAREFLEX / LLOYD
25	Insulation for external / exposed hot water pipes	KAIFLEX / ARMAFLEX / CAREFLEX
26	Pipe protection for external water supply pipes	PYPKOTE / ARMAFLEX / MAKPOLYKOTE
27	Stainless Steel Sink	NEELKANTH / NIRALI / CERA / JAYNA/KINGSTON
28	RCC Pipes	LAKSHMI / SOOD & SOOD / JAIN & CO. / PRAGATI CONCRETE
29	Facade cleaning system	CRADLE RUNWAYS (INDIA) PVT. LTD.

ELECTRICAL WORK		
1	HT Panel with Vacuum Circuit Breaker (VCB)	L&T/ ABB / Schneider/ Siemens or their authorized Channel Partner
2	Batteries	Hitachi/Panasonic/ Yuasa/ SF/ Exide/Amco/ Amaraja
3	Battery Charger	Amaraja/ Sabnife/ Statcon/ Voltstat/ HBL
4	Bus bar	Jindal/ Hindalco/ Indal
5	Bus trunking , rising mains, end feed unit, top-off box (plug-in type)	L&T/ Schneider/ C&S/ Godrej /Legrand/ EAE
6	Ceiling /Exhaust/Wall fans	Crompton/Usha/ Orient/ Bajaj/ Havells
7	Control fuse base with HRC fuse / HRC Fuse	L&T/ Siemens/ ABB/ Alstom/ Schnieder
8	Data/Telephone/TV Outlets	Systemax/ Belden/ Simone/ Legrand/ Havells/ Anchor
9	DG Set - Assembler	Jakson& Company / Jakson Ltd/ Sterling Generators / SudhirGensets/ C&S Himoinsa/ Powerica/ Kirloskar (KOEL authorized OEM) / TIPL
10	DG Set - Alternator	Stamford/ Leroy Somer/ Toyo Denki/AVK-SEG/ Kirloskar (KOEL Green)
11	DG Set - Engine	Cummins/ Mitsubishi/ Perkins/ Volvo/ Caterpiller/ Kirloskar (KOEL Green)

12	Fire Extinguisher	Ceasefire/ Exflame/ Minimax/Guard/ Safex
13	HT & LT Cables (Power & Control Cables, Solar Cables)	Havells/ Nicco/ Finolex/ KEI/Polycab
14	Insulators	Jaya Shree/ Modern/ IEC/ WSI
15	LED Lamps	Crompton Greaves / Havells/ Panasonic / Surya / Wipro
16	Lighting for Facade	Crompton Greaves / HAvells / Wipro / Allurays / RZB / BEGA
17	Lightening Arrestors	L&P ELECTRO/ LPI/ Indelec
18	LT Panels / Synchronizing Panels/ Capacitor Panels	L&T/ ABB / Schneider/ Siemens or their authorized Channel Partner
19	MCBs / RCCB/Isolaters / RCBO / Change over switch	Hager/ Havells/ Legrand/ L&T/ Schneider/ ABB/ Siemens
20	Modular Switches/ Socket outlets and wiring accessories with moulded cover plate	MK (wraparound plus) / Siemens (Delta)/ Legrand (mylinc)/ L&T (Entice)/ Havells (Crab tree-Athena)/ Anchor (Roma)/ Schnieder (Opale)/ Wipro (North-West)
21	MS Conduit	BEC/ AKG/ Steel Kraft
22	Street Light Poles & Light Fixtures – Solar & Conventional	Philips/ Wipro/ Havells/ Bajaj/ KeselacSchreder
23	Transformer (Oil Type / Dry Type)	ABB/ Siemens/ Kirloskar/ Voltamp/ Areva/ Schneider
24	UPS	Socomec / Emerson (Vertiv)/ Schnieder (APC)/ Eaton

D. FIRE FIGHTING WORK		
1	Air Release Valve	CIM/LEADER /SANT/ ZOLOTO/ SKS
2	Alarm valve & Hydraulic (Alarm motor with coupling)	HD fire /TYCO/VIKING/Newage
3	Anchor Fastener	Fischer / Hilti or equivalent
4	Ball Valves	Zoloto/ TIEMME /CIM /Sant
5	Butterfly valves	Advance/ Audco /Sant/ KSB/SKS
6	NON RETURN VALVES	Sant/Zoloto /Kirloskar/ IVC/Audco/SKS
7	PRESSURE GAUGE	EMERALD / FIEBIG / H GURU /ANERGY / PIONEER / PARTH INSTRUMENTS
8	FORGED STEEL FITTINGS	ZOLOTO-M / NEW/DRP-M/ UNIK
9	ANTI-CORROSIVE PIPE TREATMENT (AS PER IS: 10221)	PYPKOTE (IWL) / COATEK/ POLYCHEM / TYCO ADHESIVES
10	Cables	As per electrical make list
11	Check Valve/Foot Valve/Sluice Valve/	L&T/Audco / Zoloto Advance/KSB

12	Y-STRAINER	EMERALD/SANT/ ADVANCE/ KIRLOSKER/ ZOLOTO
13	Control / Potential / Current Transformer	As per respective electrical make list
14	VIBRATION ISOLATOR/ FLEXIBLE COUPLING	KPC/RESISTOFLEX/KANWAL INDUSTRIES/ DONLOP
15	Fire Extinguisher	Minimax / Newage/ Superex
16	Fire Hydrant Valves/ Fire RRL Hose Pipes / Fire Hose Reels/ Fire Man's Axe/ Gun metal short branch pipe/ 2/ 3/4 FB inlet/ draw Out connection/Hose Box/ Hose reel drum /Nozzle/ blank Caps & Chains / Coupling	Minimax / Newage/ Superex
17	Fire Pumps	Mather&Platt(WILO)/ Kirloskar/Xylem –ITT
18	Electrical Motors	ABB/ Siemens/Kirloskar/C&G
19	Flow Meter	System Sensor or equivalent
20	GI clamps	Chilly/Hilti or equivalent
21	GI / MS Pipes	Tata / Jindal- Hissar/ SAIL
22	Sprinkler Heads (Sidewall/ Upright/ Pendant)	Grinnel- Tyco / Viking / HD
23	Fire Suppression System/Gas Flooding Sytem	Tyco/Newage/Minimax/Viking
24	Clean Agent Fire Extinguisher	Tyco/Newage/SVS Buildwell/ Minimax
25	FIRE HOSE CABINET	NEWAGE / SUPEREX/ PADMINI/ SAFE GUARD/ SWASTIK/ EXFLAME
26	WELDING ROD	ADVANI/ VICTOR/ ESAB INDIA/ ADOR
27	PRESSURE SWITCH	INDFOS/ DANFOS/ WAAREE
28	IntelligentAddressableFire Alarm Panel/Detectors/Hooters/ Manual Call Point UL Listed/ Talkback/ Control Module/ Monitor Module/ Control relay Module/ Short Ckt.Isolator/Panic Button	Honeywell-Notifier/ Siemens/ Schneider/Bosch/ GE Edwards/Tyco
29	Termination Control Cable	Dowell's/ Elemex/ Wago/ Phoenix
30	Door Controller, Card Reader, Biometric Reader, Access Control server Software, Smart card	
31	CCTV Camera/ NVR/ Central Monitoring Software/ Other Items	Honeywell / Pelco /Cisco /Bosch/ GE/ Axis/ Sony
32	PA Speaker, Voice controller, paging station, Microphone	Bosch/ Honeywell/Bose
E. LIFT WORK		

1	Lifts	OTIS/ Kone / Mitsubishi/ Schindler/ Johnson Lifts Pvt. Ltd.