



**Design, Engineering, Procurement & Construction of Bus Depot at Faridabad
on EPC basis**

Under

in

**FARIDABAD CITY
(HARYANA, INDIA)**

(VOL – II)

SCOPE OF WORK

&

TECHNICAL SPECIFICATIONS

Ref No: FCTSL/2019/18

Issued on 14/09/2019

DNIT Amount: ₹ 9.6 Crores.

Employer: Faridabad City Transport Services Limited

Nain Sadan, 3rd Floor, Plot No. 35

Sector 20A, Behind EF3 Mall

Near Old Faridabad Metro Station

Faridabad - 121001

(Haryana)

[EMAIL : FCTSL.CITYBUS@GMAIL.COM](mailto:FCTSL.CITYBUS@GMAIL.COM)

WORK REQUIREMENT

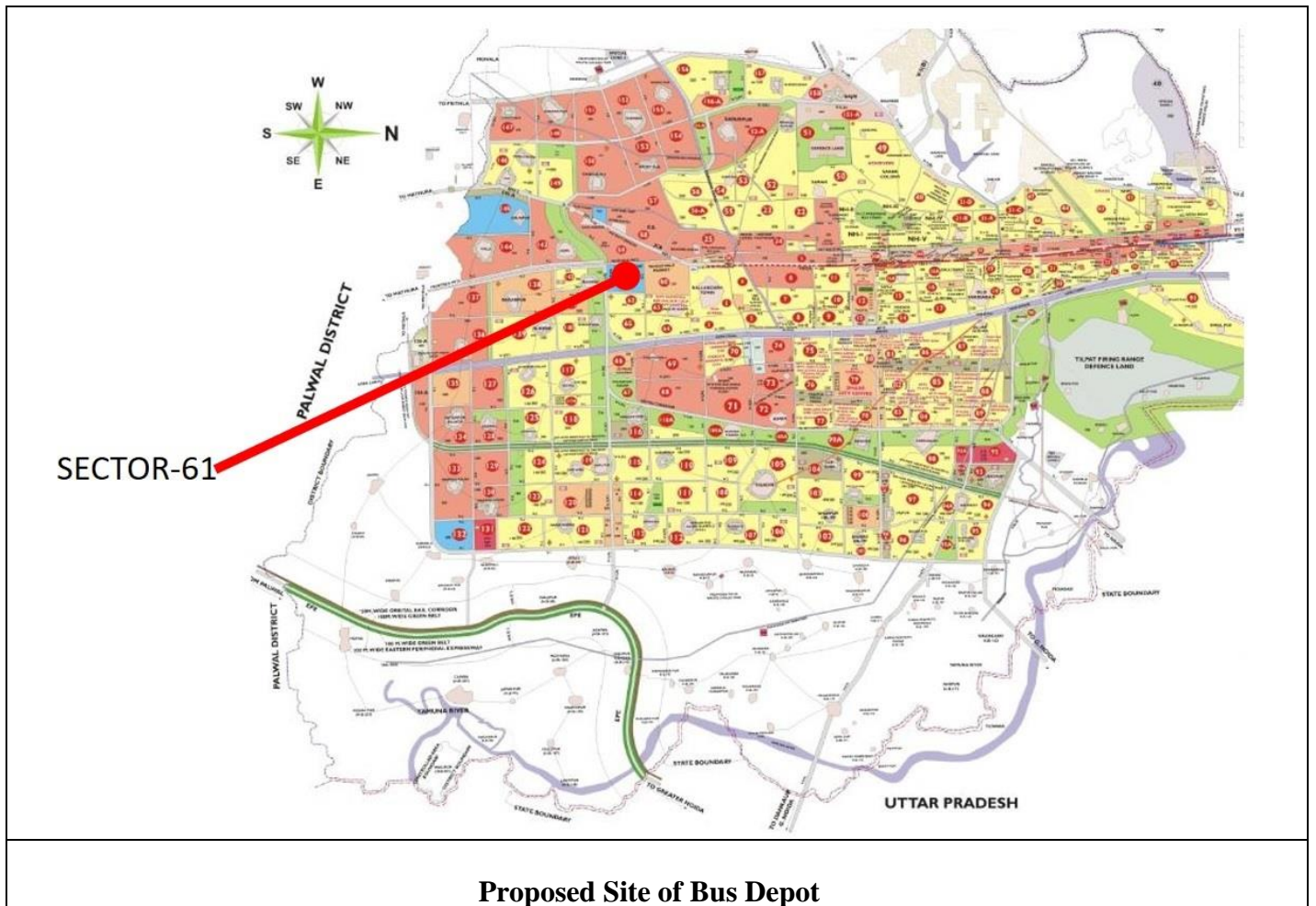
The “Faridabad City Transport Services Limited” Proposed to construct Bus depot was situated at sector-61 of Faridabad.

Size of Land Available is 5 Acre for Bus depot

Bus Depot have been planned in Sector 61, The depot land comes under the jurisdiction of Haryana Shahari Vikas Pradhikaran (HSVP).

For this above project, land parcels at 61 have been identified for development during the base year (2019-20). However, the land parcels for the bus depots are in the process of allocation to FCTSL.

The proposed site of Bus Depots in Fridabad are as shown in figure below.



Scope of Work

FCTSL is in the process of acquiring an Agency for development of bus depots at above sites

The Successful Agency is required to undertake Design, Engineering, Procurement & Construction of Bus Depot at Faridabad on Turnkey basis at the Project Site located in Sector-61 in Faridabad.

The scope of work includes but not limited to:-

- a) Preparation of Architectural Designs and building plans complete with Structure, Plumbing, Lighting, Electrical, Sewerage & Fire Fighting etc.
- b) Preparation of Structural Design and getting them vetted from an IIT/NIT/FCTSL.
- c) Preparation of Bill of Quantity as per CPWD approved specifications and relevant IS Codes and specifications.
- d) Preparation of Detailed Designs and Plan including validation of Architectural Plan for Project Execution and all other related drawings concerned with execution of the Project.
- e) Getting Approvals from FCTSL at each Stage;
- f) Procurement the Structural based on load calculation as approved by FCTSL. The designs shall be proof checked by IIT/NIT.
- g) Construction of workshop block including RCC service pit bus bays & offices, on Load Bearing structure with load/non load bearing walls.
- h) Supply & installation of the High mast street / yard Lighting.
- i) Provision of Internal lighting in Office & workshop with LED lamps.
- j) Designing, Engineering, Supplying & Commissioning, of the Effluent Treatment Plant along with Under Ground RCC tanks for 50,000 ltr storage capacity.
- k) Design, engineering, supplying, and commissioning of Underground Fire Tank for 1,00,000 ltr. Capacity.
- l) Acquisition and provisioning of Automatic fire alarm system for Workshop & Admin block.
- m) Providing fire extinguishers within entire area.
- n) Supplying & fixing of PVC overhead water tanks @ 4 X 10000 Ltr or more in a distributed manner based on end use locations etc.
- o) Construction of Cement Concrete Bus wash platform for washing of buses, complete with facilities for under-chassis washing, wheel washing, water supply and drainage system.
- p) Construction of pump room, meter room, substation building and Guard room etc.on load bearing brick walls.
- q) Construction of the Rain water harvesting pit and the related system.
- r) Construction of tube well ,along with a 150 mm dia pipe one number with submersible pump.
- s) Providing & laying Pavement Quality Concrete for hard standing/ Rigid pavement, generally for bus movement and parking, on-site-repair etc.
- t) Providing & laying Granular Sub Base course over subgrade & Dry Lean Concrete over GSBC.

- u) Construction of service road along boundary wall inside the depot.
- v) Supplying & filling of good quality earth for sub-grade preparation & raising the plinth level of depot.
- w) Supplying & fixing retro reflective sign boards including MS Frame & Skelton structure,
- x) Construction of solid boundary wall supported by RCC columns & Footings,
- y) Construction of GI Chain link fencing supported by MS angle over RCC footings.
- z) Supplying, Installation & Commissioning of 40 KVA Electric sub-station & Solar System,
- aa) Supplying, Designing & installation of a Solar System with 50KVA along with 6hrs power storage backup.
- bb) Providing & applying Road marking over rigid pavement & workshop block etc.
- cc) Providing & laying of services line i.e. drainage, sewage and filtered & unfiltered water supply lines.
- dd) This cost estimates have been arrived at base on condition when normal 10T/M soil bearing capacity with no filling required plot at the land right on the approach road with no culvert required.
- ee) Plots are situated in sector-61 of Faridabad are of tentative size of 5 Acre.
- ff) RO System with water cooler for 80 ltr/hour capacity-01 No.
- gg) Construction of :
 - a) double storied Administrative Block.
 - b) Single Storied Work Shop
 - c) Driver Rest Room
 - with RCC frame structure and load/non load bearing brick walls, etc.
 - i. Any other work required for obtaining a fully operational and duly commissioned depot at each of the locations.

Minimum Development Obligations of the Contractor

The total Project Site has an area of approximately **20800.0 Sq. m at each of the depot..** It is proposed to develop the Bus Depot as a modern iconic structure with modern amenities along with green building norm of GRIHA (Green Rating for Integrated Habitat Assessment)/IGBC (Indian Green Building Council)/ BEE (Bureau of Energy)/LEED Leadership in Energy and Environmental Design) equivalent of at least Silver Rating of LEED.

The iconic building is proposed to be a Ground+1 structure. The total construction area of the proposed facilities is **2410.0 sq. mtr.** apprx as per the **Detailed Construction Area Statement** below and is exclusive of the external development area which is approximately 18390.0 sq. mtr.

20b9

The Detailed Construction Area Statement of the Project is as below:

S.No	Nomenclature	Ground Floor	First Floor	Total Area	SQM
1	Administration Building	605.00	605.00	1210.00	SQM
2	Work Shop	1325.00	0.00	1325.00	SQM
3	Washing Area	150.00	0.00	150.00	SQM
4	Fueling Station	300.00	0.00	300.00	SQM
5	Security Room and Scrap yard	500.00	0.00	500.00	SQM
		Total built-up Area		3485.00	SQM

The above area estimates are on the basis of Indicative Depot Concept Plans. Final area requirements shall be arrived at on the basis of Approved Concept Plans.

Codes and Standard

Wherever references are made in the Agreement to particular codes and standards for execution, testing and commissioning of the Works, the effective edition(s), revision(s), amendment(s) or updating of such codes and standards as of the date of the Agreement execution/ usage of such code/standard, whichever is latest, shall apply, unless otherwise expressly stated in writing by the Authority/Project Engineer.

In case of any conflict between any referenced codes and standards and those in the EPC Agreement, the Contractor shall advise the Authority/Project Engineer in writing and the Authority/Project Engineer has the discretion to determine which version shall prevail.

Broad Specifications Guidelines to be followed by the Contractor

The broad specifications and guidelines to be adhered to while designing and constructing various components of the Project are:

Bus Depot Facilities

The minimum Bus Depot area to be developed shall be approximately 20,800 sq. mtr per depot. which includes the area of the building & bus bays. The works shall include all the construction works to be carried out in each Bus Depot for its development to cater to the future requirements.

1. The scope of works covers detailed design for project execution, detailed engineering and preparation of all related drawings concerned with the execution of the Bus Depot Facility.
2. Provision of staff amenities like Bank, parking areas for public, toilets, drinking water chambers, waiting halls, seating arrangements, dustbins etc.
3. Design and construct supporting infrastructure facilities related to Solid Waste Management, Rain Water Harvesting, Water Supply and Sanitary Installations, Communication System.

Bus Depot Components and Design of the Bus Depot Facilities

Key Facilities in each Bus Depot shall inter-alia consist of following:

1. Bus Depot Facilities

Key Facilities proposed in each Bus Depot are:

- Dormitory for Bus Drivers and Conductors
- Idle Parking Bays
- Bus Circulation Area & Approach Roads
- Toilets/washrooms for staff
- Store Room
- Canteen

2. Staff Amenities

Key Staff amenities proposed in each the bus Depot are:
Public Utilities (Toilets, Drinking Water Chambers etc.)

- Waiting Halls
- Bank
- Commercial Facilities for the Bus Depot Facilities like canteen.

3. Common Areas & Facilities

Major supporting infrastructure requirements proposed in the bus depot is:

- Water Supply and Sanitation Structures
- Storm Water Drainage
- Rain Water Harvesting Structures
- Solid Waste Management Systems
- Communication Systems
- Effluent treatment plant
- Landscaped Area

✓ Factors to be considered for Bus Depot Design

General factors to be considered in Bus Depot design that would call for an appreciation of activity and facility inter-relationship are:

- Segregation of Depot and non-Depot traffic based on activity and activity

concentration pattern.

- Segregation of vehicular and Staff traffic and movement to avoid conflict.
- Segregation of traffic by type, function and direction.
- Co-ordination of different activities in terms of functional and spatial interrelationships.
- Separate access for bus Depot and commercial facilities.
- Provision of good user and vehicular information.
- Provision of necessary and identified facilities to meet requirement of all user groups.
- Achieving minimum Staff and vehicular processing time.
- Achieving overall functional and space efficiency.
- Achieving smooth flow for all types of traffic to and from the Depot.

Indicative Concept Plans have been prepared and provided herein. Bidders are encouraged to bring innovation while preparing the Detailed Plans for the same while taking into consideration fixed parameters.

✓ **Depot Facilities**

(a) Following table indicates the minimum facilities requirements in a bus depot. These are to be provided mandatory as part of the Bus Depot Facility.

Table 1: Minimum Depot Facility Requirements

Sl. No.	Components	Minimum Requirement
1.	Idle Parking	100 Buses
2.	Digital Display Clocks	Digital Display Clocks suspended from the ceiling by suitable holders in the Staff Concourse area.
3.	Public Address System	An announcement booth complete with amplifiers appropriately positioned shall be provided in the Bus depot
4.	Security Guard Cabins	Security Guard Cabins are to be provided near the main entry and exit gates. Depot planning may be such as to need minimal security staff deployment.
5.	Vacuum Cleaners, Floor Cleaners, Automatic Wipers or superior mechanized cleaning equipment.	These shall be provided in adequate number in the Depot for housekeeping activities for ensuring dust free environment
6.	Administration Office Space for (Bus Depot Manager, Traffic Controller Office, Traffic Supervisor along with their respective support staff and other key personnel)	Provision for office spaces for adda- in charges operators/Agencies/Authorized private partner providing city bus services Under PPP concept and operating from the Bus Depot.
7.	Store Room	Store room shall be provided in the bus depot premises for various storage requirements.

Bus Entry / Exit to the Depot

- Bus circulation pattern in the bus Depot shall be such that there is no queuing of buses at the entry / exit gates in the Depot.
- Entry and exit for buses shall be separate from the other vehicles. Speed-breakers may be provided near the entry and exit gates.
- In case, more than one entry and exit gate is provided on the roadside, a buffer of minimum 7 m shall be provided parallel to the same road.

Bus Depot Parking Area

- Designated parking area shall be allotted for the public and private vehicles along with the drop in and drop off facility, without any interaction with depot vehicles.
- Entry and exit for the parking areas of IPT and private vehicles shall be segregated by use of railings or medians.

✓ Pavement for Bus Depot

- Contractor shall construct the bus circulation and the parking area along with the approaches/roads to various components in the bus Depot with rigid pavement.
- The pavement shall be designed as per the standards of IRC and the National Building Code.

✓ Idle Parking for Buses

- Idle parking bays are to be earmarked separately within the bus depot. However there shall be enough circulation area, to ensure safe movement, turning and manoeuvrability of buses.
- The idle parking bay area shall be marked and designated with thermoplastic paint along with the provision of appropriate Informatory signages.

• Traffic Signs and Signage

Contractor shall provide signage with bus crew focused approach. While designing the same, following guidelines amongst other shall be adhered to:

- Adequate number of traffic signs shall be provided in bus depot for convenience of crew.
- As far as possible, architectural elements, landscaping, and other design features shall identify entrances, exits, etc.
- Signs shall be located for maximum visibility at or before all decision points within the facilities.
- Signs shall be placed at frequent intervals so that any infrequent or new user can readily find his or her way without assistance.

- All signage's should comply with relevant standards and codes.
- Signage shall also include items relating to regulatory enforcement (e.g. no smoking, no parking here, etc).
- Relate outbound Staffs to the surrounding community with appropriate signage.
- Pavement markings shall be provided as per the requirement in the bus depot area for convenience of crew and users.

Functional and Geometric Design Dimension Parameters

Table no.2 provided indicative the minimum dimensions related to functional and geometric design aspects of the bus Depot components.

Table 2: Indicative Minimum Functional and Geometric Dimensions

Sl. No.	Parameter	Minimum Requirement
1	Bus Bay dimension	3.5m x 10.0m clear along with a stub arm m wide space of 1.2
2	Turning radius movement for bus	Not less than 12.0m
3	Driveway width for bus	Not less than 12.0m
4	Driveway width entry/exit gates at the bus	Not less than 9.00 m

Minimum Staff & Public Amenities Requirements

- a) The bus depot shall consist of various staff amenities. These are to be in adequate number, located and designed for staff convenience. The following staff amenities are mandatory to be provided as part of the Bus depot Facility. All staff facilities shall be provided and maintained as per best practices in modern bus depot of similar traffic characteristics. The amenities shall include but not limited to the following:
1. Waiting Halls
 2. WC for Ladies
 3. WC for Gents
 4. Urinal for Gents
 5. Cloak Room
 6. Parking Area
 7. Drinking Water Chambers
 8. Seating Arrangements
 9. Dustbins
 10. Canteen / Cafeteria
 11. Kiosks (Not eateries or Dhabas and other General Shops)
 12. Ramps for handicapped and Disabled people

13. Public Relations Office

14. Parcel Room

15. Wheel Chairs.

Staff Amenities (on Commercial basis) within the Bus Depot Facility

- a) Contractor shall develop Staff amenities (on commercial basis in the form of canteen / cafeteria) in the bus Depot in accordance with the volumetric constraints as provided herein for the commercial and finally fixed as per the approved plans. These Staff amenities shall be a part of the Bus Depot Facility and shall be in compliance with the Applicable Laws and in accordance with the Technical Requirements in this behalf. The Staff amenities area development is to be done as per the technical specifications mentioned in the RFQ cum RFP document and good engineering practices.
- b) The range of Staff amenities (on commercial basis) that shall be developed by the Contractor shall include but not limited to the following:
 - 1) Canteen
- c) The Contractor would ensure, by either planned allocation of space or control that any activity generated by commercial establishments, if any, should not hamper the bus depot operations or people's movement in the public concourse area.

Bus Depot Parking Area

- a) Parking area shall be integrated with the bus depot such that there is easy accessibility for the staff & public. The parking area shall be suitably segregated into lots for two-wheelers, cars, auto rickshaws and cycles.
- b) shall be constructed with rigid pavement to withstand vehicle loads and forces due to frequent acceleration and deceleration of vehicles. Parking bays/lots shall have proper cross slope and drainage. They shall be marked with paint as per the applicable codes to demarcate parking and circulation space.

Common Area and Facilities

- **Water Supply Structures**

Contractor shall provide adequate number of Water Storage and Supply Structures in the form of Over Head Water Storage and Under Ground Water Storage Tanks. These tanks shall be of adequate capacity to meet the peak hour requirements of the bus Depot and shall be designed and built as per relevant standards. Apart from meeting the user requirements, water storage shall be maintained for meeting the contingency requirements in case of fire or similar incidents.

The water supply distribution network shall be laid exclusively for the Bus Depot Facilities. Separate water supply meters shall be installed for usage by Bus Depot.

Contractor shall provide adequate number of Sanitation structures along with proper flushing and cleaning arrangement.

- **Rain Water Harvesting Structures**

Contractor shall mandatorily provide rainwater harvesting system in the bus Depot. This shall consist of a properly designed network, which shall be cleaned and maintained at all times.

- **Solid Waste Management System**

Contractor shall provide adequate support facility for storage of solid waste at the bus Depot. The facility shall have a proper enclosure and should be aesthetically pleasant. The entire solidwaste from the bus Depot shall be collected and stored in this facility, before being taken for disposal by relevant authorities.

- **Communication System**

Contractor shall provide a state-of-art communication system which shall primarily consist of telecommunication and networking equipment. These shall form the basic infrastructure for implementing the Management Information System in the bus Depot.

Different departments/maintenance staff of the Contractor should be accessible on call at all times. Preferably walky-talkies and wireless local loop phones shall be provided.

- **Landscaping Area**

No area/pocket in the bus Depot is to be left barren. Adequate landscaping shall be done in the Project Site Area. This area has to be suitably provided for improving aesthetics of the bus Depot. The pockets shall be properly illuminated and railings of suitable type shall be provided to boundary the area. Landscaped area shall be provided as a buffer between the Staff concourse area and the commercial development component.

- **Electricity Supply & Illumination Standards**

An electric sub-station if required shall be provided for the bus Depot facility, open area, workshop building, fuelling stations, depot yard including high mast lighting, administrative offices complex etc

Apart from the electric supply, in case of emergencies, there shall be provision for Standby Diesel Generator Sets (To be provided by the bus operator) of suitable capacity which shall be provided for the bus Depot facility, open area, offices,

workshop requirements in a non-polluting manner for providing electricity to the depot during power break down and cuts. The depot shall be adequately lit as per the the minimum approximate illumination standards prescribed. During night time common areas and facilities should be sufficiently illuminated to ensure visibility and safety to users. High mast lighting shall be provided to lit up the bus Depot area.

Table 3: Minimum Illumination Standards

Sr. No.	Project Component	Minimum Approximate Illumination (Lux)
1	Staff Circulation Area	150
2	Administrative Office	150
3	Corridors	70
4	Restaurant	70
5	Cloakroom	100
6	Toilets	100
7	Waiting Halls	150
8	Roofs	20
9	External Lighting	20

Entry and Exit Area Specifications Location

Location of the Entry and Exit Areas and of the driveways along with their connection to the road system should be made properly free from any friction amongst incoming/outgoing / the staff etc.

Size

The Entry and Exit Areas must be sized to allow drivers to safely and comfortably drive the vehicles in and out. Turning radii and width of drive aisles and minimum clear width of Entry and Exit Area shall be designed according to the respective needs leaving adequate space to the left and right of the buses for Staffs to leave / enter the bus and in accordance with Applicable Codes.

Components

- a) All Entry and Exit Areas must comply with disability requirements.
- b) The driveways for inbound and outbound traffic shall be designed to provide sufficient queuing spaces; simple visual signage and guidance shall clearly direct approaching traffic off the street and into the Entry and Exit Areas. Respective commands via a visual message centre shall be applied inside the Depots for the drivers in such manner that an easy use of the system is

possible.

- c) Inbound / outbound traffic crossing shall be prevented.
- d) As Entry and Exit Areas are the exchange station of the Parking Structure, special attention shall be directed to ease the “drive-in” and positioning of the car by the drivers (preferably by means of physical aids)
- e) The Ticketing Station or access system shall be located outside the Entry and Exit Areas on the right side of the inbound traffic.
- f) If the system has installed radio frequency access system, the readers shall have enough range to detect approaching vehicles from at least 9 meter outside of the Entry and Exit Areas.

Fire Safety/Fire Fighting

- a) Fire safety measures as recommended in applicable codes shall be implemented.
- b) Construct the ‘Parking Facilities’ structure with non-combustible construction materials with a specified fire resistance. In addition, those portions of the facility used for the transport and / or storage shall have a finish of non-absorbent, non-combustible material.
- c) Contractor shall make all provisions in the construction as per the Relevant Fire Safety Act as well as take all measures as per the rules and regulations including guidelines from Central Government, State Government and drafted by the ULB and any agency appointed by the government on the subject.
- d) Sprinkler systems should be provided in the parking bays as per fire safety act.

Ventilation

- a) Areas accessible to the drivers / staff /employees shall be equipped with sufficient ventilation.
- b) Depending on the design of the Entry and Exit Areas, a ventilation of emissions may be required in that area.

Lighting/Accessibility For Maintenance

- a) Lighting in areas accessible to the drivers / staff /employees shall be properly illuminated.

Energy Efficient Building

Contractor shall ensure energy efficient buildings/ infrastructure and energy management and shall follow Energy Conservation Building Code (ECBS) design norms while executing the Works.

Solar panel

Scope of work includes the Engineering, Procurement and Construction of the works (EPC works), involved in the proposed Solar Panel.

This consists of the design, engineering, manufacturing, procurement, supply/ transportation of materials at site, project management, unloading of materials at site, storage at site, handling of material at site, installation of all piping, cabling and Appurtenances, Instrumentation and electrical system and other equipment’s.

The scope of supply and services for the equipment / plant / systems covered under this offer shall be read in conjunction with the battery limits, exclusions, detailed system description, etc. which have been provided elsewhere in this document.

The detailed scope matrix is as follows:

- Solar Photovoltaic panel, Inverter selection and configuration
- Distribution boards, junction boxes, cables.
- Earthing for solar modules and inverter.
- Control room and Switchyard (CSS type – Container Design complying with the relevant IEC and BIS specs).
- Internal roads, Street lighting with Solar lights, bore well and water supply
- Lighting and surge protection
- Weather monitoring station with Pyronometer.
- SCADA and communication
- Fencing, gate and watchman shed.
- Installation and Commissioning.
- Project management.

CONSTRUCTION STANDARDS

- a) Contractor shall follow National Building Codes for Purposes of Building Design & Specifications. For purposes of Road Work, relevant specifications of IRC and MORTH guidelines shall be followed.

All the items of work shall be executed as per CPWD specifications / relevant IS Codes and specifications. The design of facilities for the handicapped and the disabled people, like the toilets, bathrooms, ramps shall be as per the respective IS Codes. **Fly ash as per directives of the Central / State Government to be used wherever applicable.**

APPROVALS

Contractor shall be required to get the following approvals:

1. Final Design/Concept Plans approval from FCTSL. For this purpose, FCTSL shall appoint "Project Engineer" who shall be responsible for day to day monitoring of works by the Contractor.
2. Structural Designs Approval from IIT/NIT/FCTSL.
3. Detailed working drawings on the basis of which actual work is to be preceded will be furnished by the Contractor to Project Engineer from time to time.
4. Getting approval of the Final Bill of Quantity from the Project Engineer. The decision of the Project Engineer shall be final in this respect.
5. Performance tests shall be carried out on all/any items of work as directed by the Project Engineer. Should any item fail to pass the tests, the Contractor shall be given opportunity to take corrective measures and have the same re-tested to the satisfaction of the Project Engineer, who may at his sole discretion order dismantling of the whole or part of the works done and order the Contractor to reconstruct the same. The cost of all these operations and materials shall be borne by the Contractor without any extra claim.

1.2 SCOPE OF WORK

1. 2.1 This specification covers the drilling and construction of tube wells, the requirements r development and final tests of tube wells. The drilling and construction of tube wells shall also conform to IS: 2800 (Part-1). Development and final tests of tube wells shall also conform to IS: 2800 (Part-2).

1. 2.2 This section of the tender Documents deals mainly with the Scope and Technical Specifications needed for the boring, development of Tube wells and for supply and installation of submersible pumps as per details given below. The scope of work includes Transportation of all equipments and erection, boring, development and testing as per relevant IS codes and as per schedule attached based on the locations

within the site as per the directions of the site officer at proposed “**BUS DEPO AT FARIDABAD**” as per the items indicated in the "Schedule of Rates".

1.2.3 WATER REQUIREMENTS

- a) No of Tube wells : 1 Nos
- b) Capacity of tubewell : 10 Cu.M/hr at 150 M.
- c) Type of service : Continuous
- d) Use of Water : Domestic & Drinking
- e) Quality of Water : Potable
- f) Location : Faridabad, Haryana

2.0 CODES AND STANDARDS

2.1 All standards and codes of practice referred to herein shall be the latest editions including all applicable revisions issued.

2.2 All works shall be carried out as per the relevant Indian Standard Codes. In case of conflict between the specification and the IS Codes referred to herein, the former shall prevail.

Some of the applicable Indian Standard Codes referred to here are given below:

IS : 432 (Part-1 & 2)	Mild Steel and Medium Tensile bars and hard drawn steel wire for concrete reinforcement.
IS : 456	Code of practice for plain and reinforced concrete.
IS : 816	Code of practice for metal arc welding for general construction in mild steel.
IS : 1239	Mild steel tubes, tubular and other wrought steel fittings.
IS : 1786	High strength deformed steel bars and wires for concrete reinforcement.
IS : 2062	Weldable structural steel.
IS : 2800 (Part-1&2)	Code of practice for tubewell
IS : 4097	Gravel for use as pack in tube wells.
IS : 4270	Steel tubes used for water wells.
IS : 8110	Well screens & slotted pipes.
IS : 13083	Liquid Flow measurement in open channels-flat -V weirs.

3.0 GENERAL REQUIREMENTS

- 3.1 The work shall include mobilization of all necessary equipments, providing necessary engineering supervision through qualified and technical personnel, skilled and unskilled labour etc., as required to carry out design, drilling, construction, development, final tests etc., of tube wells and submission of results / records as indicated in this specification.
- 3.2 The Contractor shall guarantee the “Safe Rated Discharge” of the tubewell installed by him.
- 3.3 Consequent upon award of work and prior to installation of tube wells, the Contractor shall submit design of tube well in terms of discharge, length and diameter of housing, blank and shrouded strainer pipes, termination depth etc., for the approval of Owner / Consultant. Owner’s approval on the design of tube wells will not in any way absolve the Contractor of his final responsibility for fulfilment of the performance and guaranteed discharge of the tube wells.
- 3.4 The Contractor shall make his own arrangements for locating the coordinates and position of tube wells shown in approved drawings and for determining the Reduced Level (R.L) of these locations with respect to the single bench mark indicated by the Engineer-in-Charge. Two established reference lines in mutually perpendicular direction shall be indicated to the Contractor. The Contractor shall provide at site all the required survey instruments to the satisfaction of the Engineer-in-Charge so that the work can be carried out accurately according to specifications and drawings.
- 3.5 Full details of the equipment proposed to be used for the drilling, construction, development and tests of tube wells shall be submitted to the Engineer-in-Charge, before starting the drilling, for his approval.
- 3.6 All operations in connection with the drilling, construction, development and tests of the tube wells shall be carried out in a safe manner so as to prevent the exposure of people to hazard.

In case all the above operations are to be executed in the existing plant, the Contractor shall take all necessary precautions to protect all the existing equipment, structures, facilities and buildings, etc., from damage. In case, any damage occurs due to the activities of the Contractor on account of negligence, ignorance, accidental or any other reasons whatsoever, the damage shall be made good by the Contractor at his own cost to the satisfaction of the Owner / Consultant. The Contractor shall also take all necessary safety measures at his own cost, to avoid any harm / injury to his workers and staffs from the equipment and other facilities of the existing plant.

- 3.7 If under any circumstances drilling of the tubewell is to be discontinued by the Contractor for any reason and it is decided to abandon the drilling spot, the Contractor shall carry

out the drilling operation at some other location to be decided by the Engineer-in-Charge without any extra cost to the Owner.

3.8 After completion of tube well, the Contractor shall submit 4 (four) copies of the following documents for the record and future reference of Owners / Consultants:

- a) Strata Chart in the form as indicated in Clause No. 5.5.3 along with Drilling time log and dried samples of strata preferably in polythene bags.
- b) Chart showing pipe assembly provided for the tube wells.
- c) Results of Development of tube well as per Performa as prescribed in Annexure-B.
- d) Step Draw-down and Aquifer Performance Test data / results as per Performa prescribed in Annexure-C and Annexure-D respectively.
- e) Results of Chemical Analysis of water samples, collected during Aquifer Performance Test, in the form as indicated in Clause No. 9.0.

4.0 MATERIALS

4.1 GENERAL

All materials viz. electric resistant welded pipes, pea gravel, cement, steel reinforcements, aggregates, water etc., which are to be used for tubewell construction shall conform to relevant IS Codes Specifications for properties, storage and handling of common building materials. However, aggregates more than 20 mm shall not be used.

4.2 CEMENT

The cement shall be Ordinary Portland Cement conforming to IS: 269 or as decided by the Engineering-in-Charge.

4.3 AGGREGATE, WATER, ADMIXTURES, REINFORCEMENT ETC

Coarse and fine aggregates for cement concrete plain and reinforced, water, admixtures, reinforcements shall be as per relevant clauses of IS:456.

4.4 TUBEWELL ASSEMBLY

The tube well assembly shall comprise mainly electric resistance welded mild steel plain-ended pipes/tubes conforming to IS: 4270 and IS: 1239 in general. The grade of steel for the above pipes shall be ST 42. The plain ended pipes shall be with both ends bevelled for welding. The angle of bevel shall be $30^{\circ} \pm 5^{\circ}$ measured from a line drawn perpendicular to the axis of the pipe and with root face of 1.6 ± 0.8 mm. The pipes shall

be reasonably straight, free from harmful defects, of good commercial finish and free from loose scale and rust.

a. **Housing Pipe.**

This shall be electric resistance welded (E.R.W) mild steel pipe of minimum 200 mm nominal diameter (i.e, 219.1 mm outside diameter) having shell thickness of minimum 6 mm and tested for 77 kg/sq.cm pressure.

b. **Blank Pipes.**

This shall be E.R.W. mild steel plain ended pipes of minimum 150 mm nominal diameter (i.e, 168.3 mm O.D) with shell thickness of minimum 6 mm and shall be tested for 100 kg/sq.cm. pressure. The plain ended shall be bevelled for welding.

c. **Taper Reducer.**

Taper reducer of size 219.1 mm x 168.3 mm O.D shall be of mild steel plate conforming to IS: 2062 and having beveled ends for welding. The smaller diameter end shall be suitably ground for matching the thickness of the blank pipe.

d. **Strainer Pipes.**

The strainer pipes shall be shrouded with pea-gravel filters and it shall be Hagusta brand or its approved equivalent. The strainer pipes shall be plain ended mild steel pipes with beveled ends. The size of the same shall be minimum 150 mm nominal dia (168.3 mm O.D) with shell thickness of minimum 6 mm and tested for 100 kg/sq.cm. The sizes of perforations or slots for the strainers are so designed that the total opening area available is adequate to pass the water in filtering from the aquifer without exceeding the critical velocity. The slots or perforations are milled such a way that the strength of the pipe is not impaired. The slotted pipes shall have slots preferably of width minimum 1.6 mm with side's perpendicular to the surface of the pipe and of length minimum 65 mm. The opening area of the slots shall not be less than 15% of the total surface area of the strainer pipes. Bigger slots of 3 mm in width and 500 mm in length are provided in conjunction with pea-gravel shroud of 100 mm to 250 mm thick all round. The slots are V-shaped with the smaller opening at the outside.

Slotted mild steel pipe core shall be coated with anti-corrosive paint and provided with an enveloping graded pea-gravel shroud bonded with heat resistant, water repellent plastic.

e. Centralized Guide shall be of mild steel and shall be placed at every 10.0 m interval.

f. Bail Plug or Bottom Plug. The bottom end of the blank pipe shall be plugged. Bail plug or bottom plug shall be fabricated from E.R.W. mild steel pipe of 168.3 mm O.D. having 6.0 mm shell thickness with a mild steel bull-nose.

g. Housing Clamp shall be of mild steel plate of 25.0 mm thick and shall be fixed at the top of the housing pipe. This shall be embedded in plain cement concrete (nominal mix - 1

cement : 1½ coarse sand : 3 graded coarse aggregate of 20 mm nominal size) foundation of size 2000 mm x 2000 mm x 1300 mm depth below finished floor level.

- h. Well cap shall be of mild steel having 219.2 mm O.D. It shall be either threaded type or a plate type suitably fixed with bolts and nuts for easy removal, when required.
- i. Bull-nose shall be of mild steel rod connected at the bottom of the well plug-pipe.

4.5 GRAVEL

- a) Pea-gravel used for packing shall conform to IS: 4097 and shall be free from impurities such as mica, feldspar, clay, sand, dirt, loam and organic matter.
- b) All pea-gravels shall consist of hard well rounded particles reasonably uniform in diameter and shall be of size ranging from 3.0 mm to 5.0 mm with maximum 10% tolerance in grading or as decided by the Engineer-in-Charge depending upon the sand size of the aquifer. The pea-gravel shall have a hardness not less than 5 (five) in Moh's scale and uniformity co-efficient shall be 2 or less.
- c) The grading of the gravel shall be as per IS: 4097 and size of the pea-gravel shall be 6 (six) to 10 (ten) times of the largest diameter of the sand of the aquifer.

4.6 PAINTING OF PIPES

- 4.6.1 All pipes and specials shall be painted with two coats of anti-corrosive bituminous paint both inside and outside before welding and lowering is started. The joints after welding shall also be painted from outside before lowering.
- 4.6.2 The bituminous paint shall be of quality such as to produce a coating which, when dry, shall be smooth, tough and tenacious and sufficiently hard not to flow on exposure to a temperature of 63° C and shall not be brittle at 0° C.

4.7 EQUIPMENT AND ACCESSORIES

- 4.7.1 The equipment and accessories for drilling and construction of tube wells consisting of derrick, suitable cables and reels for handling the tools and lowering the well pipe in the boreholes, a rotary table for rotating the drill pipe and bit, pumps for handling mud fluid, etc., complete, shall be supplied by the Contractor for successful operation of the drilling. These shall be of standard type and shall have the approval of the Engineer-in-Charge. The Contractor shall maintain them in good condition throughout the progress of the work.
- 4.7.2 List of details of equipment and accessories proposed to be used for the job shall be submitted along with the bid.
- 4.7.3 The capacity of the rig shall be adequate so as to reach the desired termination depth.

5.0 DRILLING

5.1 METHOD OF DRILLING

Drilling operations shall be done by Hydraulic Rotary type drilling rigs using direct / reverse mud circulation (DMC or RMC) methods. In soft clays and loose sands, bailer method, if used, shall be used with caution to avoid the effect of suction. Boring operations by any of the above methods shall be done using drilling mud.

5.1.1 Direct Mud Circulation

A drill bit is rotated mechanically through a hollow shaft known as drill pipe, circulating prepared drilling mud (usually bentonite with certain chemicals added to give it a gelling quality) under pressure, through the drill pipe. This process of circulation lubricates the bit, carries in suspension the drilled cuttings and also plasters the wall of the hole to prevent it from caving in.

5.1.2 Reverse Mud Circulation

A string of drill pipes with a drill bit at the bottom is rotated by mechanical means. Plain water or a fluid of gelling quality, depending upon the strata conditions, is circulated to prevent the hole from caving in and for sucking up the drill cuttings through drill pipes.

5.2 SUITABILITY OF THE METHOD

The Contractor shall satisfy himself about the suitability of the method to be adopted for site. If DMC or RMC is used, bentonite slurry shall be pumped through drill rods by means of high pressure pumps. The cutting tool shall have suitable ports for the bentonite slurry to flow out at high pressure. If on mobilization the Contractor fails to make a proper bore for any reason, the Contractor has to switch over to other boring methods as approved by the Engineer at no extra cost to the Owner.

5.2.1 Use of drilling mud (bentonite suspension / slurry) for stabilizing the wall of the tubewell bore is necessary wherever it is likely to caving in. Drilling mud to be used shall meet the following requirement:

- a) Liquid limit of bentonite when tested in accordance with IS: 2720 (Part - V) shall be more than 300 percent and less than 450 percent.
- b) Sand content of the bentonite powder shall not be greater than 7 percent.
- c) Bentonite solution should be made by mixing it with fresh water. The density of the freshly prepared bentonite suspension shall be between 1.034 and 1.10 gm/ml depending upon the tube-well dimensions and type of soil in which the tube-well is

to be installed. However, the density of bentonite suspension after mixing with deleterious materials in the bore may be up to 1.25 gm/ml.

- d) The Marsh viscosity when tested by a Marsh cone shall be between 30 to 60 seconds.
- e) The differential free swell shall be more than 540 percent.
- f) The pH value of the bentonite suspension shall be between 9 and 11.5.

5.2.2 The bentonite slurry and the cuttings, which are carried to the surface by the rising flow of slurry shall pass through settling tanks of adequate size to remove the sand and spoils from the slurry, before the slurry is recirculated to the boring. The bentonite slurry mixing and recirculation plant shall be suitably designed and installed.

5.3 CLEANING OF BORE

5.3.1 After completion of boring up to the required depth, the bottom of the bore shall be thoroughly cleaned. Cleaning shall ensure that the bore is completely free from sludge / bored material, debris of rock / boulder etc.

5.3.2 Tube-well bore spoil along with used drilling mud shall be disposed off from site as directed by the Engineer-in-Charge.

5.4 ADJACENT STRUCTURES

5.4.1 When working near existing structures care shall be taken to avoid any damage to such structures.

5.5 GEOLOGICAL DATA

5.5.1 Samples of drill cuttings from different strata should be collected at every 2.0 metre depth drilled or at closer intervals if a change in the strata is met with.

5.5.2 The samples should be dried and stored in neat cloth or polythene bags which should be levelled clearly indicating the depth range of the strata.

5.5.3 After the drilling has reached sufficient depth, all the samples of strata collected should be carefully examined and analysed and a strata chart in the form given below should be prepared, indicating the probable strata, which are likely to yield water.

SL.NO.	LITHOLOGY	DEPTH	THICKNESS
		RANGE	
1.	Clay, top soil, brown etc.		
2.	Clay, brown, silty with trap gravel		
3.	Gravel, consisting of trap, sub-angular to rounded with some trap sand, calcareous material, etc.		
4.	Gravel, consisting of trap, sub-angular to rounded mixed with clay and kankar.		
5.	Gravel, consisting of trap, sub-angular to rounded (pea size), with angular pieces of fresh or weather trap etc.		
6.	Gravel, consisting of trap (size up to 50 mm in dia) with very coarse trap sand.		
7.	Gravel, consisting of trap (pea size) with coarse sand, consisting of altered trap, agate, flint, chert and fresh calcite		
8.	Clay, brown, yellowish brown, chocolate or grey, hard, plastic with a little angular to sub-angular trap gravel.		
9.	Trap basalt.		

5.6 DRILLING TIME LOG

- 5.6.1 As the drilling progresses, an accurate drilling time log shall be kept indicating the time taken to drill each 3.0 m depth. This log will enable interpretation regarding the nature of the formations (hard, soft, unconsolidated, etc.) which has a bearing on the water yielding capacity of the formations.
- 5.6.2 After the completion of drilling up to the desired depth, the borehole shall be electrically logged to collect adequate information about the conditions of the formations.

6.0 DESIGN AND LOWERING OF PIPE ASSEMBLY

6.1 GENERAL

- 6.1.1 From the data collected about the nature of the aquifers met, the Contractor shall design the tube wells in respect of size and length of the housing pipe, blank pipes, pea-gravel shrouded

Slotted or perforated pipes, and bail plug etc. It should be ideal to have the length of the slotted pipes or screens exactly equal to the thickness of the aquifers to be tapped. However, in practice the actual length of each of the housing pipes, blank pipes and pea gravel shrouded pipes may be kept as multiple of the length of the pipes available in the market, provided there is no difficulty, such as intrusion of water from a saline aquifer and gradation in the texture of formation material.

- 6.1.2 The sizes of perforation or slots for pea-gravel shrouded strainer pipes shall be so designed that the total opening available is adequate to pass the water in filtering from the aquifer without exceeding the critical velocity.
- 6.1.3 In case of patented pea- gravel shrouded strainers, the manufacturer's directions shall be followed to obtain the best results.
- 6.1.4 The circumferential, longitudinal or spiral seams of the metal casing shall be welded in such a manner as to develop strength nearly equal to that of the parent metal. It is preferable to use seamless steel pipes.

6.2 GRAVEL PACKING OF TUBEWELL

- 6.2.1 All gravel shall consist of hard well-rounded particles reasonably uniform in diameter and shall be of a size determined after analyzing the character of the water bearing formation to be packed. A minimum thickness of 150 mm of the pea-gravel shroud around the strainer pipes shall be provided to prevent inflow of sand from the aquifer under normal operating conditions.
- 6.2.2 With the hydraulic rotary drilling, the pipe assembly shall be lowered into the borehole in position and gravel-packing shall be done up to the bottom of the housing pipe. Verticality of the housing pipes shall then be tested and the defects, if any, shall be rectified. Thereafter, the gravel-packing up to the top shall be completed. The feeding of the gravel shall be done in such a manner that there should not be any bridging in the annular space. To avoid bridging, the circulating fluid shall be pumped to agitate the gravel during feeding of gravel.

6.3 PLUMBNESS AND ALIGNMENT

- 6.3.1 The verticality shall be checked immediately after the housing pipes are installed but prior to commencing the gravel filling.

- 6.3.2 If the tubewell pipe assembly is found inclined before filling the gravels, the assembly shall be pulled in desired direction by applying force through jacks or by other means with a view to rectify the slantness and bring the pipe assembly within the permissible limits of verticality. The gravel filling operation shall then be undertaken immediately after the verticality has been rectified and tested. If necessary, remedial measures should also be adopted in between by means of jacks or any other means to bring the pipe assembly within the permissible limits of verticality.
- 6.3.3 For tube wells encased with pipes less than 350 mm diameter, the verticality of the tubewell shall have a deviation not exceeding 10 cm per 30 m of depth of the tubewell and the deviation shall be in one direction and in one plain only. The verticality of the tubewell shall be determined according to the method described in Clause No.7.9.4 of IS: 2800.

7.0 DEVELOPMENT OF TUBEWELL

After completion of gravel packing, the dirty water from the tubewell shall be pumped out and the development of the tubewell shall be carried out as under in the presence of Engineer-in - Charge who will issue a certificate to the Contractor for the satisfactory completion of the test.

- 7.1 The well shall be developed either by surging, including washing and agitating, or by over-pumping and back-washing with an air lift. The development process shall be continued until the stabilization of sand and gravel pack is completely assured.
- 7.1.1 Initial development of tubewell shall be carried out by means of compressed air. The compressor to be used for this purpose shall have minimum capacity of 10 cu.m./minute under a pressure of 7.5 kg / cm² (Compressor etc., for the above test shall be provided by the Contractor at his own cost).
- 7.1.2 A suitable diameter of pipe for air supply, approved by the Engineer-in-Charge shall be lowered into the well. The air shall be released suddenly into the tubewell by means of quick opening of valves. The bottom of the air pipe shall be moved up to and down along the aquifer depth to agitate the aquifer evenly.
- 7.1.3 Development by air injection and pumping shall be continued till the sand free water is obtained to the satisfaction of the Engineer-in-Charge.
- 7.2 After the initial development is completed, the tube wells shall be further developed by means of deep well turbine pump (to be provided by the Contractor for the test at his own cost).
- 7.2.1 The discharge of the pump during development shall correspond to a draw-down of 50% higher than the normal drawdown at which the tubewell will be working during its

normal continuous operation. The pump shall be fitted with a depth gauge and pressure gauge.

7.2.2 The development of tubewell shall be continued till:

- a) The tubewell ceases to absorb further gravel.
- b) A specific capacity at a given RPM becomes constant and
- c) The water remains sand free with maximum tolerance of 10 parts of sand in one million parts of water by volume after 30 minutes continuous running of the pump.

7.2.3 In case, the condition under clause No. 7.2.2 is achieved earlier than 12 (twelve) hours from the starting of the pumping operation, the Contractor shall continue the pumping operation for not less than 12 (twelve) hours.

7.2.4 The tubewell shall be further pumped for at least 4 (four) hours and pumping level shall be measured by the Contractor at an interval of every one hour and shall be passed on to the Engineer-in-Charge.

7.2.5 After the development of tube well, the Contractor shall remove all material, which might have accumulated by the side of the tubewell to a place directed by the Engineer-in-Charge at no extra cost to the Owner / Consultant.

7.2.6 Where a depression of 50 percent higher than the normal depression cannot be arranged, the tubewell may be over-developed so as to yield a discharge 20 percent excess of the rated discharge.

7.2.7 The results of the development of tubewell shall be tabulated in the Performa as prescribed in Annexure-B.

8.0 FINAL TESTS

The following tests shall be conducted on the completed tube well:

- a) To find out the performance of the tubewell in regard to yield and drawdown
- b) To select a suitable size and type of pump to be installed in the tube well.

8.1 STEP DRAWDOWN TEST

8.1.1 This test shall be conducted by installing a test pump in the tubewell temporarily and pumping out water at various speeds or by throttling delivery sluice valve. At each rate of discharge, pumping is carried out at least for 30 minutes. If the water level and discharge are found to be fluctuating, the development of tubewell shall be carried out for some more hours, until the discharge becomes steady and sand content is within the

above tolerance limits. The specific capacities of the tubewell for various pumping rates shall be computed based on the step drawdown test data.

8.1.2 The discharge shall be measured by any of the methods detailed in Clause No. 11.2.5 of IS: 1710.

8.1.3 The data of the Step Drawdown Test shall be recorded as per the Performa given in Annexure-C.

8.2 AQUIFER PERFORMANCE TEST

8.2.1 This test shall be conducted after the tube well is allowed sufficient time to recoup its normal condition after step drawdown test.

8.2.2 The tube well shall be pumped at a constant discharge rate and pumping water level shall be measured at close intervals of time during the initial stages of pumping. The measurement of water level should be conducted according to any of the recognized methods, such as graduated steel tape and electrical method. After pumping continuously at constant discharge for at least four hours, the pump shall be stopped and water level in the tube well shall be noted at very close intervals as it recoups. The process is continued until the water level attains the original static water level in the pumped tube well.

8.2.3 The test data so obtained shall be tabulated in the Performa as given in Annexure-D.

9.0 CHEMICAL ANALYSIS OF WATER SAMPLES

The water samples shall be collected during aquifer performance test for carrying out the chemical analysis of water. The following tests shall be carried out for one sample collected from each tube well. The chemical analysis of water shall be carried out as per standard methods.

1. Temperature.
2. Odour
3. Colour
4. Turbidity
5. Characteristics showing slim and sediments
6. Total dissolved solids
7. Suspended solids
8. pH value
8. Phenolphthaleine alkalinity as CaCO_3

9. Methyl orange alkalinity as CaCO₃
10. Temporary hardness as CaCO₃
11. Permanent hardness as CaCO₃
12. Calcium as CaCO₃
13. CaSO₄ as CaCO₃
14. CaCl₂ as CaCO₃
15. MgSO₄ as CaCO₃
16. Sodium as Na
17. NaCl
18. Iron as Fe
19. Chloride as Cl
20. Sulphate as SO₄
21. Conductivity
22. Silica dissolved as SiO₂
23. Fluoride as F
24. Oxygen absorbed at 37°C in 4 hours.
25. Hydrogen Sulphide as H₂S
26. Ammonia (free and Saline) as NH₃
27. Nitrate as NO₃
28. Total Organic matter.
29. Bacteriological Test.

10.0 SANITARY SEALING

For installations where water is to be used for drinking purposes, the annular space between the tubewell bore and the housing pipe shall be cement grouted up to 5 m below ground level or up to first clay bed whichever is met first. Two nos. of 75 mm nominal bore G.I. pipes on either side of the housing pipe to the full depth of foundation shall be provided for feeding gravel as and when required in future.

11.0 SPECIFICATION OF PUMP

Depending upon the discharge and drawdown noted during the above tests, specification for a suitable submersible type pumping set shall be drawn and got approved by the Engineer-in-Charge before procurement of the same. The above pumping set shall be fitted in the tube well. The pumps are to be supplied by the Contractor, the vertical turbine pump shall conform to IS -1710 and Electric Motor shall conform to IS-325.

12.0 HANDING OVER OF TUBEWELL

- 12.1 The tubewell should be handed over to the Owner / Consultant in a complete shape. The housing pipe should be closed by a well-cap for the period between the completions of

the tubewell and the installation of the pumping set. The cap should be of such a design that it is easily removable without any damage to the housing pipe.

12.2 The following information should be furnished by the Contractor to the Owner/Consultant on completion of the tube well:

- a) Strata chart of the borehole indicating the different types of soil met with at different depths and granular zones.
- b) Samples of strata collected, neatly packed and correctly marked in sample bags.
- c) Chart of actual pipe assembly lowered indicating the sizes of pipes, depth ranges where slotted pipe have been placed, depth and diameter of housing pipe, reduced level of the top of the housing pipe, and the diameter and depth of borehole.
- d) Hours of developing by compressed air, pumping sets or by other means.
- e) Results of development, step draw-down test and aquifer performance test on the performance of the tubewell which are to be recorded in the Performa attached with this.
- f) Results of mechanical sieve analysis of samples of the aquifer material.
- g) Recommendation on the safe pumping yield, specification and setting of a suitable submersible type pumping set.
- h) Verticality test results which are recorded in accordance with the performa given in Appendix-A of IS: 2800.
- i) Report on the chemical and bacteriological tests of the tubewell water.

ANNEXURE-A

Verticality Test Results which are recorded in accordance with the Performa given in Appendix-A of IS: 2800.

ANNEXURE-B

RESULTS OF DEVELOPMENT OF TUBEWELL

Table – A : For Rated Discharge.

Rated Discharge	Depression at the Rated Discharge	Sand in PPM after 30 minutes of start of pumping	Total hours Of run	Sand in PPM at the end of the test.
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Table – B : For discharge at 1.5 times the normal depression:

(If 1.5 times normal depression can not be arranged, the test shall be carried out up to 20% in excess of rated discharge).

Discharge at 1.5 times the normal depression or 20% in excess of the rated discharge if 50% extra depression cannot be arranged.	Sand in PPM after 30 min. of start of pumping	Total hours of run	Sand in PPM at the end of the test	Static water level	Pumping water level
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ANNEXURE-C

STEP DRAW-DOWN TEST

1. A suitable test pump approved by the Engineer-in-Charge shall be installed in the tubewell.
2. Water shall be pumped out at various speeds of the test pump or by throttling delivery valve.
3. At each rate of discharge, pumping shall be carried out at least for 30 minutes.
4. If the water level and discharge are found to be fluctuating, the tubewell shall be developed for some more hours until the discharge becomes steady and sand content is within the specified limits without any extra cost to the Owner / Consultant.
5. The test results shall be tabulated in the prescribed performa as given below for computing specific capacities of the tubewell for various pumping rates.

RESULTS OF STEP DRAW-

DOWN TEST Table – A : Readings and Measurements:

(To be taken at every 5 to 10 minutes intervals)

Date & hour	Depth to water level below measuring point (In metre)	Discharge (in l / min.)	R e m a r k s

Table – B : Summarized Results:

Discharge (In l / min.)	Draw-down (In metre)	Specific Capacity (In l/min. per metre draw-down)

ANNEXURE-D

AQUIFER PERFORMANCE TEST

This test shall be conducted after the tubewell is allowed sufficient time to recoup its normal condition after Step Draw-down Test.

1. The tubewell shall be pumped at a constant discharge rate and pumping water level shall be measured at close intervals of time during the initial stages of pumping.
2. The depth of water level shall be measured by any standard method, approved by the Engineer-in-Charge.
3. Pumping shall be continued at the constant discharge at least for 4 (four) hours, then the pumping shall be stopped. Water level shall be measured at this time.
4. The water level in the tubewell shall be measured at very close intervals of time as it recoups.
5. The measurement shall be continued until the water level attains the original static water level in the tubewell. The test results shall be tabulated in the prescribed performa as given below for working out the co-efficient of transmissibility and field permeability.

Table – A : Readings and Measurements:

Date & Hour	Depth to water level below measuring point (In metre)	Discharge (In l / min.)	Remarks
			For example, water samples, temperature, pump started and stopped etc.

Table – B : Readings and Measurements for Recovery:

Date & Hour	Depth to water Level below Measuring Point (In metre)	Residual Draw-down	t / t'	Remarks

Where, t = Time in minutes since pumping started and
t' = Time in minutes since pumping stopped.

APPLICABLE PERMITS

1 Applicable Permits

The Contractor shall obtain, as required under the Applicable Laws, the following Applicable Permits:

- (a) Permission of the State Government for extraction of boulders from quarry;
- (b) Permission of Pollution Control Board for installation of crushers;
- (c) License for use of explosives;
- (d) Permission of the State Government for drawing water from river/reservoir;
- (e) License from inspector of factories or other competent Authority for setting up Batching Plant;
- (f) Clearance of Pollution Control Board for setting up Batching Plant;
- (g) Clearance of Pollution Control Board for Asphalt Plant;
- (h) Permission of State Government for borrow earth; and
- (i) Any other permits or clearances required under Applicable Laws.

INDICATIVE SPECIFICATIONS

OFFICE AREA	<p>Flooring – Vitrified Tiles</p> <p>Walls – POP punning with acrylic emulsion paint</p> <p>Ceiling – Oil Bound Distemper:</p> <p>Door/Window – Anodised/ Powder Coated Aluminium Door/Window</p>
TOILET	<p>Flooring – Anti skid Ceramic Tiles</p> <p>Walls – Ceramic Tiles on Walls</p> <p>Ceiling – Oil Bound Distemper</p> <p>Internal Door – PVC Doors</p> <p>Peripheral Door/ Windows - Anodised/ Powder Coated Aluminium Door/Window</p> <p>Fixtures – Approved Quality</p>

	Counters – Granite/Marble
COMMON AREAS Flooring	Staircases – Granite/ Marble Stone Lift/ Lobby - Granite/ Marble Stone
COMMON AREAS Wall	Walls – POP punning with acrylic emulsion paint Ceiling – Oil Bound Distemper
ELECTRICAL & COMMUNICATION	Concealed Copper Wiring Modular Switches

Table 0-1: Details of Proposed Equipment at Bus Depots

Sl. No.	Equipment	Section
1	Air Compressor (10HP)	Tyre Section
2	Ammeter cum Voltmeter	Electric cum battery room
3	Arc welding machine	Maintenance Section
4	Auto cut-off Tyre inflator with pedestal mounted digital meter	Tyre / fuel Sections
5	Auto Electrical Test Bench	Electric cum battery room
6	Automatic Bus wash System with ETP (including under chassis washing and wheel rim washing)	Washing Section
7	Battery booster trolley with auto cut-off system	Electric cum battery room
8	Battery gravity / hydrometer	Electric cum battery room
9	Battery Operated Brush Truck	Others
10	Lathe Machine with Brake Drum Turning Facility	Maintenance Section
11	Brake Efficiency Meter	Maintenance Section
12	Car washer with 2guns	Washing Section
13	Cell tester	Electric cum battery room
14	Clutch Plate / Brake liners riveting machine	Maintenance Section
15	Computerised Lube Oil Dispensing System	Maintenance Section
16	Computerized Wheel Balancer (2 tyres at a time) for Bus	Tyre Section
17	Software for Engine Diagnosis	Maintenance Section
18	Diagnostic Tool for CNG propelled Buses (BSIV)	Maintenance Section
19	Dial pressure gauge	Tyre Section
20	Electric Chain Hoist	Others
21	Electric fly catching machine	Environmental Management Plan
22	Electric grinding machine-Pedestal Type	Maintenance Section / Environmental Management Plan
23	Emergency full body safety shower, eye wash fountain	Environmental Management Plan
24	Engine Trolley/Crane	Maintenance Section
25	Exhaust Gas Analyzer	Maintenance Section
26	Fire safety equipment	Environmental Management Plan

Sl. No.	Equipment	Section
27	Fork Lift for material handling	Maintenance Section
28	Calibration equipment for CNG Fuel system of buses	Fuel Section
29	Fully Automatic Bus Tyre Changer	Tyre Section
30	Gas welding machine	Maintenance Section
31	Gear box trolley	Maintenance Section
32	Genset-125KvA	Maintenance Section
33	Head- beam aligner	Maintenance Section
34	Hydraulic Engine jib crane	Maintenance Section
35	Hydraulic Press	Others
36	Hydraulic Trolley Jack	Maintenance Section
37	Industrial Grade Water Purifier	Maintenance Section
38	Laptops-for Diagnostic Software	Maintenance Section
39	Master pressure gauge	Tyre Section
40	Mini truck for break-down relief	Maintenance Section
41	Micro-processor based Wheel Aligner System	Maintenance Section
42	New Battery charger with auto cut-off system	Electric cum battery room
43	Nitrogen Tyre Inflator along with sufficient storage & distribution equipment	Tyre inflation / tyres Section
44	Oil intercepting chambers at outfall points	Environmental Management Plan
45	Open Truck for Material Handling	Maintenance Section
46	Paint Booth for painting buses	Maintenance Section
47	Pedestal Electric drill machine	Maintenance Section
48	Pneumatic combined waste oil extractor and dispenser	Maintenance Section
49	Pneumatic Greasing machine (50Kg) with automatic electronic cut-off	Maintenance Section
50	Pneumatic wheel nut runner (Impact wrench)	Tyre Section
51	Portable Electrical Grinder	Maintenance Section
52	Protective gear for workers	Environmental Management Plan
53	Rain water harvesting system	Environmental Management Plan
54	Rim cleaning machine for buses	Tyre Section
55	Scrubbing machine for cleaning the floor	Maintenance Section
56	Smoke Meter	Maintenance Section
57	Spray Painting Gun	Maintenance Section
58	Standard set of hand and pneumatic tools	Maintenance Section
59	TIG Welding Machine	Maintenance Section
60	Tree Plantation/landscaping	Environmental Management Plan
61	Tyre cut repair Spotter	Tyre Section
62	Spark plug cleaner and tester	Fuel Section
63	Tyre dismantling/assembling equipment	Tyre section
64	Wheel Balancing Machine	Tyre Section
65	Propeller shaft balancing machine	Maintenance Section
66	Pedestal Grinder	Maintenance Section
67	Torque Wrench	Maintenance Section
68	Jigs /fixtures/stands for storage of axles, etc	Maintenance Section

Sl. No.	Equipment	Section
69	Towing Equipment / bar	Maintenance Section
70	Storage racks /bins etc in stores	Maintenance Section

Table 0-2: Equipment related to Occupational Safety Health and Environment

Sl. No.	Equipment	Section
1	DCP(5Kg) fire extinguisher at fuel dispenser	Fuel Section
2	Sand bucket per fuel dispenser	Fuel Section
3	DCP firefighting equipment (2 Nos.)	Maintenance Section
4	Sand bucket	Maintenance Section
5	DCP firefighting equipment	Tyre Section
6	Sand buckets	Tyre Section
7	DCP firefighting equipment	Electric cum battery room
8	Sand buckets	Electric cum battery room
9	DCP firefighting equipment	Stores/tyre section / oil and lubricants sections
10	DCP firefighting equipment	Administrative office
11	Sand buckets	Administrative office

Table 0-3: Supporting Fixtures/items required at Depots

Sr. No.	Equipment	Section
1	Instruction boards	Fuel Section
	Instruction boards	Maintenance Section
	Instruction boards	Electric cum battery room
	Instruction boards	Stores
	Instruction boards	Tyre and other Sections
2	Pit planks—one per pit	Maintenance Section
3	Pit stand(Small + Big)—one per pit	Maintenance Section
4	Pigeon hole cup board	Electric cum battery room
5	Cup board for keeping costly items	Electric cum battery room
6	Adjustable Pigeonhole	Stores
7	Racks for keeping major items	Stores
8	Cupboard for keeping costly items	Stores

TECHNICAL SPECIFICATIONS:

GENERAL INSTRUCTIONS

The specifications contained herein are general in nature and as such only the specifications relating to execution of work shall hold good. The contractor shall bear in mind the instructions given in the Tender Documents while referring these specifications.

1. Abbreviations:

In the Technical Specifications as well as the Schedule of Quantities, the following abbreviations have been used.

The abbreviation - Shall mean

Cum / Cu.M. - Cubic Meters

Sqm / Sq.M. - Square Meters

Rmtr / Rmt / Rm - Running Meters

Nos / Each - For Each

Cum/m.d. - Cubic Meters per meter depth

2. Terminology:

The terms - Shall mean

Approval or approved - Approval by the Engineer

As directed - As directed by the Engineer-In-Charge

3. Rates:

The rates quoted, shall be for all works shown on drawings and covered under the battery limit for individual item, irrespective of fact whether they are specifically mentioned or otherwise.

The rates quoted shall be inclusive of all works whether specified or otherwise and which is required for satisfactory execution of the Item. In case of doubt it should be got clarified before quoting.

In case there are any details of construction or requirement of materials, which have not been reflected to in the specifications, detailed description of items, the Bill of Quantities, or on the drawings, but which are useful or essential in true completion of the work, then the same shall be deemed to have been included in the rate/s quoted by the contractor.

Any claim from contractors on any or all of the above will not be entertained.

4. Site Clearance:

Before starting the work, the site shall be cleared of all shrubs, grass and other vegetation including large and small bushes, all tree stumps, removal of roots, cutting and disposal of trees up to 300mm girth etc. (The girth shall be measured at a height of 1.5 meters above GL). The site if found uneven, up to a height difference of 1.00m, shall be leveled to a plain topography.

The contractor shall make himself familiar with the local rules and regulations pertaining to land clearance environmental aspects including special requirements of forest areas, wherever applicable and the work shall be carried out in strict accordance therewith.

The above shall not be measured and paid for separately unless specific items for the same have been provided for in the BOQ.

5. Specific Instructions:

Block levellers: The contractor shall independently survey the entire plot and ascertain the dimensions and levels of the plot and submit and take approval from the Engineer before commencement of actual setting. The Contractor shall carry out the contour / block survey (5m x 5m or closer if so instructed) of the site before setting out the works. Such survey shall be carried out by taking accurate cross sections of the area perpendicular to the established reference/grid lines at 5 m intervals or nearer as determined by Engineer based on ground profile. These shall be checked and verified by the Engineer and thereafter properly recorded. If any roots or stumps of trees are found during excavation/filling, they shall be burnt or disposed off as directed. ***This shall not be measured and paid for separately.***

The contractor shall maintain and provide on the site at all times, high precision surveying instruments like Dumpy level, theodolite (one or two second theodolite) and total station and carry out the survey of entire plot and setting out of works, building lines & levels, etc., with the help of high precision instruments only.

The contractor shall provide at his own cost all labour, pegs, strings and other materials as may be required for line out and setting out the work.

All levels referred to in connection with these works shall be based on local Benchmarks. The contractor shall protect and preserve all Benchmarks used in setting out the works till the Engineer directs its removal.

The contractor shall be responsible for the accurate setting out of the works in relation to original points, lines and levels of reference given by the Engineer. The checking of any line or level by the Engineer shall not in any way relieve the contractor of his responsibility for the accuracy thereof.

If, at any time during the execution of the works, any error appears in the position, levels, dimensions or alignment of any part of the works on being required so to do by the Engineer, the contractor shall at his own cost rectify such error to the satisfaction of the Engineer.

Test Pits: Test pits of 1.5m x 1.5m x 1.5m or as instructed by the Engineer shall be excavated, if required, and the strata for resting of the foundations shall be got approved from the Engineer. The Engineer may instruct that the depth of the test pit be deepened in case if sufficiently hard strata is not met with. ***This shall not be measured and paid for separately.***

Relics, Objects Of Antiquity etc.: All gold, silver, oil minerals archaeological and other findings of importance, all precious stones, coins, treasures, relics, antiquities and other similar things which may be found in or upon the site shall be the property of owner and Contractor shall duly preserve the same to the satisfaction of the owner/employer and from time to time deliver the same to such person or persons, as the Owner may from time to time authorise or appoint to receive the same.

6. Specific Instructions related Bill of Quantities:

GENERAL INSTRUCTIONS / NOTES:

1. The Tenderers are required to visit the site of the work and acquaint themselves with working conditions before quoting for the work.
2. All rates should be mentioned in figures / Numericals, corrections if any shall be initialed.
3. In items where "Equivalent" make is mentioned, Contractor shall take prior approval from Engineer before procurement.

4. Drawing attached in the Tender are indicative drawings.
5. Contractor to provide temporary barrier/curtain to the site with bamboo mundas or props adequately spaced with Corrugated GI sheets with one temporary gate to enter material etc. Material used for fencing to be taken away after the completion of the project by the contractor. The contractor shall visit the site to understand all the works and especially the soil strata before quoting.
6. The Contractor shall take care to ensure that no dust, debris etc., is created.
7. Cement Used for the construction should be OPC of 43 grade and shall be approved by Engineer-In-Charge.
8. Sand to be screened, sieved and washed before use.
9. Aggregate shall be angular and hard, flaky or round aggregate will be rejected.

A EXCAVATION & EARTHWORKS

1. The available boulders/rock shall be broken into 200 x 200 x 200 size or as instructed and stacked in stacks of 3m x 3m x 1.5m high at one place on site. No additional charges shall be paid for the same.
2. All the excess soil/ material shall be taken away from the site for disposal on Engineers/employers approval, after evaluation of requirements if any. Contractor shall be completely responsible for its carting and disposal, away from the site at all leads and lift. The Employer shall not be responsible for the said material and no additional charges shall be paid for the same.
3. The contractor should give at least three working days clear notice to the Engineer before covering up any of the work in foundations or any other that proper measurements may be taken of the work as executed.
4. Identification of site for disposal of any material will be the Contractors responsibility.

CEMENT

Cement to be used in the works shall be any of the following type s with the prior approval of the Engineer-in-Charge. These have to be procured from reputed ISO:9000 organization:

1. Ordinary Portland cement, 43 grade, conforming to IS:12269

Cement conforming to IS:8041 shall be used only for pre-cast concrete products after specific approval of the Engineer

BRICKS

The work covered under this specification pertains to procurement of best quality locally available bricks and workmanship of walls of various thickness. In strict compliance with the specifications and applicable drawings.

CONCRETE WORK

1. Cement used for the construction should be OPC of 43 grade and shall be approved by engineer.

2. Sand to be screened, sieved and washed before use.
3. Aggregate shall be angular and hard, flaky or round aggregate will be rejected.
4. Cover block shall be of fibre reinforced concrete of "Astra" make.
5. Shuttering:

Column / pedestals - plywood

Beam side shuttering - plywood

Beam bottom - Timber

Slab & staircase- New / good condition plywood shutters.

b) Scaffolding to be of adjustable props, acro spans, pipes for bracing. No timber / bamboo / munda to be used.

6. The contractor shall manufacture concrete on site as per the technical specification & as per standard practice, which shall be approved by engineer. However in the event of non availability of material use of Ready Mix concrete may be permitted under following conditions:-

a) Contractor shall submit the details of supplier/ vendor of RMC to the satisfaction of Consultant/ Engineer.

b) Vendor/supplier shall be approved by engineer.

c) The cement used for RMC shall be OPC grade 43 for RCC works and 43 for Plain Cement Concrete works only.

d) No slag cement or blended cement shall be permitted for RCC works.

e) M25/ M30/ M35/M40 grade concrete shall be used as per IS 456 2000.

f) The cost of the RMC shall be borne by the contractor & no additional payment shall be made towards this.

7. If any construction/ cold joint is kept in the RCC structure, Epoxy bonding agent Sikadur 32 / Sika HIBOND/Sikadur 32 LP or equivalent epoxy should be used for bonding of old and new concrete to the satisfaction of the engineer and it should be procured by the contractor. No extra payment will be made for supply and application.

8. All concrete works shall be cured for atleast 14 days.

REINFORCEMENT

1. Fiber reinforced concrete cover block of Astra only to be used. Mortar cover blocks or mosaic tile cover blocks not to be used.
2. All reinforcement used shall be of TMT bar (Fe 500) ISI mark and shall be clean and free from loose mill scales, rust and coating of oil or other coatings which may destroy or reduce bond.
3. For Reinforcement steel the laps provided in slabs shall not be considered for payment and the contractor should include the said cost in the item rate and no additional payment shall be made

for laps in all items of construction including footing, beams, slabs, retaining walls, etc. except that column laps shall be payable.

4. Type of steel shall be approved by engineer before procurement.

PLASTER

1. Only river sand allowed for construction, Sand to be cleaned, sieved, screened and washed.
2. Mortar to be used in rendering plaster shall be prepared by mechanical mixer.
3. All concrete surface to be roughened (Tacha) immediately after deshuttering, prior to plaster. No additional payment will be done towards roughening (Tacha).
4. All work to be in plumb, level and corners in right angles for all types of surfaces as per specifications
5. No additional payment will be done for colouring material, pigment or using water proofing material.

FLOORING WORK

1. All concrete surfaces/ Floors shall be assured to be in perfect line and level. Any debris shall be cleaned and plaster etc. shall be hacked and cleared. (No additional payment will be done towards this.)
2. In the event the interlocking/cement paving tile colour is not uniform in colour, the tile shall be painted as approved by Engineer to get required shade, at no additional cost.

STRUCTURAL STEEL WORK

1. All structural members shall be cleaned / scrubbed with wire brush / sanded and cleared of rust before starting the process of painting.
2. The members shall be coated with rust preventor "Steel Guard Nano Coat" and Red oxide primer after fabrication. For application application purpose of rust preventor Steel Guard Nano Coat refer product specification. The rates shall be inclusive of all consumables, anchor fasteners etc.
3. Members shall be coated with 2 coats of Enamel paint of ICI (Dulux) / Berger (Luxol) before erection.
4. Prior to erection the members shall be checked for rust, etc. If found rusty or unclean the area is to be reassembled, sanded, primed and painted as above at no additional cost.
5. Final coat to be applied after erection and entire welding is complete but before laying of sheets.
6. The payment for Structural work shall be done as follows:
 - a) Fabricating and applying one coat of red oxide paint - 50 %
 - b) Erection and final coat of paint - 50 %

Qualification Criteria for Steel Fabrication Agency

Since the project involves fabrication and erection of a specialized steel roof structure, it is mandatory that the Bidder shall have experience and equipment necessary for fabricating and erecting such works. In the absence of such experience and equipment, the bidder shall enter into an irrevocable Joint-Venture/ irrevocable MoU with an agency who has similar experience and equipment.

The fabricator should have in-house fabrication facilities with equipment's 2nos CO2 Welding machines, 1 nos Beam Welder, 1 nos Multi Torch Plate cutting machine, 1 nos In-house Weld test using Ultra Sonic Testing equipment, Parent Material Testing to be carried out by NABL certified laboratories with requisite quality standards, etc. in place to be able to execute precision fabrication. The steel fabricator must have in-house shop drawing production capabilities & a proven track record of having built complex structures in steel.

ROOFING

- 1) Contractor shall quote rate for roof sheeting including laps. Lapping Length shall not be paid separately
- 2) The Basic Rate of sheet does not consider the lap and the lap component shall be included in the quoted rate.

DOORS, WINDOWS AND ROLLING SHUTTERS

- 1) Gaps between aluminium section and Jambs if any shall be filled with silicon sealant of matching colour and shade and no additional payment will be done for the same.

PAINTING

- 1) Preparation of Surface: The surface to be painted shall be cleaned with sand paper.
- 2) The base coat / primer in the number of coats as recommended by the manufacturer shall be applied.
- 3) The painting shall be done in a minimum of three coats or until the desired shade and finish is achieved.
- 4) The consecutive coats of paint shall be done after a minimum of 4 hours at temperature of 250.
- 5) No stainers or colourants shall be used.
- 6) The paint shall not be over thinned or the brush over extended.
- 7) Instructions specified by the Manufacturer are to be strictly followed.
- 8) Colour from Berger colour bank / Asian paints Apex / ICI colour solution shall be chosen.
- 9) Nothing extra shall be payable for the above.

PROOFING

- 1) The Contractor shall give a 10 year guarantee on a stamped paper for good performance of his work and shall undertake to rectify the work at his own cost if any defects are observed during the guarantee period.

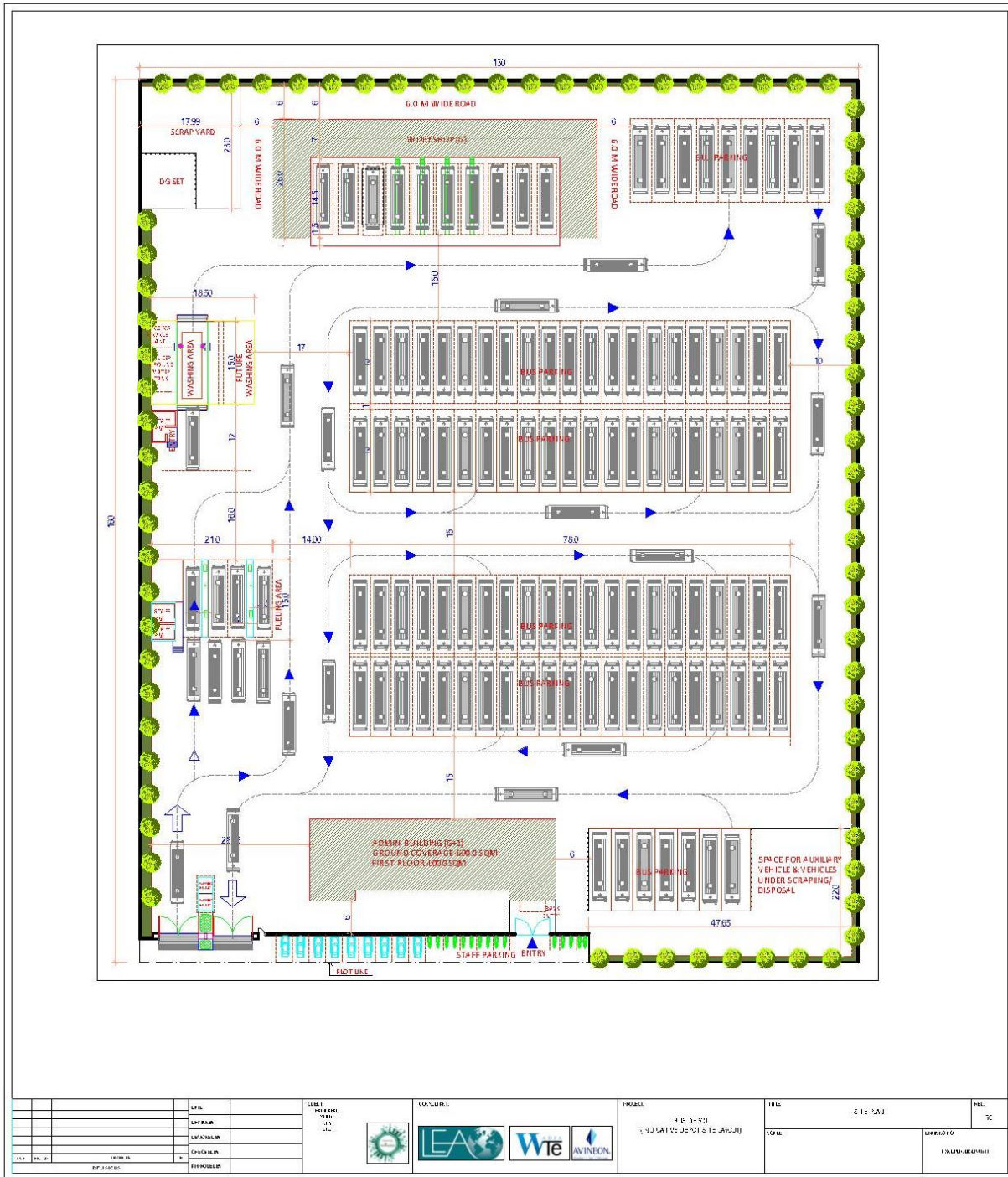
PLUMBING / DRAINAGE AND WATER SUPPLY

- 1) All sanitary fittings / faucets to be fixed with Teflon tape. Contractor will include providing and fixing of all other accessories, like extension pieces, fixing devices etc. in the respective item rates for the same in his tender. No extra payment on this account will be admissible under any circumstances.

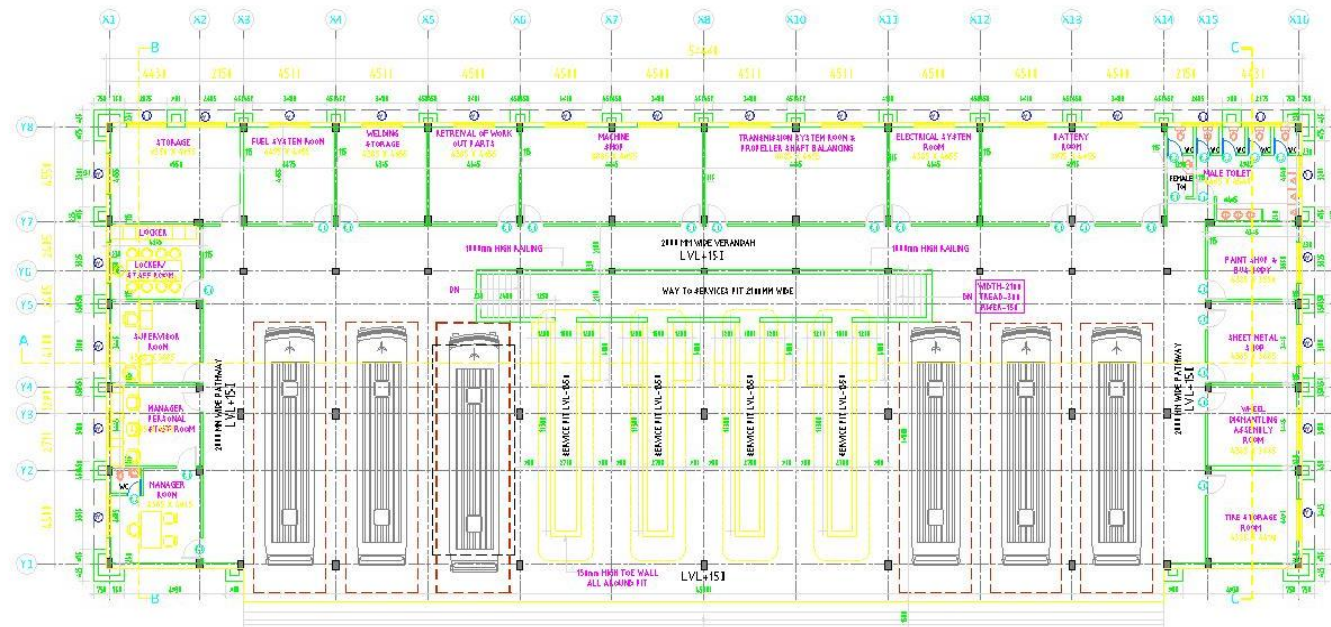
Sr. No.	Item
1.	Cement – For RCC works
2.	Cement – For Other works
3.	White Cement
4.	TMT Steel (of min 500 grade)
5.	Structural Steel
6.	Precast Cement Products
7.	Construction Chemicals
8.	Marine plywood
9.	Flush door
10.	FRP Door
11.	Block Board
12.	Laminate
13.	Drawer channels / keyboard tray / CPU Stand / Auto Clave Hinges
14.	Adhesives
15.	Ball Catches Magnetic
16.	Hinge Systems for Furniture
17.	S. S. Hinges for Furniture
18.	Heavy Duty Hinges
19.	Aluminium Section
20.	Glass
21.	Synthetic Enamel
22.	Acrylic Emulsion
23.	Special Effect Paint
24.	Melamine Polish
25.	Wood Preservatives
26.	Textured Paints
27.	Frosting Film
28.	Door Closer / Floor Spring / Locks
29.	Door Handles
30.	Hardware fitting
31.	Flush Door Shutter
32.	Screws (M. S. Oxidised)

Sr. No.	Item
33.	Acoustical Ceiling & Acoustical Panelling
34.	False Ceiling, Mineral Fibre Tile
35.	Incinerator in Ladies Toilet
36.	Vinyl Flooring
37.	Ceramic/Vitrified/Glazed Tiles
38.	Fully vitrified Tac Tile
39.	Precast Interlocking pavers
40.	Wall Putty
41.	Cement Paint
42.	Synthetic Enamel
43.	Oil Bound Acrylic Distemper
44.	Premium Interior Emulsion
45.	Aluminium Composite Panel
46.	S. S. Screws
47.	Zinc Oxide
48.	Heavy Duty Hinges

DRAWINGS/ INDICATIVE CONCEPT PLAN



Layout Plan



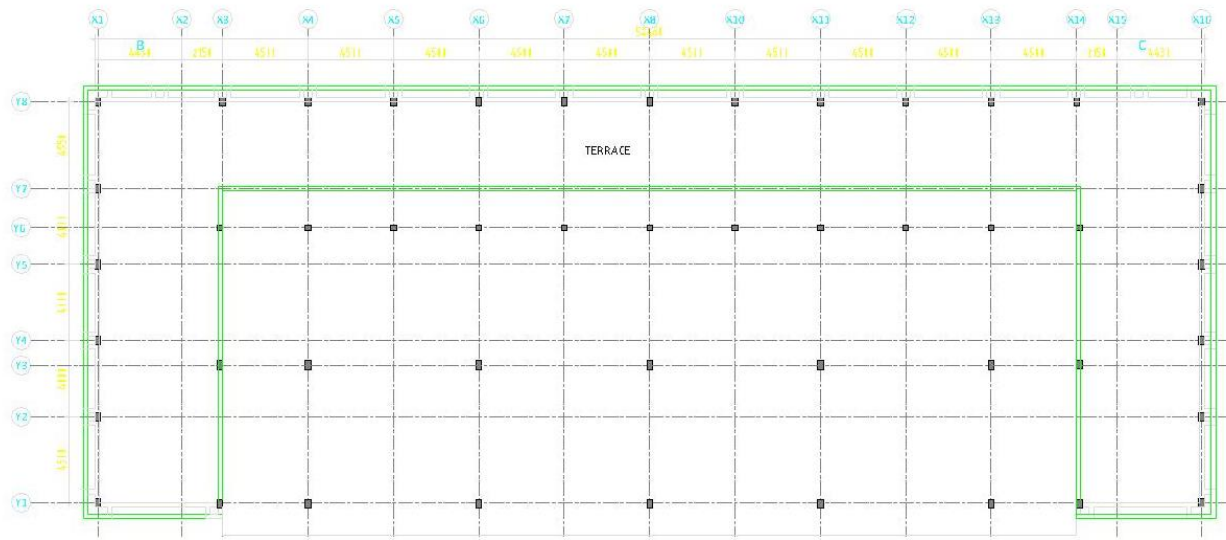
GROUND FLOOR PLAN

RAMP UP LVL-1.0
SLOPE 1:1

AREA -
BUILDING 615.1 SQM
WORKSHOP AREA - 721.1 SQM

DATE: _____		CHECKED BY: _____ APPROVED BY: _____	CLIENT: 	CONSULTANT:   	PROJECT: BUS DEPOT	TITLE: GROUND FLOOR PLAN (WORKSHOP)		DRAWING NO: _____ SHEET NO: _____
DESIGNED BY: _____	DRAWN BY: _____					SCALE: 1:1000		
CHECKED BY: _____	DATE: _____							
APPROVED BY: _____								
REV: 01	DESCRIPTION: REV 1 OF 1							

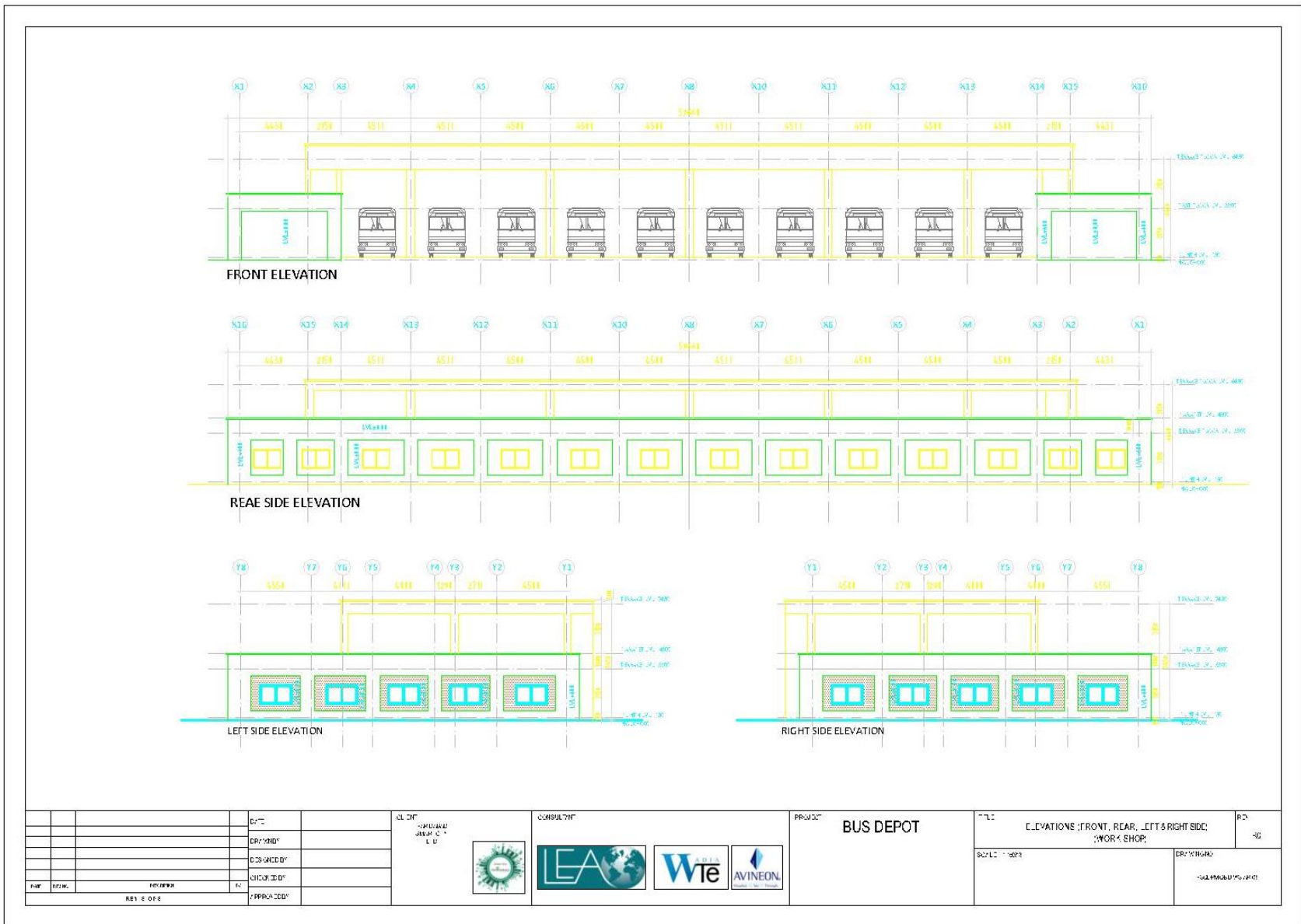
Workshop Building – Ground Floor Plan



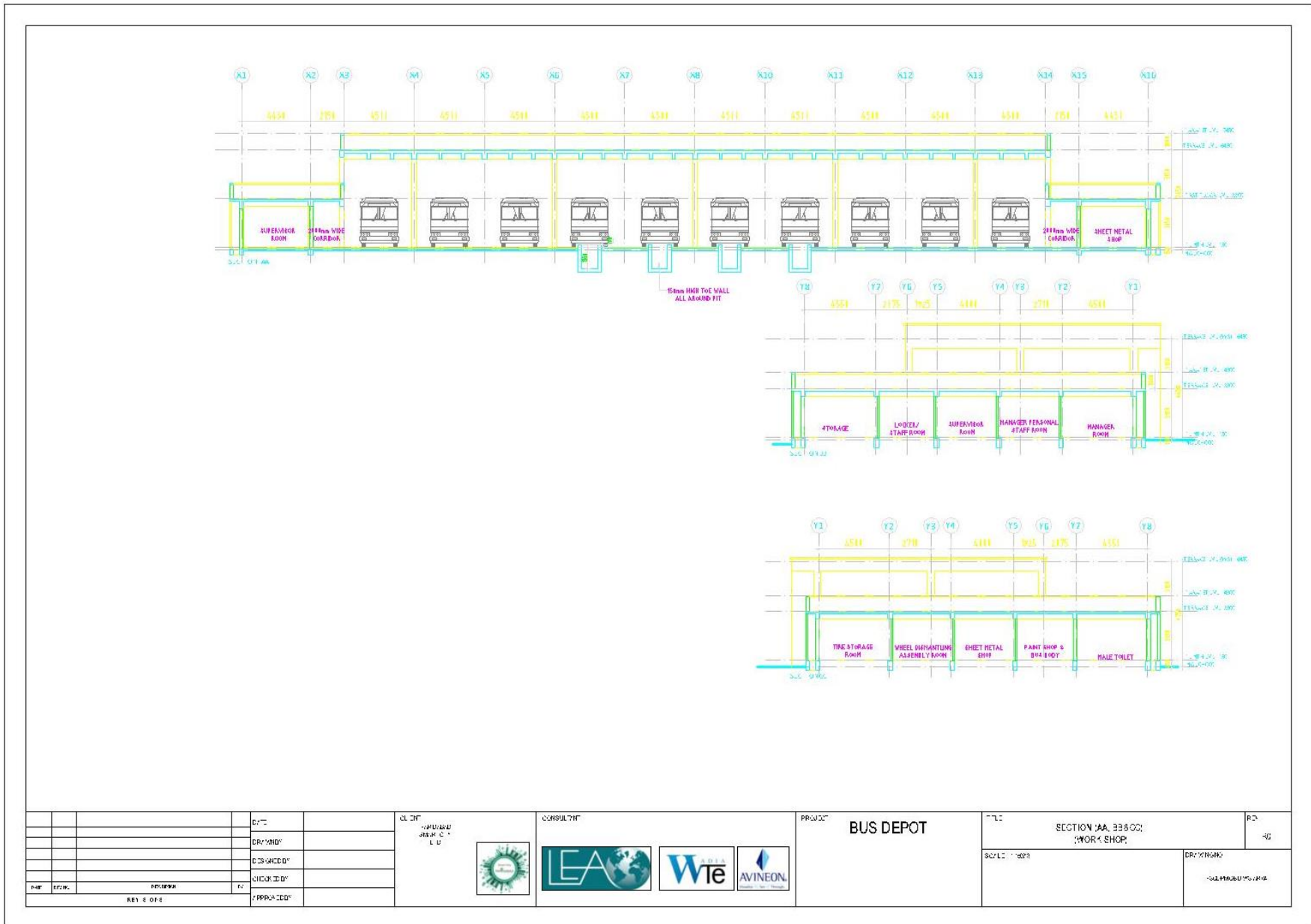
TERRACE FLOOR PLAN

		DATE	CLIENT	CONSULTANT		PROJECT	TITLE	REV.	
		REVISED	PROJECT NAME	LEA CONSULTING		BUS DEPOT	TERRACE FLOOR PLAN	01	
		DESIGNED BY	ADDRESS	  			SCALE	DRAWING NO.	
		CHECKED BY							
		APPROVED							
DATE	BY	REVISION	REV. 0 OF 0						

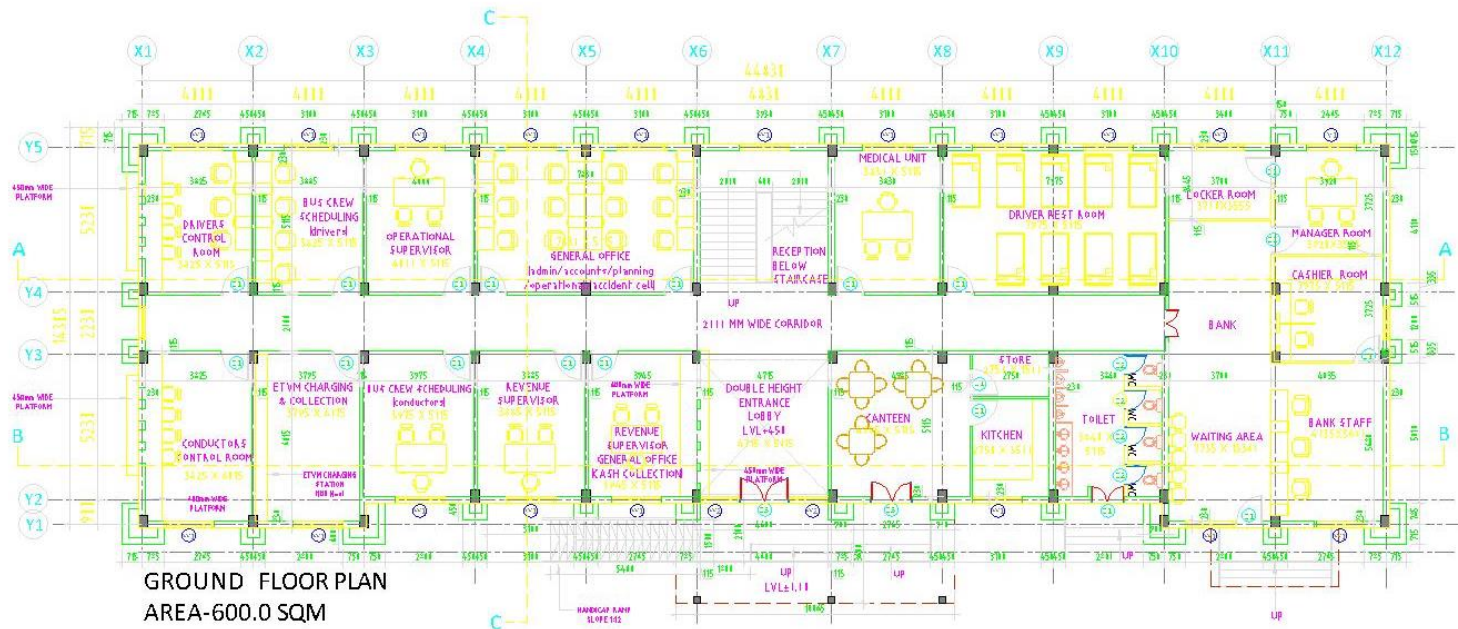
Workshop Building – Terrace Floor Plan



Workshop Building – Elevations



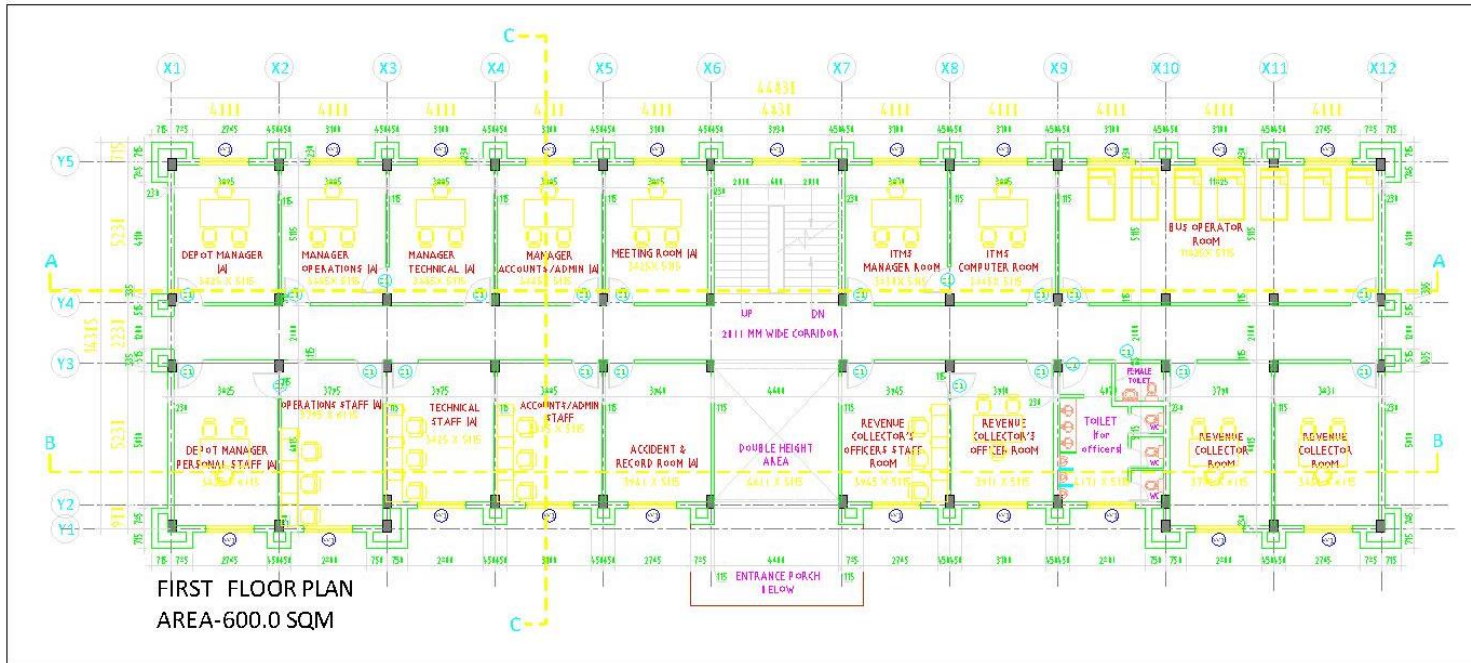
Workshop Building – Sections



**GROUND FLOOR PLAN
AREA-600.0 SQM**

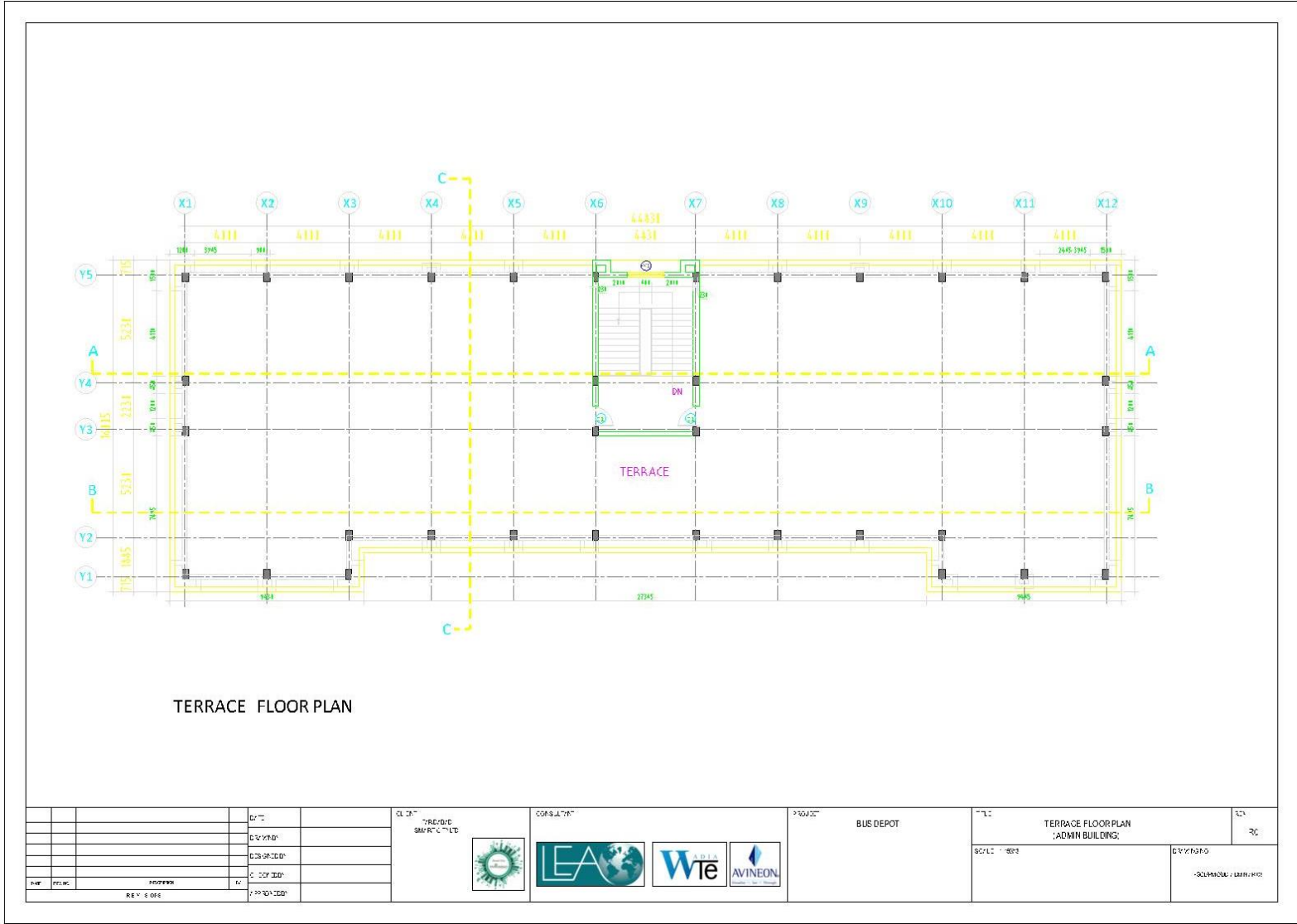
								BUS DEPOT		GROUND FLOOR PLAN ADMIN BUILDING		20
DATE:		DRAWN BY:		CHECKED BY:		APPROVED BY:		SCALE:		DRAWING NO:		30
PROJECT NO:		SHEET NO:		TOTAL SHEETS:		DATE:		PROJECT NAME:		CLIENT NAME:		40
REVISIONS:		NO. OF SHEETS:		NO. OF SHEETS:		NO. OF SHEETS:		NO. OF SHEETS:		NO. OF SHEETS:		50

Administrative Building – Ground Floor Plan

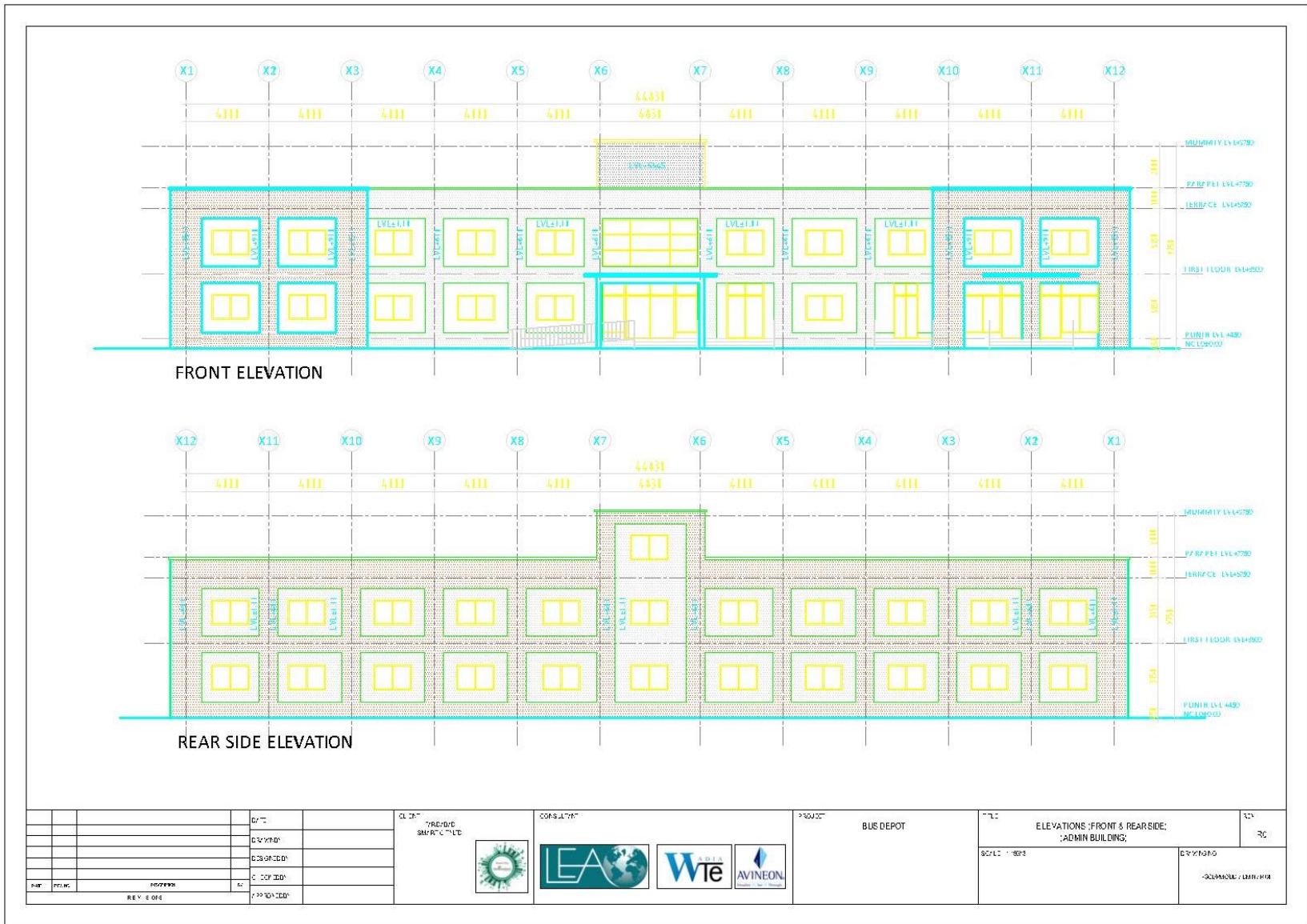


		DATE	CLIENT	CONSULTANT	PROJECT	TITLE	SCALE	DATE
		01/10/2011	TRABUS S.M.A.R.C. LTD.	LEA WTe AVINEON	BUS DEPOT	FIRST FLOOR PLAN (ADMIN BUILDING)	1:500	20
REV	DESCRIPTION	DATE						
01	ISSUED FOR PERMIT	01/10/2011						

Administrative Building – First Floor Plan



Administrative Building Terrace Floor Plan



NO.	REV.	DESCRIPTION	DATE

CLIENT: **PRESTON SMITH CONSULTANTS**

CONSULTANT:

PROJECT: **BUS DEPOT**

TITLE: **ELEVATIONS - FRONT & REAR SIDE; ADMIN BUILDING**

SCALE: 1/8"=1'-0"

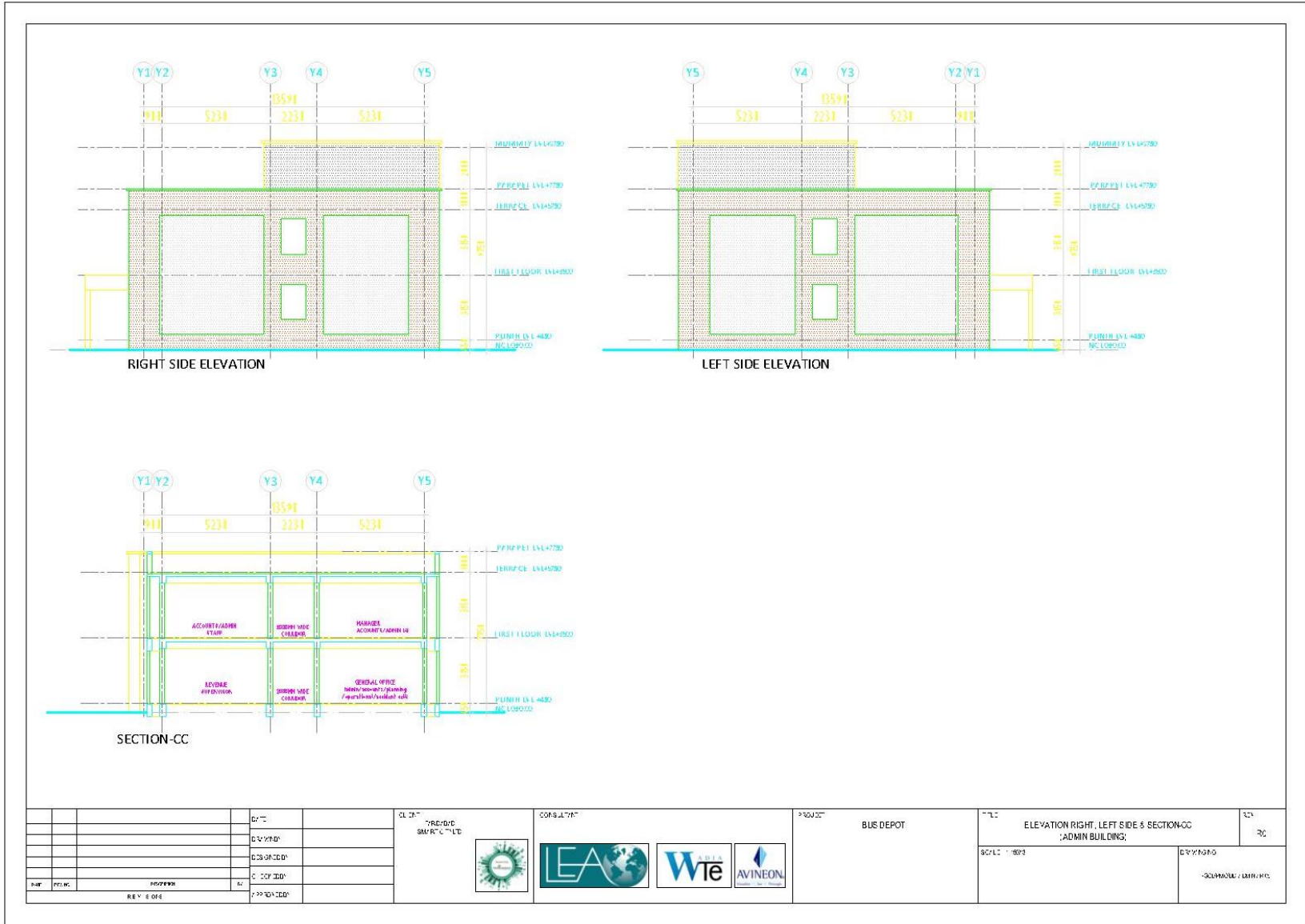
DATE: 05/20/2019

DESIGNED BY: [Name]

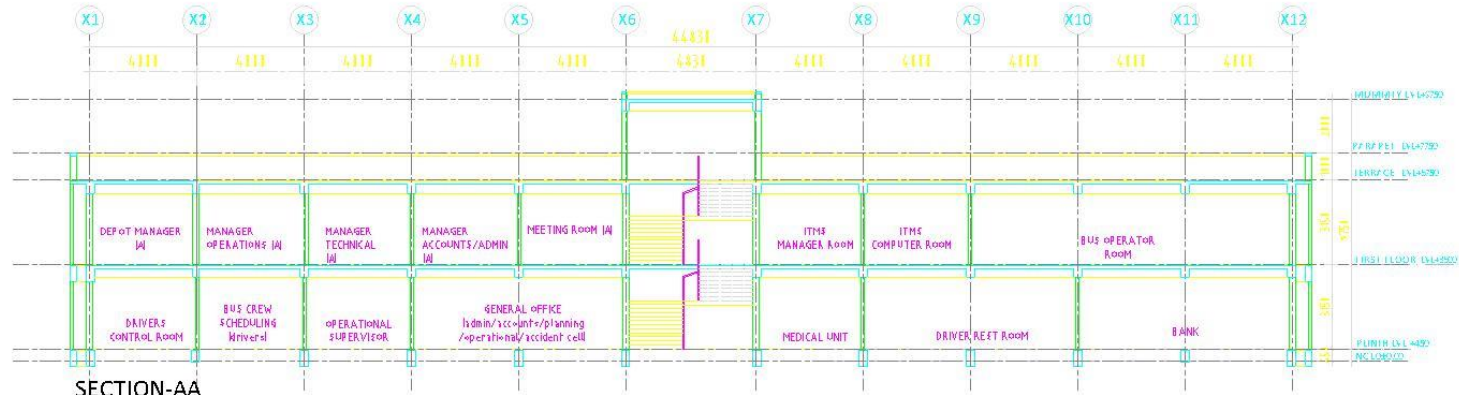
DRAWN BY: [Name]

SHEET NO: **30**

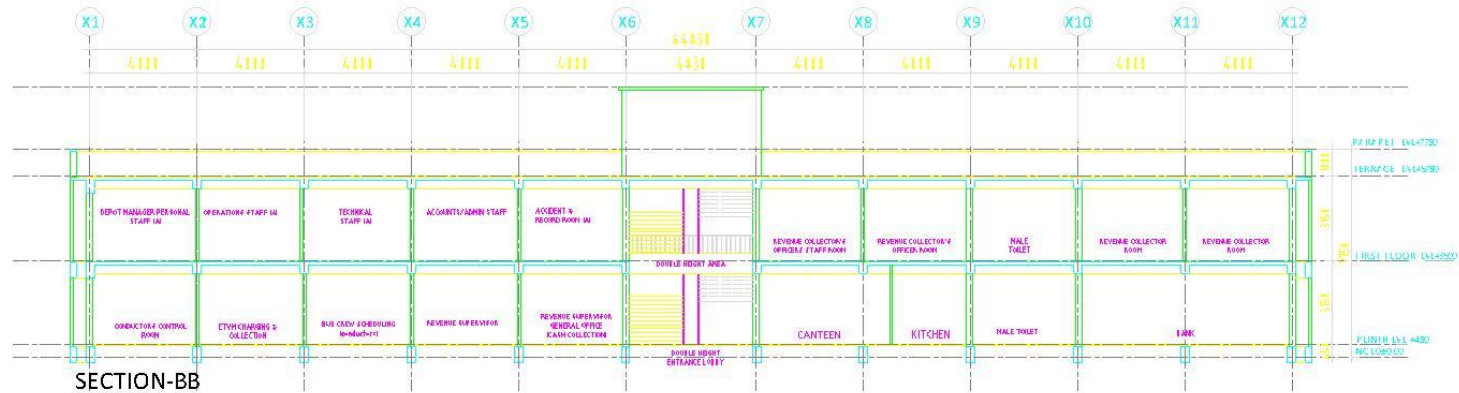
Administrative Building Elevations



Administrative Building Sections



SECTION-AA



SECTION-BB

DATE		CLIENT	CONSULTANT	PROJECT	TITLE	SCALE	DATE
DRAWN BY		PROJECT NAME	LEA	BUS DEPOT	SECTION-AA & BB ADMIN BUILDING	1:500	2023
CHECKED BY		CLIENT NAME	WTe				
APPROVED BY		CLIENT ADDRESS	AVINEON				
REV & DATE		CLIENT CONTACT					

Administrative Building Elevations & Section

1.1 ANNEX- I (SCHEDULE-I)

LIST OF DRAWINGS

Sl No	Description of Drawings	Drawing No.
1	Layout Plan	FCTSL/PMC/BD/LP/AR/01
2	Work Shop Ground Floor plan	FCTSL/PMC/BD/WS/AR/01
3	Work Shop Terrace Floor Plan	FCTSL/PMC/BD/WS/AR/02
4	Work Shop Elevation	FCTSL/PMC/BD/WS/AR/03
5	Work Shop Section	FCTSL/PMC/BD/WS/AR/04
6	Administrative Ground Floor Plan	FCTSL/PMC/BD/ADMIN/AR/01
7	Administrative First Floor Plan	FCTSL/PMC/BD/ADMIN/AR/02
8	Administrative Terrace Floor Plan	FCTSL/PMC/BD/ADMIN/AR/03
9	Administrative Elevation-1	FCTSL/PMC/BD/ADMIN/AR/04
10	Administrative Elevation-2	FCTSL/PMC/BD/ADMIN/AR/05
11	Administrative Section	FCTSL/PMC/BD/ADMIN/AR/06

BUS DEPOT - ITEM WISE DESCRIPTION WITH STAGE WISE PAYMENT RELEASE

TOTAL COST OF SEC-61 DEPOT

S.No.	Description of work	Unit	Quantity	Quoted Unit Cost (Rs.)	Total Cost in INR	Stage of Payment	Stage wise % of payment release
1	Administration building Bank Area (G+1)-605+605=1210 Sqm	L.S	1			1.Up to plinth level +00.00 Mtr.	20
						2. GF to FF level +00.00 to 03.00 Mtr.	25
						3. FF to SF level +03.00 to 06.00 Mtr.	25
						4. Terrace mumnty ,parapet, water proofing etc. all complete	10
						5. Hand Over with finishing	20
2	Work shop main Hall with staff rooms (1325 Sqm)	L.S	1			1.Up to plinth level +00.00 Mtr.	20
						2. GF to FF level +00.00 to 03.25 Mtr.	25
						3. FF to SF level +03.25 to 06.50 Mtr.	30
						4. Terrace work with Water proofing etc. complete.	10
						5.Hand Over with finishing	15
3	Washing area with ramp & used water drain to ETP	Sqm	150			100% after completion	
4	Security Room & Pump Room (50 Sqm)	L.S	1			100% after completion	

S.No.	Description of work	Unit	Quantity	Quoted Unit Cost (Rs.)	Total Cost in INR	Stage of Payment	Stage wise % of payment release
5	Scrap yard with paver block and fencing	Sqm	325			100% after completion	
6	Road rigid concrete pavement (15000 Sqm)	Sqm	15000			30% after GSB, 15% After DLC, 25 % After 1st Phase PQC, 25 % After 2nd Phase PQC, 5% after handing over with Road marking etc.	
7	Boundary wall with fencing	Rm	580			60% after completion of civil work, 25 % after fencing, 15 % after handing over with panting etc. complete.	
8	High mast lights	Nos.	2			100% after completion with testing	
9	Solar Pannels-50 KVA with Backup of minimum 6 Hrs	Set	1			80% after supply & installation, 20 % After Testing and O.K. certificate from authority	
10	Under ground water Tank for Fire fighting (2,00,000 ltrs.)	Nos.	1			20% after raft, 60% after side walls, 15% after Top Slab, 5 % after handing over	
11	Effluent Treatment Plant UG Tank with reuse of treated water (50,000 Ltr. Capacity)	Nos.	1			20% after raft, 60% after side walls, 15% after Top Slab, 5 % after handing over	
12	Overheads RCC water Tank (20,000 ltr.)	Each	2			100% after installation & fixing	
13	Tube Well with pumping arrangement	Nos.	1			100% after completion & successful outcome of water	
14	Entry/Exit Mechanical Operated gate	Nos.	2			80% after installation, 20 % after handing over	
15	Lightening Arrestor Complete Set	Nos.	2			100% after completion	

S.No.	Description of work	Unit	Quantity	Quoted Unit Cost (Rs.)	Total Cost in INR	Stage of Payment	Stage wise % of payment release
16	Internal & External Electrical work-workshop & Administrative building ,trench cabling with chequered plate drain cover, Supply of air conditioning, Telephone & computer cabling etc. . All complete .	L.S	1			Internal Electrical work etc.-70% and external electrical work-30% with permission and connection line with meter from DHBVN etc. complete.	
17	Plumbing work with sewerage ,water supply and drainage etc. complete connection with existing sewer line. (Permission from competent authority)	L.S	1			Internal Plumbing, sanitary work-70 % and External plumbing work-30% with connection of existing sewer line (NOC from competent authority.)	
18	Fire safety & alarm system complete set (NOC from competent authority)	L.S	1			80% after installation, 20 % after handing over with certification.	
19	Rain water Harvesting	Nos.	1			100% after completion of work	
	Total Cost of Sec-61 Depot						