

**Tender for Internal utility electrification, street lighting  
[Phase –1C] for Mahindra Industrial Park Chennai  
Limited near Gummidipoondi located in Pudukkottai  
village, Gummidipoondi Taluk & Elambedu village,  
Ponneri Taluk of Thiruvallur District**

**Volume – II A**

**Technical Specification**

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## **Electrical specifications**

### **1. Preamble**

This specification describes the minimum requirements for electrical equipment and systems that are involved in the execution of the subject electrical works and inter-alia involves sizing, selection, procurement, supply, installation, testing and commissioning of power distribution and control equipment, cabling, lighting, earthing and other allied minor electrical systems

#### **1.1. Scope of works and responsibility of the contractor**

The contractor is advised to peruse the document in full and understand the scope of work as detailed elsewhere in this document. He is / they are also advised to make himself / themselves aware of the site requirements and conditions before submission of his / their bid. Clarification, if any, required shall be made with the consultant before submission of bid.

However, nothing shall absolve the contractor to carry out and complete the entire works including those minor / incidental works required for the completion of the work whether it is explicitly brought out in this document or not.

#### **1.2. Interpretation**

All the technical terms referred in this document shall have the interpretation as per the relevant Indian standard code / Indian Electricity Rules / Indian Electricity Act etc., In case on any doubt in any of the meanings / interpretations, the tenderer shall get the same clarified from the owner prior to submission of bid.

#### **1.3. Contractor's license**

The electrical works shall be carried out by persons holding valid competency certificate issued / recognised by the Licensing Board of the locality / State in which the works is to be done. The contractor holding valid Licence / Authorisation from the Licensing Board of the locality / State for carrying out the installation work of such nature and voltage grade.

#### **1.4. Design philosophy**

All equipment offered by the contractor shall offer the following features:-

- Safety to personnel and equipment during operation and maintenance.
- Reliability of Services.
- Ease of maintenance.
- Facility for ready addition of future loads.
- Convenience of operation.
- Maximum Inter-changeability of equipment.
- Minimum fire risk.

#### **1.5. Codes and standards**

Whether explicitly mentioned in this specification document or not, all the engineering, systems, equipment, materials and works being provided by the Contractor for this project shall conform to the requirements of the respective latest editions / amendments of the Indian Standards Specifications. In particular cases where relevant Indian Standards are not available, other International Codes and Standards may be accepted, subject to Developer's specific approval.

The design and the installation shall be in accordance with established and sound engineering practices, standard specifications and must conform to the statutory regulations applicable.

The equipment and installation shall conform to (but not be limited to) the following (Latest versions/editions).

- Indian Electricity Act, 1910
- Indian Electricity Rules, 1956
- The Factory Act, 1948

In case of conflict between various documents, specifications and codes / standards etc. the following order of procedure shall govern:

- Job specification

- Codes and Standards.

## 1.6. Electrical system

Unless and until specified, otherwise the complete electrical system shall be suitable to work satisfactorily with the following system parameters

System Voltage (High Voltage)	:	11 kV (E) 3 wire 50 Hz AC system of supply and subject to permissible variations as per IE Rules
System Voltage (Medium Voltage)	:	415 Volts, 3 phase, 4 Wire AC system of supply subject to permissible variations as per IE rules
System Voltage (Low Voltage)	:	240 Volts Single phase 3 wire AC system of supply subject to permissible variations as per IE rules
Frequency	:	50 Hz and subject to permissible variations as per IE rules
Neutral Earthing	:	Solidly earthed
Fault Level	:	50 kA at Main / Incomer level
Control Voltage	:	110 Volts AC

## 1.7. Service conditions

All equipment to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

Maximum ambient temperature (deg C)	:	50
Maximum temperature in shade (deg C)	:	45
Average temperature in air (deg C) in shade	:	35
Relative Humidity (%)	:	60 to 80
Maximum altitude above mean sea level (Meters)	:	1000
Operating Environment	:	Moderately hot & humid tropical climate conducive to rust & fungus growth.

## **1.8. Drawings and data**

The contractor shall furnish the following drawings and data as part of the work:

- i. General arrangement showing plan, elevation, and typical section views.
- ii. Foundation plan showing location of fixing Tubewell Panel, Street Light etc.
- iii. Schematic wiring drawings for Feeder Pillar Panel.
- iv. Technical literature on the equipment offered.
- v. Make/ Model No. of various major electrical equipment

The Contractor shall also furnish the following drawings for each major equipment such as Tube well Panel, Street lighting Poles etc., after the award of contract.

- (i) Overall outline dimensions and general arrangement including plan, front elevations, clearances required in front and back etc.,.
- (ii) Schematic control diagrams to cover controls, protection, interlocks, switch instruments etc., for each Feeder Pillar Panel.
- (iii) Itemized bill of material for each module, listing all devices mounted and cable glands, indicating all type, rating quantity and special notes, if any.
- (iv) Detailed internal wiring diagram of each type of module, including terminal block number, ferrule numbers & the external cable connection designations.
- (v) Inter panel interconnection wiring diagram including terminal numbers and ferrule numbers.

## **1.9. Acceptable makes / Brands of electrical equipment / items**

The list of preferred brands / makes of various electrical equipment / items is furnished vide **Annexure – G**. The tenderer are free to choose any one of the make / brand listed therein and have to clearly bring out the same in their tender. However, the owner reserves the right to insist for any specific / particular brand from the list without any additional financial implication.

## **2. Specific project requirements for electrical equipment**

## **2.1. 11 kV XLPE Power cables**

### **2.1.1. Scope**

The specification covers design, manufacture, shop testing, packing and delivery of 11 kV multi core, cross-linked polyethylene insulated power cables suitable for effectively earthed neutral system.

### **2.1.2. Standards**

Unless otherwise specified elsewhere in this specification, the rating as well as performance and testing of the HT XLPE power cables shall conform to the latest revisions available at the time of placement of order of all the relevant standards as listed in, but not limited to table below

IS: 8130 - 1984	Conductors for insulated electric cables and flexible cords.
IS :7098 (Part 2) - 1985	XLPE PVC sheathed cable for working voltages from 3.3 kV up to and including 33 kV.
IS: 5831 - 1984	PVC insulation and sheath of electric cables.
IS: 3975 - 1988	Mild steel wires , formed wires and Tapes for armouring of cables
IS :10462 (Part I) - 1983	Fictitious calculation method for determination of dimensions of protective coverings of cables.

### **2.1.3. General constructional requirements**

The HT multi core power cables shall normally be with stranded compacted H2/H4 grade aluminum conductor as per IS: 8130 - 1984, provided with conductor screening (of extruded semi-conducting cross link material) and shall be insulated with XLPE of natural colour. Identification of cores shall be by colour, as per provision of clause 13.1 of IS: 7098 (Part 2) - 1985. The insulation (XLPE) screening shall be provided consisting of extruded semi-conducting cross link material in combination with a metallic layer of copper tapes. Three such screened cores shall be laid up together with fillers and/or binder tapes where necessary and provided with extruded inner sheathing of heat resistant PVC conforming to type ST-2 of IS: 5831- 1984. Maximum continuous operating temperature shall be 90 deg C under

normal operation and 250 deg C under short circuit condition Armouring shall be provided consisting of single galvanized round steel wires (In case of Single core cable armouring shall be of Non-magnetic material) conforming to IS:3975 - 1988 (amended upto date) & over the armouring a tough outer sheath of PVC compound shall be extruded. The PVC compound for the outer sheath shall conform to type ST-2 of IS: 5831 - 1984 (amended upto date). The colour of the outer sheath shall be black. The cable shall be manufactured strictly conforming to IS:7098 (Part 2) - 1985 amended upto date and shall bear ISI mark.

#### **2.1.4. Sequential marking of length of cable**

Non-erasable Sequential Marking of length shall be provided by embossing on outer sheath of the cable for each meter length. The quality of insulation should be good and insulation should not be deteriorated when exposed to the climatic conditions.

#### **2.1.5. Discharge free construction:**

Inner conductor shielding, XLPE insulation and outer core shielding shall be extruded in one operation by special process (viz. Triple Extrusion Process) to ensure that the insulation is free from contamination and voids and perfect bonding of inner and outer shielding with insulation is achieved. The bidders are requested to elaborate the manufacturing technique adopted by their manufacturers to achieve this motive. The Company will order the verification of triple extrusion process at manufacturer's works as a pre-qualification if it is technically accepting the bid. During verification if it is found that the firm is not manufacturing the cable with triple extrusion process the offer shall be rejected.

#### **2.1.6. Continuous A.C. Current carrying capacity:**

Continuous A.C. current capacity shall be as per Table given below.

Conductor sizes in sq.mm.	Continuous a.c. current capacity in Amps. at maximum conductor temp. of 90 deg .C.	
	When laid direct in the ground 30 deg. C	When laid in air 40 deg. C



Conductor sizes in sq.mm.	Continuous a.c. current capacity in Amps. at maximum conductor temp. of 90 deg .C.	
	When laid direct in the ground 30 deg. C	When laid in air 40 deg. C
70 sq mm	160	165
95 sq mm	190	200
120 sq mm	215	230
150 sq mm	240	265
185 sq mm	270	310
240 sq mm	315	345
300 sq mm	355	396
400 sq mm	405	460
500 sq mm	450	590

#### 2.1.7. Short circuit current

Short circuit current of 11 kV XLPE cable shall be as per Table given below.

Duration of Short Circuit in sec	Area of Al. Conductor	Short circuit current in kA
t	A	$I=0.094 \times A/\text{sq.rt (t)}$
1	70 sq.mm	6.58
1	95 sq.mm	8.93
1	120 sq.mm	11.28
1	150 sq.mm	14.10
1	185 sq.mm	17.39
1	240 sq.mm	22.56
1	300 sq.mm.	28.20
1	400 sq.mm.	37.60
1	500 sq.mm	47.00
1	630 sq.mm	59.20

#### 2.1.8. Routine tests

All the Routine tests as per IS: 7098 (Part 2) - 1985 amended upto date shall be carried out on each delivery length of cable. The result should be given in test report. Partial discharge test must be carried out in a fully screened test cell. It is, therefore,

essential that the manufacturer should have the appropriate type of facility to conduct this test, which is routine test.

#### **2.1.9. Acceptance tests**

All Acceptance tests as per IS: 7098 (Part 2) - 1985 as modified upto date including the optional test as per Clause no 18.4 and Flammability Test shall be carried out on sample taken from the delivery lot.

#### **2.1.10. Packing and marking:**

##### **Identification marks on cable:**

The following particulars shall be properly legible embossed on the cable sheath at the intervals of not exceeding one meter throughout the length of the cable. The cables with poor and illegible embossing shall be liable for rejection.

- a) Manufactures name and/or Trade name.
- b) Voltage grade.
- c) Year of manufacture.
- d) Successive Length.
- e) Size of cable
- f) ISI mark

The cable shall be supplied in continuous standard length of 250 running meters with plus or minus 5% tolerance wound on non-returnable wooden drum of good quality and non-standard lengths not less than 100 meters upto 5% of the ordered quantity shall be accepted. Alternately, cable can be supplied wound on non-returnable steel drum without any extra cost to the purchaser. Packing & marking shall be as per Clause No. 21 of IS: 7098 (Part 2) - 1985 amended up to date.

Type	:	Panel door mounted – shrouded type for START and Mushroom type for STOP / RESET
Contact ratings	:	6 Amps

## **2.2. 1.1 kV XLPE cable**

### **2.2.1. Scope**

This part of the specification covers the requirements of design, manufacture, inspection, testing and supply at site of 1.1 kV grade XLPE power and control cables.

### **2.2.2. Standards**

The 1.1 kV grade Power & Control Cables conform to the requirements of the latest Indian Standard Specifications including but not limited to the following:

IS 7098	:	Cross-linked polyethylene insulated PVC sheathed cables
IS 3975	:	Mild steel wires, strips and tapes for armouring of cables
IS 10418: 1982	:	Drums for electric cables.
IS 10810	:	Methods of test for cables
IS 1554 (Part I)	:	PVC Cables for voltage up to and including 1100 volts
IS 8130	:	Conductors for insulated electric cables
IS 5831	:	PVC insulation and sheath of electric cables
IS 3975	:	Mild steel wires, strips and tapes for armouring of cables

### **2.2.3. General construction**

The cables shall be suitable for laying in trays, trenches, ducts, conduits and buried underground installation with uncontrolled backfill and possibility of flooding by water. These shall have following constructional features.

All power and control cables for use on low voltage system shall be heavy of 1100 V grade with aluminium / copper conductor, XLPE insulated, PVC inner sheathed, armoured and overall PVC sheathed.

The construction of the conductors shall be SOLID for aluminium conductor cables up to 10 mm sq. and for copper conductor cables up to 2.5 mm sq. For cables above 10 mm sq. and for copper cables above 2.5 mm sq. the conductor shall be STRANDED. Conductors of nominal cross sectional area less than 10 sq.mm shall

be circular only. Conductors of nominal cross section area 16 sq.mm and above may be circular or sector shaped.

The core insulation shall be with XLPE applied over the conductor by extrusion and shall conform to the IS 7098. Control cables having 6 cores & above shall be identified with prominent & indelible numerals on the outer surface of the insulation. Colour of the numbers shall be white with a spacing of maximum 500 mm between two consecutive numbers.

The inner sheath shall be applied over the laid-up cores by extrusion and shall be of PVC conforming to the requirements of type ST2 PVC compound per IS 5831. The extruded inner sheath shall be of uniform thickness of size not less than 0.5 mm up to 16 sq.mm, 0.8 mm from 25 sq.mm upto 120 sq.mm and 1.0 mm above 120 sq.mm conductor size. Taped inner sheath shall also be acceptable.

For multi core cables, the armouring shall be by single round galvanized steel wires where the calculated diameter below armouring does not exceed 13 mm and galvanized steel strips where this dimension is greater than 13 mm. Requirement and methods of tests for armour material and uniformity of galvanization shall be as per IS 3975 and IS 2611.

The outer sheath for the cables shall be applied by extrusion and shall be of PVC compound and conforming to the requirements of type ST 2 compound per IS 5831. To protect the cables against rodent and termite attack, suitable chemicals shall be added into the PVC compound of the outer sheath.

The dimensions of the insulation, armour and outer sheath materials shall be governed by values given in IS 1554 (Part I).

#### **2.2.4. Packing**

The cables shall be supplied in standard drum lengths duly wound on non-returnable wooden drums.

Vendor shall ensure that the bending radii of cables are not less than 12 times their overall diameters when wound on drums. Both ends of the cables shall be sealed.

Following information shall be printed on the flange of each cable drum.

- a) Type
- b) Size
- c) Voltage grade
- d) Length in meters
- e) ISI Mark
- f) Gross weight
- g) Direction of rolling
- h)

## **2.3. Technical specification for street lighting pole**

### **2.3.1. Scope**

This part of the specification covers the requirements of design, manufacture, testing at works, transportation, delivery at site, storage, erection, testing & commissioning of the entire lighting system, including swaged steel tubular pole, light fittings, cables, timer, earthing system.

The contractor shall carry out the works in accordance with the general terms and conditions, the special terms & tender document.

### **2.3.2. Standards**

The Street light shall confirm to the requirements of the latest Indian Standard Specifications including but not limited to the following:

- |         |   |  |
|---------|---|--|
| IS 732  | : | Code of Practice for Electrical Wiring Installations         |
| IS 3043 | : | Code of Practice for Earthing.                               |
| IS 5216 | : | Guide for Safely Procedures and practices in electrical Work |
| IS 2713 | : | Specification for Steel Pole                                 |

### **2.3.3. Description of street lighting poles**

Street lighting poles shall be swaged steel tubular poles with necessary mounting brackets suitable for mounting outdoor street light fixtures.

The pole after manufacture shall be thoroughly cleaned both inside and outside and the exterior portion is to be painted with Anti corrosive chemical resistant paint as per IS: 157 of approved brand and manufacture shall be used. Yellow primer coat to be used shall be as per manufacturer's specifications.

Standard earthing arrangement with a junction box is to be provided in each pole at a height of 500 mm above planting depth.

Steel base plate of size 300 x 300 x 6 mm shall be welded to the bottom of pole.

The poles shall be complete with canopy arrangement to suit single / double cross arm bracket to mount the fixture, as the case may be. The canopies are to be fabricated out of mild steel tubes and to be supplied as separate attachments to facilitate transportation and installation with ease.

The pole shall be provided with a SMC junction box for looping cable of appropriate size and type for supply cable looping in and out. The size of the junction box shall be adequate for easy termination of the cable. For specific poles at junction, where more than one outgoing cables going on different routes are involved, the junction box sizes shall be adequate to accommodate that many number of cable termination.

In addition, the junction box shall be provided with locking device and key. One 10 amps double pole MCB shall be provided per fixture in the junction box for fixture control along with connectors for looping in and out. The junction boxes shall be suitable for outdoor installation and weatherproof type.

Clamping arrangement for mounting junction box, etc., and entry and exit for flexible cable from junction box to fixture shall be provided at suitable locations.

Flood light mounting poles shall be provided with suitable mounting arrangement in place of cross arm bracket, which are normally used for street lighting fixtures.

The poles shall be erected on road as indicated on the proposed section of roads indicating its width and relative position of street lighting poles. The cross arm bracket shall be mounted perpendicular to the length of the road and junction box on rear side of the pole. All the poles shall be absolutely straight and in perfect plumb. These poles shall be aligned properly along the edge of the road and with other poles.

The poles shall be erected with M-25 grade concrete foundation below the ground level and 300 mm coping above ground level. While erection, the poles shall be erected in such a way that the length of poles underground, shall be at least 1/5<sup>th</sup> the length of the pole above ground level.

2 Nos. HDPE Pipe sleeves of adequate dia. and length shall be provided for each cable during erection of the poles for leading of cables at a later date.

Street light fittings shall be suitable for LED street light fighting, comprising of single piece die cast aluminum alloy LM6 housing with reflector, finished in stove enameled tone. Fitted with high transparency clear acrylic cover. The control gear compartment shall be wired with LED driver and mains connector. The total housing shall be weather proof and shall prevent entry of insects.

The cable entry to the fixture shall be protected by rubber grommet inlet against ingress of water. Suitable type of connector shall be provided inside the control gear compartment for incoming wire termination.

The mounting arrangement shall be suitable for mounting fixture firmly on G.I pipe having maximum 65 mm O.D. The fixture shall be weather proof and suitable for outdoor installation.

Protection class shall be least IP: 65 for control gear as well as lamp compartment.

3 Nos. cable entries and lugs for mounting the box shall be provided on the box.

#### **2.3.4. Earthing of lighting poles**

The earthing system shall consist of earth electrodes, earthing conductors, connected to each other to form a close loop. Earthing shall be carried out as per IS:3043.

The steel armour of the cable also shall be connected to the earthing system by means of cable gland.

The fixture shall be connected to earth by means of one extra core of the 3 core PVC insulated copper wire from junction box to fixture.

All hardware used for earthing installation shall be hot dip galvanized.

#### **2.3.5. Civil works**

All civil works associated with street lighting work are included in the scope of electrical contractor. This includes excavation in all types of soils, soft / Hard rock, reinstatement, making good the surfaces to match original, removal of surplus earth, PCC, foundation of poles, 1:3:6 concrete / masonry works plastering work etc., all inclusive

#### **2.3.6. Guaranteed technical particulars for street lighting poles**

Sl. No	Description	Owner's requirement	As offered (tenderer to fill)
1	Type of Pole	Swaged tubular pole	
2	a) Whether tubes are of seamless construction Or welded type.		
	b) Is it manually welded tubes? If so, state name / address of manufacturer		
	c) It is ERW tubes? If so, state name/address of manufacturer		
3	Overall length	9.5 M and 8.5 M	



Sl. No	Description	Owner's requirement	As offered (tenderer to fill)
		(refer drawings)	
4	Effective length of section		
a	Bottom		
b	Middle		
c	Top		
5	Effective dia & thickness of section		
a	Bottom		
b	Middle		
c	Top		
6	Total pole weight in Kg		
7	Weight of sections		
a	Top Section (kg)		
b	Middle Section (kg)		
c	Bottom Section (kg)		
8	Breaking Load (Kg.)		
10	Working Load (Kg.)		
11	Crippling load (kg)		
12	Load for permanent set		
13	Load for temporary deflection		
14	Joint length		
15	Paint coating thickness in microns		
a	Primer coat		
b	Outer coat		

## **2.4. Technical specification for LED Street light fitting**

### **2.4.1. Scope**

This specification covers the requirement of design, manufacture, testing and delivery at site of the light fittings (Non-flameproof type).

#### 2.4.2. Description of light fittings

- Street light fittings shall be suitable for LED compatible to Smart Street light comprising of single piece die cast aluminium alloy LM6 housing with name of the manufacturer shall be Engraved, pot optics reflector, RS 485 Communication enabled connectivity port ,finished in powder coat of approved colour.
- LED lumens output efficiency should be more than 100 lumens per watt or higher. Necessary Test Certificate from Govt. Approved Lab / NABL accredited Lab / UL to substantiate lumen output as per LM 79 must be furnished for evaluation.
- The control gear compartment shall be wired with copper wire ballast, power factor improvement capacitor and mains connector. The total housing shall be weather proof and shall prevent entry of insects. A pair of purity anodized aluminium side reflector shall be mounted inside the lamp compartment for high photometry efficiency.
- Necessary INSITU Thermal report to be submitted from the manufacturer indicating maximum temperature point on LED array. Which shall not exceed junction temperature Specified in LM 80 report at life of higher than 50000 hrs.
- The luminaire shall have the Ultra Violet stabilized Heat resistant clear toughened glass protector with impact resistance IK07 rating.
- The LED fitting power consumption should be within the tolerance of  $\pm 5\%$  with LED colour temperature shall be 5700K or higher
- Street light shall have Ingress Protection of IP 66 Rated for Both for Optical & Electrical Compartment. Necessary supporting document for Test Report for the same need to be furnished from any Govt. Approved/NABL accredited Laboratory.
- Luminaire should consist of Universal Voltage driver to operate from 140V to 270V 50 Hz application within necessary built in protection against short circuit, over voltage, overload & wrong wiring protection. **Driver should have Surge Protection as per IEC 6100-4**

- The electronic driver shall be dimmable driver (analog 0-10V) suitable for dimming the luminaires to various power levels. Typical requirement is 0-100% lighting levels.
- The fixture should be designed so as to have lumen maintenance of at least 70% at the end of 50,000 hours with life of 50000 hrs with CRI of LED shall be more than 70.
- The LED should be provided with structured LED array for optimized roadway photometric distribution with photometric lenses designed to optimize application efficiency and minimal glare
- The internal wiring used inside the luminaire, shall be low smoke halogen free, fire retardant and MCB protection shall be provided in input side.
- The LED fitting should be supported with necessary Type Test Certificate of luminaire from Govt. accredited Test Lab / ERTL / NABL shall be submitted.
- The cable entry to the fixture shall be protected by rubber grommet inlet against ingress of water. Suitable type of connector shall be provided inside the control gear compartment for incoming wire termination.
- The construction of the fixture shall be such that lamp replacement shall be easily possible by releasing toggles and opening acrylic cover which is hinged to one end. The mounting arrangement shall be suitable for mounting fixture firmly on G.I. pipe having maximum 65 mm O.D. The fixture shall be weather proof and suitable for outdoor installation.

#### **2.4.3. Local Decision and Intelligence**

The Street Light Controllers uses extremely powerful Microcontroller that allows faster responses with complex logic system.

#### **2.4.4. Individual Street Light Control and Monitoring**

Smart lighting system featured with monitoring individual street light control and monitoring. Street Light Controller (SLC) enriched with on board energy measurement capability which measures voltage, current, power, power factor, active energy, apparent energy, frequency. SLC controls ON / OFF / Dimming of streetlights

#### **2.4.5. Group Level Street Light Control and Monitoring**

Smart lighting system supports group level street light control and monitoring in single go. Street Lights under cluster can be made ON/OFF/Dim in single click.

#### **2.4.6. Simple and Remote Configuration**

The street Light Controller can be easily and remotely configured from easy web interface. Configuration allows user to set operating modes, ON / OFF timings, RTC configuration, Updating GPS locations, Astronomical Clock, Motion Detectors

#### **2.4.7. Connectivity Options**

Street Light Controllers communicate with central server through Wi-Fi as backhaul network.

### **2.5. Technical specification for street lighting feeder pillar panel**

#### **2.5.1. Scope**

This specification covers the requirements of design, manufacture, supply, erection and testing and delivery at site of street lighting feeder pillar panels.

#### **2.5.2. Standards**

The Power / Lighting Distribution Boards / Feeder Pillar / Panels shall conform to the requirements of the latest Indian Standard Specifications including but not limited to the following:

IS 13947 (Part I)	: Low Voltage Switchgear and Control gear - General Rules
IS 11353	: Guide for Uniform System of marking and identification of conductors and apparatus
IS 2705	: Current Transformers
IS 8623	: Low voltage switchgear and control gear assemblies.
IS 4237	: General requirements for switchgear and control gear for voltages not exceeding 1000V.
IS 8828	: Miniature, Air break circuit breakers for voltage not exceeding 1000V.
IS 13947 (Part 3)	: Switches, dis-connectors, air break switch dis-connectors and fuse combination units.
IS 9224	: Fuses with high breaking capacity
IS 1248	: Direct acting electrical instruments
IS 722	: AC Electricity Meters

### **2.5.3. Construction & component specification**

#### **Street lighting feeder pillar panels**

- The panels shall be sheet steel enclosed on all sides and shall be dust and vermin-proof, providing a degree of protection equivalent to IP 54. The sheet steel used shall be 14/16 Gauge CRCA. The panel shall be suitable for outdoor installation and shall be provided with a canopy on the top extended by at least 74 mm outwards from all dimensions of main panel to prevent seepage of water inside the panel. In addition to doors provided on individual compartment, the panel shall be provided with an additional overall hinged door with padlock, locking arrangement etc. suitable for outdoor operation.
- The street light feeder pillar shall be provided with a AUTO / MANUAL facility with space to mount SCADA based automation system in future for centralized operation.
- The distribution panels shall be provided with hinged doors for access to components. Doors shall be gasketed all around with neoprene gaskets. The floor mounted Panels with MCCB units shall be compartmentalized with hinged door to each unit with interlock so as to prevent opening of the door when the switch is ON

and to prevent closing of the switch with the door not fully closed. However, defeat interlock features shall also be provided for the purpose of examination / maintenance. The switch shall be provided with padlocking facility in OFF position.

- The panels shall be suitable for mounting on raised M.S. fabricated frame or RCC columns so that clearance and access is available between road surface and bottom of the panel for cable end termination. Cable entries to these boards / panels for incoming as well as outgoing cables shall be from the bottom. The boards / panels shall require no rear access for maintenance.
- All accessible live connections shall be shrouded and it shall be possible to change individual fuses, switches, from the front of board / panel without danger of contact with live connections.
- The bus bars of the Panels shall be of electrical grade aluminium of adequate size conforming to IS-5082. These shall be supported on SMC/DMC/Epoxy non-hygroscopic supports at suitable intervals to withstand the thermal and dynamic stresses developed due to short circuit current of 50 KA. The continuous rating of the bus bars shall be as specified on drawings.
- Internal Earth bus of 50 x 6 aluminium flat shall be provided at the bottom extending through the entire length of the boards / panels. Earthing bus in the board / panel shall be bolted to each vertical section / component housing chambers. Suitable stud type terminals shall be provided on the earthing bus of the distribution boards / panels for connecting the same to earth grid / earth station.

#### **2.5.4. Specification of components**

- Moulded Case Circuit Breaker (MCCB)
- MCCB shall be suitable for manual operation with rotary handles. Breaking capacity of 50 KA
- Auxiliary contact of 2 NO / 2 NC shall be provided for the PLC communication. Under voltage coil, shall be provided in the incoming MCCB.

- MCCB's shall be front mounted type with standard mounting accessory like phase barriers, padlock support, spreader links for high rating MCCBs shall provided as required.

#### **2.5.5. Miniature circuit breakers**

- These shall be hand operated type. The miniature circuit breaker shall incorporate thermal overload and magnetic short circuit tripping devices. These shall have short circuit withstand capacity of 10 KA.
- Provide positive 'ON' locking devices for miniature circuit breakers supplying power to corridor lights, night lights and other circuits requiring continuous supply.
- Provide flush type latch and lock on the hinged doors with two sets of keys. All keys shall be identical.
- Provide a neatly typed directory on each panel, listing the locations of devices and equipment served by each circuit, mounted on the inside of the front cover in a frame with hard transparent shield.

#### **2.5.6. Indicating meters, lamps**

The meters shall be moving iron type, flush mounted, 96 mm sq. size and shall have provision for zero adjustment outside the cover. Lamps shall be of filament type, low watt consumption with series resistors.

#### **1. Astronomical programmable timer:**

The timer shall be suitable for program with minimum switching period of 20 minutes, programmable automatically calculates sunrise and sunset times based on latitude and longitude. In steps of 10 min. with  $\pm 5$  min. accuracy and one change over contact. The timer shall operate normally on 230 volts + 10% - 15% and frequency  $50 \pm 6\%$  with a rechargeable battery backup for 150 Hrs. in the event of power failure. The change over contact rating shall be 16 amps. AC. The timer shall also indicate actual time for accurate setting.

## **2. Control switches**

Control and selector switches shall be rotary type provided with indicating plate to indicate the functional operating position & suitable for semi-flush mounting.

## **3. Current transformers**

Current transformers of appropriate ratio, class of accuracy and burden shall be provided. The secondary windings of current transformers shall be earthed at one point through removable & accessible links with provision for attaching test links.

Current transformers shall be rated to withstand the thermal and magnetic stresses resulting from through fault current equal to system fault level. The CTs shall be epoxy resin insulated type.

## **4. Contactors**

These shall be electro-magnetic, air break type rated for continuous duty and suitable for AC-1 utilization category.

### **2.5.7. Internal wiring**

The boards / panels shall be supplied completely wired, ready for the external connection at the terminal blocks. Wiring shall be carried out with 1100 / 650 V grade PVC insulated, stranded copper conductor of adequate size 9 min. 2.5 mm sq.) Identification ferrules shall be provided to correspond with wiring diagrams. All wiring shall be terminated on terminal block. Terminals of Power Distribution Boards / Lighting Panels shall be stud type whereas outgoing terminals of sub-lighting panels can be clamp type.

### **2.5.8. Painting**

Sheet metal work of the Boards / Panels shall undergo a thorough surface treatment comprising rust removal, degreasing, pickling & phosphating prior to painting. The pretreated boards / panels shall be powder coated with two coats of



suitable primer and finished with two coats of powder coating paint in a shade 631 as per IS-5. The thickness of paint shall not be less than 100 microns.

#### **2.5.9. Name plate**

A nameplate shall be provided for each board / panel. The nameplates shall be rear engraved Perspex with white letters on black background also individual circuit identification nameplates shall be provided for each switch fuse unit.

#### **2.5.10. Hardware**

All hardware used shall be cadmium plated or zinc passivated.

#### **2.5.11. Inspection and testing**

- Representatives of the Owner shall have free access to vendor's works to inspect, expedite and witness shop tests. Any materials or work found to be defective or which does not meet the requirements of the specification shall be rejected and replaced at supplier's cost.
- Tests shall be carried out on the boards / panels as per the relevant Indian Standard Specifications and the test report shall be submitted to the Owner.
- Following tests shall be carried out by the vendor on each board / panel which shall be witnessed by the Owner
  - a. Verification of wiring (continuity test) as per approved wiring diagrams.
  - b. Mechanical Operation test.
  - c. Insulation test on bus bars, power and control wiring circuits with 1000V megger.
  - d. High voltage test at 2500 V for 1 minute.

#### **2.5.12. Tools**

A complete set of special tools required for maintenance of the boards / panels shall be supplied by the vendor free of cost.

## **2.6. Earthing**

### **2.6.1. General**

The metallic body / enclosure of all electrical equipment shall be earthed with a minimum of 2 distinct earth connections of adequate size earth conductors.

Earthing shall be in conformation with IS 3043

### **2.6.2. Earth station**

- **Pipe electrode earthing**

Earth electrode shall be of minimum 40 mm dia class “B” GI Pipe 3.0 m long with tapered bottom and with 12 mm dia holes at 75 mm c/c on all sides for bottom 2.0 m with top watering arrangement.

- **Plate electrode**

600 x 600 x 6 mm GI plates with 25 mm dia watering pipe with funnel buried at a depth of 2.5 m forms earth electrode. Earthing strip is directly brought to chamber/disconnecting link in protective pipe.

Earth electrode shall be back filled with alternate layers of charcoal and salt are provided through out height of electrode with overall 300 mm cover

### **2.6.3. Inspection chamber**

Brick masonry chamber of size 450 x 450 x 450 mm with heavy duty cast iron cover and frame with top at ground level are provided for watering arrangement.

### **2.6.4. Soil treatment**

In case of rocky soil or hard murrum, soil resistance is very high. Hence, for getting lower resistivity values, the contractor shall carryout artificial soil treatment to achieve the required level of lower resistance as per IS.

The earth resistance shall not exceed 1.0 ohms in any case. The contractor shall provide additional earth pits to get the desired earth resistance value of 1.0 ohm.

## **2.7 Inspection and testing**

The consultant and the representative of the Owner shall have free access to vendor's works to inspect, expedite and witness shop tests. Any materials or works found to be defective or which does not meet the requirements of this specification will be rejected and shall be replaced at supplier's cost. Purchaser reserves the right to carryout stage wise inspection.

All routine tests shall be carried out on the electrical equipment as per relevant Indian Standard Specifications. The delivery of the electrical equipment / electrical items shall be accompanied with copies of such routine test certificates clearly mentioning reference to the P.O No., Line item No. of P.O, quantity as per P.O, quantity inspected and passed, Governing IS for testing, test results and details of test equipment with their calibration details

## **3. Erection, testing and commissioning**

### **3.1. Equipment installation, testing and commissioning**

#### **3.1.1. Installation of equipment**

- a) In accordance with the specific installation instructions, as shown in the Contractor's drawings or as directed by the Developer, the Contractor shall unload, erect, install, wire, test and place into use of all electrical equipment included in the contract. Equipment shall be installed in a neat, workmanlike manner so that it is level, plumb, square and properly aligned and oriented.
- b) The Contractor shall furnish all supervision, labour, tools, equipment, rigging materials and incidental materials such as bolts, wedges, anchors, concrete inserts etc. required to completely install, test and adjust the equipment.
- c) Drawings, instructions and recommendations shall be correctly followed in handling, settling, testing and commissioning of all equipment and care shall be

exercised in handling to avoid distortion to stationary structures, the marring of finish, or damaging of delicate instruments or other electrical parts.

- d) The Contractor shall erect and commission the equipment as per the instructions of the Developer and shall extend all co-operation to him.
- e) In case of any doubt / query as to correct interpretation of drawings or instructions, necessary clarification shall be obtained from the Developer. The Contractor shall be held responsible for any damage to the equipment consequent to not following instructions correctly.
- f) The Contractor shall move all equipment into the respective buildings through regular doors or floors openings provided specifically for the equipment. The Contractor shall make his own arrangement for lifting of equipment.
- g) Where assemblies are supplied in more than one section, the Contractor shall make all necessary mechanical and electrical connections between sections including the connections between bus bars / wires. The Contractor shall also carry out the adjustments/alignments necessary for proper operation of the circuit breakers. All insulators and bushings shall be protected against damage during installation. Insulators or bushings chipped, cracked or damaged due to negligence or carelessness shall be replaced by the Contractor at his own expenses.
- h) The Contractor shall take utmost care in handling instruments, relays and other delicate mechanisms. Wherever the instruments or relays are supplied separately, they shall be mounted only after the associated control panels have been erected and aligned. The blocking material/mechanism employed for the safe transit of the instruments and relays shall be removed after ensuring that the panels have been completely installed and no further movement of the same would be necessary. **Any damage to relays and instruments shall be immediately reported to the Developer.**
- i) Care shall be taken during handling on insulating oil to prevent ingress of moisture or foreign matter. In the testing, circulation, filtering, or otherwise handling of oil, rubber hose shall not be used. Circulation and filtering of oil, the heating of oil by regulated short-circuit current during drying runs and sampling

and testing of oil shall be in accordance with the latest Code of Practice IS:10028 (Part II) shall be carried out.

- j) Inspection, storage, installation, testing and commissioning of transformers shall be in accordance with the latest Indian Standard Code of Practice IS:10028. All commissioning tests as applicable, vide Appendix B of IS:10028 (Part II) shall be carried out.
- k) Switchgear, relay and control panels shall be installed in accordance with the latest Indian Standard Code of Practice IS:10118. The switchgear panels shall be installed on finished surface or concrete or steel sills. The Contractor shall be required to install and align any channel sills which form part of the foundations. Tape or compound shall be applied where called for. The base of outdoor type units shall be sealed in approved manner to prevent ingress of moisture.
- l) After installation of all power and control wiring, the Contractor shall perform operating tests on all switchgear and panels to verify the proper operation of switchgear / panels and the correctness of the interconnections between various items of equipment. This shall be done by applying normal AC or DC voltage to the circuits and operating the equipment. Megger tests for insulation, polarity installation tests shall be carried out by the Contractor who shall also make all necessary for proper functioning of the equipment.
- m) Installation and testing of the battery and battery chargers shall be done in strict compliance with the applicable standards. Each cell shall be inspected for breakage and condition of cover seals as soon as received at site. The battery shall be set up on racks as soon as possible after receipt, utilizing lifting devices. The cells shall not be lifted by terminals. Contact surface of the battery terminals and inter cell connectors shall be cleaned, coated with protective grease and assembled. Each connection shall be properly tightened. Each cell shall be tested with an hydrometer and thermometer and the results logged. A freshening charge, if required, shall be added. When handed over to the Developer, the battery shall be fully charged and the electrolyte shall be at the full level of the specified specific gravity.

- n) Equipment furnished with finished coats of paint shall be touched up by the Contractor if their surface is spoiled or marred while handling.
- o) Foundation work and grouting-in of fixing bolts or channels for all transformer, switchgear, motors and control panels will be carried out by the Contractor.

### **3.2. Installation work for earthing system.**

- o The Contractor shall install aluminium / copper / steel conductors, braids, etc. required for the system and individual equipment earthing. All work such as cutting, bending, supporting, painting / coating, drilling, brazing / soldering / welding, clamping, bolting and connecting onto structures, equipment frames, terminals, rails or other devices shall be in the Contractor's scope of work. All incidental hardware and consumables such as fixing cleats/clamps, anchor fasteners, lugs, bolts, nuts, washing, bituminous.
- o The quantities, sizes, materials of earthing conductors and electrodes to be installed as per requirement. Routes of the conductors & locations of electrodes shall be as shown on the project drawings.
- o The work of embedment of earthing conductor in RCC floors / walls along with provision of earth plate inserts / pads / earth risers shall be done by the Civil Contractor when the floors are cast or during construction of walls. However, when required to do so in those areas where flooring will be done after the Contractor is at site, the Contractor shall co-ordinate with Civil Contractor and shall install the earthing conductors before the commencement of the concrete work. In such cases, the Contractor's scope of installation shall include laying the conductors in position with 50mm concrete cover, making welded connections to inserts / pad / risers above the floor near the equipment. The embedded conductors shall be connected to reinforcing rods wherever necessary.
- o If the tap connections (earthing leads) from the floor embedded main earthing grid to the equipment are more than 500 mm long then the same shall be embedded in floor by the Contractor where required, together with associated civil work such as excavation / chasing, concreting and surfacing, if not already

done by the civil Contractor. The concrete cover over the conductor shall not be less than 50 mm.

- Installation of earth conductors in outdoor areas, buried in ground, shall include excavation of earth upto 600 mm deep 450 mm wide, laying of conductors at 600 mm depth, brazing / welding as required, of main grid conductor joints as well as risers of length 500 mm above ground at required locations and then backfilling material to be placed over buried conductor shall be free from stones & other harmful mixtures. Backfill shall be placed in layers of 150mm, uniformly spread along the ditch and tampered utilizing pneumatic tampers or other approved means. If the excavated soil is found unsuitable for backfilling, the Contractor shall arrange for suitable material from outside.
- Installation of earth connection leads to equipment and risers on steel structures / walls shall include laying the conductors, welding / cleating at specified intervals, welding / brazing to the main earth grid risers, bolting at equipment terminals and coating welded / brazed joints by bitumen paint. Galvanized conductors shall be touched up with zinc rich paint where holes are drilled at site for bolting to equipment / structure.
- Electrodes shall be installed (a) directly in earth, or (b) in constructed earth pits and connected to main buried earth grid. The scope of work shall include excavation, construction of the earth pits including all materials required for construction of earth pits, placing the rod and fixing test links on those pipe / rod / plate electrodes in test pits and connecting to main earth conductors.
- Installation of lightning conductors on the roofs of buildings shall include laying, anchoring, fastening and cleating of horizontal conductors, grouting of vertical rods wherever necessary, laying fastening / cleating / welding of the down comers on the walls / columns of the building and connection to the test links to be provided above ground level.
- Installation of the test links shall include mounting of the same at specified height on wall / column by suitable brackets and connections of the test link to the earth electrode.

- Whenever main earthing conductor crosses cable trenches, they shall be buried below the trench floor.
- Suitable earth risers shall be provided above finished floor/ground level. If the equipment is not available at the time of laying of the main earth conductors, the minimum length of such riser inside the building shall be 200 mm and outdoors shall be 500 mm above ground level. The risers to be provided will be marked in project drawings.
- Earth leads and risers between equipment earthing terminal and the earthing grid shall follow as direct and short a path as possible.
- Wherever earthing conductors passes through walls galvanized iron sleeves shall be provided for the passage of earthing conductor. The pipe ends shall be sealed by the Contractor by suitable water proof compound.

### **3.2.1. Earthing connections**

- All connections in the main earth conductors buried in earth/concrete and connection between main earthing conductor and earth leads shall be of welded type.
- Connection between earth leads & earthing terminal provided on the equipment shall be bolted type.
- All bimetallic connections shall be treated with suitable compound to prevent moisture ingress.
- Metallic conduits and pipes shall be connected to the earthing system.
- Lightning protection system down conductors shall not be connected to other earthing conductors above ground level. Also no intermediate earthing connection shall be made to lightning arrestor and transformer earthing leads which shall be directly connected to plate electrode.

### **3.2.2. Earth electrodes**



- Electrodes shall as far practicable, be embedded below permanent moisture level.
- Test pits with concrete covers shall be provided for periodic testing of earth resistance. Installation of plate electrodes in test pits shall be suitable for watering. The necessary materials required for installation work shall also include civil work such as excavation and connection to main earth grid.
- Earth pits shall be treated with salt and charcoal.
- Soil, salt and charcoal placed around the electrode shall be finely graded, free from stones and other harmful mixtures. Backfill shall be placed in layers of 250 mm thick uniformly spread and compacted. If excavated soil is found unsuitable for backfilling, the Contractor shall arrange for a suitable soil from outside.

### **3.3. Installation of cables**

- a) The Contractor shall install, test and commission the cables specified in the specification in accordance with drawings & instructions issued by the Developer's representative. Cables shall be laid directly buried in earth, on cable racks, in built-up trenches, on cable trays and supports, in conduits and ducts or bare on walls, ceiling etc. as per drawings. Contractor's scope of work includes unloading, laying, fixing, jointing, bending and termination of the cables. The Contractor shall also supply the necessary materials and equipment required for jointing and termination of the cables.
- b) All apparatus, connections and cable work shall be designed and arranged to minimise risk of fire and any damage which might be caused in the event of fire. Wherever cables pass through floor or wall openings or other partitions, suitable bushes of an approved type shall be supplied and put into position by the Contractor.
- c) Standard cable grips and reels shall be utilised for cable pulling. If unduly difficult pulling occurs, the Contractor shall check the pull required and suspend pulling until further procedure has been approved by the Developer. The maximum pull tension shall not exceed the recommended value for the cable measured by the tension dynamometer. In general, any lubricant that does not injure the overall covering and does not set up undesirable conditions of electrostatic stress or electrostatic charge may be used to assist in the pulling of insulated cables in conduits and ducts.

- d) After pulling the cable, the Contractor shall record cable identification with date pulled neatly with waterproof ink in linen tags. Identification tags shall be attached securely to each end of cable with non-corrosive wire. The said wire must be non-ferrous material on single conductor power cable. Tags shall further be attached at intervals on long runs of cables on cable trays and in pull boxes. Cables and joint markers and RCC warning covers shall be provided wherever required. All cables shall be allocated a unique number which shall be fixed to each end of the cable using corrosion resistant label. Cable of different categories shall be tagged with the following subscripts and three digit number.

- HV power	HV-P _____
- LV power	P _____
- Control	C _____
- Instrumentation	I _____
- Protection	PR _____
- Telecommunication	T _____

- e) Sharp bending and kinking of cables shall be avoided. The bending radii for various types of cables shall not be less than those specified below :

11 KV XLPE multicore armoured cables: 15 times the overall dia of the cable

650 / 1100 V PVC insulated armoured cables: 12 times the overall dia of the cable

If shorter radius appears necessary, no bend shall be made until clearance and instructions have been received from the Developer.

- f) Power, control and instrumentation cables shall be laid in separate cable racks / rays.
- g) Where groups of HV, LV and control cables are to be laid along the same route, suitable barriers to segregate them physically shall be provided.

- h) Cables of different categories shall be installed so as to maintain satisfactory clearances for safety and in order to reduce the possibility of electrical interference. The following table gives the distances in mm that shall be maintained between the different categories / voltage grade of cable.

<b>Cable category</b>	<b>HV Power</b>	<b>LV Power</b>	<b>C&amp;I Protection</b>	<b>Telecommunication / data network</b>
HV Power	-	275	550	550
LV Power	275	-	275	275
C&I Protection	550	275	-	275
Telecommunication	550	275	275	-

- i) Where cables cross roads and water, oil, gas or sewage pipes, the cables shall be laid in reinforced spun concrete or steel pipes. For road crossings the pipe for the cables shall be buried at not less than one metre depth.
- j) Cables laid in ground shall be laid on a 50 mm riddled earth bed. The cables shall then be covered on top and at their sides with riddled earth of depth of about 150 mm. This is then gently filled up to a depth of about 100 mm above the top of uppermost cable to provide bedding for the protective cable covers which are placed centrally over the cables. The protective cable covers for LV cables may be of earthenware and for HV cables of reinforced concrete. The RCC covers shall have one hole at each end, to tie them to each other with GI wires to prevent displacement. The trench is then backfilled with the excavated soil and well rammed in successive layer of not more than 300mm depth, with the trenches being watered to improve consolidation wherever necessary. To allow for subsidence, it is advisable to allow a crown of earth not less than 50mm in the centre & tapering towards the sides of the trench.
- k) In each cable run some extra length shall be kept at a suitable point to enable one or two straight through joints to be made, should the cable develop a fault at a later date.
- l) Cables on cable racks, on cable trays and conduits shall be formed to avoid bearing against edges of trays, racks, conduits or their supports upon

entering or leaving trays, racks or conduits. Cables shall be racked or laid directly into cantilevered cable trays where practicable, but in some cases it may be necessary that cables are pulled or threaded into trays. To facilitate visual tracing, cables in tray shall be laid only in single layers and unnecessary crossing of cables shall be avoided. Cables on trays shall finally be clamped in an approved manner.

- m) Cable splices will not be permitted except where permitted by the Developer. Splices shall be made by Contractor for each type of wire or cable in accordance with the instructions issued by cable manufacturer's and the Developer. Before splicing, insulated cables shall have conductor insulation stepped and bound or pencilled for recommended distance back from splices to provide a long leakage path. After splicing, insulation equal to that on the spliced conductors shall be applied at each splice.
- n) Jointing of cables shall be in accordance with relevant Indian Standard Code of Practice. Materials and tools required for cable jointing work, including cold setting bituminous compound shall be supplied by the Contractor. Cables shall be firmly clamped on either side of a straight through joint at a distance of not more than 300mm away from the joints. Identification tags shall be provided at each joint at all cable terminations.
- o) At cable terminal points where the conductor and cable insulation will be terminated, termination shall be made in neat, workmanlike and approved manner by men specialised in this class of work.
- p) Control cable termination shall be made in accordance with wiring diagrams, using colour codes established by the Developer for the various control circuit, by code marked wiring diagram.
- q) When control cables are to be fanned out and cabled together with cord, the Contractor shall make connections to terminal blocks, & test the equipment for proper operation before cables are corded together. If there is any question as to the proper connection, the Contractor shall make a temporary connection with sufficient length of cables so that the cable can be switched to another terminal without splicing. After correct connections are established through operating the equipment, cables shall be cut to their correct lengths,

connected to terminals in the specified manner, and corded together where necessary to hold them in place in a workmanlike manner.

- r) Cable seals shall be examined to ascertain if they are intact and that cable ends are not damaged. If the seals are found to be broken the cable ends shall not be jointed until after due examination and testing by the Developer. Before jointing is commenced, insulation resistance of both sections of cables to be jointed shall be checked by megger.
- s) After installation and alignment of motors, the Contractor shall complete the conduit installation, including a section of flexible conduit between motor terminal box and trench / tray. The Contractor shall install and connect the power, control and heater supply cables as per equipment manufacturer's drawings, if any.
- t) For directly buried underground cables, Contractor shall install galvanised cast iron cable markers over ground, at all bends, loops, joints, crossing points and at every 25 meters interval on straight runs. The cable markers shall be anchored in the ground to a depth of minimum 500mm. The cable markers for L.T. cables & HT cables shall be distinctly different in shape and marked as L.T. Cables and HT Cables as the case may be by 30mm size letters.

### **3.4. Lighting system installation**

This covers the requirements of installation of the following :-

- a) Lighting fixtures complete with lamps and accessories
- b) Lighting panels
- c) Receptacles and lighting control switches
- d) Street lighting poles and flood light towers
- e) Multicore cables for street and boundary lighting
- f) Maintaining equipment/materials during storage and being responsible for the equipment/material until they are handed over to the Developer.
- g) Installation, testing and commissioning shall be carried out in accordance with the drawings and as stipulated in this specification.

### **3.4.1. Applicable standards**

Electrical wiring installations (system voltage exceeding 650 V)	:	IS:732
Code of practice for interior illumination (Part-1):		IS:3646/BS:8206
Code of practice for street lighting installation	:	IS:1944
Code of practice for industrial lighting	:	IS:6666
Code of practice for fire safety of building	:	IS:1646
Boxes for enclosure of electrical accessories	:	IS:5133 (Part I)
Guide for safety procedures and practices in electrical work	:	IS:5216
Ceiling roses	:	IS:371

### **3.4.2. Lighting fixtures**

- a) The installation of lighting fixtures shall be based on the mounting arrangement shown in the drawings enclosed. Installation shall include all materials required to mount the fixtures in the manner as shown in the drawings. Installation of lighting fixtures shall include installation of control gear box wherever applicable.
- b) Installation of receptacles and switches shall be carried out suitably as per the lighting layout drawings prepared by Contractor and approved by Developer. Switch shall be mounted in flush with the front cover plate. Supply and installation of necessary hardware shall be included in the scope for installation of receptacles/switches.
- c) Lighting distribution boards shall be installed at the location indicated in the layout drawings prepared by Contractor & approved by Developer. Installation

rates quoted for installation of lighting distribution boards shall include supply and installation of base channels, foundation bolts, etc.

- d) Outdoor lighting distribution boards shall be installed on a concrete plinth. The top of plinth shall be 100mm (min.) above the ground level. Construction of concrete plinth shall be included in the installation of outdoor lighting distribution board. Installation cost of lighting distribution board shall include installation of earthing conductor from LDB to the nearest earthing grid.

### **3.4.3 Outdoor lighting (Street and flood lighting)**

The following shall be deemed to be included as part of the installation work for outdoor lighting point wiring.

- Installation of multicore/single core cables between LDB and junction box mounted on street light pole/flood lighting tower, from junction box to metal enclosed control gear box.
- Supply and installation of crimping type cable lugs, double compression type cable glands at each junction box and fixture, termination and testing and commissioning of cables.
- Contractor's scope shall also include excavation and preparation for buried cables. Supply and installation of route markers, supply and installation of HDPE pipes for road crossing shall also be included.
- Supply and installation of necessary cleating arrangement for cabling on flood light poles.
- Contractor shall provide necessary foundation for erecting street light pole/flood light tower and install the same. Contractor shall prepare foundation drawings with necessary details to Developer for approval.
- Contractor shall plan and cut the cables in such a way that there is no wastage and no cable jointing is required in any run. However, should any joint become

necessary, the same shall be provided by the Contractor and joint marker shall also be provided at no extra cost.

- Earthing of street light pole / flood light tower, lighting fixtures, control gear boxes, junction boxes, etc. are also included in the scope of installation. Contractor shall earth street light pole/flood light poles and junction box with 25 x 3 mm G.S. flat tap off from the 25 x 3 mm M.S. flat earthing grid along the street lighting included in the scope. The Contractor shall interconnect earthing grid to plant main earthing grid at first and last pole of each feeder circuit and at one intermediate pole.

#### **3.4.4 Installation of lighting poles & towers for outdoor lighting (Street and flood lighting)**

- Work includes supply and installation of street light poles and flood light towers including associated junction boxes with fuses, links and terminals for junction boxes and junction boxes near each flood light fixtures.
- All street light poles and towers shall be painted with two coats of red oxide oil primer followed by two coats of aluminium alkyd paint.

#### **3.4.5 Earthing**

- a) Exposed conduits and fittings shall be earthed by 12 SWG GI wires run along the length of the conduit and secured by means of suitable clamps efficiently fastened to conduit tip. To achieve perfect electrical continuity, the conduits shall be bonded effectively on either end of a coupling and other joints. In case of concealed wiring 1.5 / 2.5 sq.mm PVC insulated wire inside the conduit shall be used for earthing.
- b) Conduits shall be earthed at the ends adjacent to switch boards at which they originate or otherwise at the earth clip, clamp or gland, in effective electrical contact with the conduit.
- c) For outdoor lighting poles the earthing conductor shall be terminated upto the junction box on the pole and 12 SWG wire shall be taken up to the pole fitting.



### **3.5. Pre-Commissioning checks and commissioning**

All checks and tests shall be as per the Manufacturer's drawing manuals, relevant codes of installation and commissioning check lists as given below :-

- a) Among other commissioning tests, the following shall be carried out at site after completion of installation. Contractor shall ensure to use calibrated test equipment having valid calibration test certificates from standard laboratories traceable to National Standards / International Standards. All tests to be carried out in the presence of Developer.

#### **(i) Cables**

- All new cables shall be tested for its insulation strength before terminating / jointing. After terminating / jointing is completed of all L.V. (i.e. 650/1100V) cable shall be tested by 1000V megger. All H.T. Cables (i.e. 11 KV) shall be tested by 2500 V motor operated megger.
- Cable core shall be tested for
  - Continuity
  - Absence of cross phasing
  - Insulation resistance to earth
  - Insulation resistance between conductors

#### **(ii) Earthing system**

The Contractor shall ensure the continuity of all conductors and joints. The Developer may ask for earth continuity tests earth resistance measurements and other tests which in his opinion are necessary to prove that the system is in accordance with design, specification, code of practice and electricity rules. Earth resistance value should be not greater than one (1) ohm

#### **(iii) Lighting system**

Before putting complete system into service, commissioning tests stipulated in applicable standards and code of practice shall be carried out by the Contractor in the presence of the Developer covering all lighting system equipment.

**(iv) The Contractor shall carry out insulation resistance tests by megger of following rating:**

- Control circuits upto 220 V : 500 V megger
- Power circuits upto 1.1 KV : 1000 V megger

**3.6. Safety procedure and practice**

Following safety procedure and practice should be provided by electrical Contractor in switchgear room/sub-station as per latest edition of I.S. 5216.

**a) Caution / Danger Board**

- (i) Feeder Pillar Panel

**b) Fire Safety**

The requirement of hand appliance in switchgear room, electrical equipment room shall be provided as per Clause 4.0 of Fire Protection Manual by Regional Traffic Committee, 10<sup>th</sup> edition 1988.

**ANNEXURE - E**  
**EHS Requirements**

## Project Environmental I Health and Safety Requirements

1	<p><b>General</b></p> <p>This document and corresponding documents such as EHS Plan, SOP, check lists, Work permits, and Safe Work instructions are applicable to MLDL Staff, PMC, Contractors and their subcontractors including vendors down the line at all levels below while they are engaged for any task related to MLDL Projects. Wherever PMC is assigned, it is the duty of PMC to ensure the adherence to EHS Requirements and applicable penalty clauses will be applied to PMC for any failures.</p> <p>Follow latest EHS Plan (Revised and updated by MLDL), Ensure that EHS Requirements and other EHS documents are shared with subcontractors and vendors down the line who are directly or indirectly related to MLDL Projects for strict compliance of MLDL EHS standards while they are engaged for any task related to MLDL Projects.</p> <p>EHS Induction for all involved in Project, Raise query on EHS matter if any.</p> <p>Prepare and submit EHS Plan in line with MLDL EHS Plan to EHS Department in HO. To be revised on as and when the MLDL Plan is revised.</p> <p>Child workers (below 18 years of age) shall be not be deployed directly/indirectly. Contractor shall take steps to ascertain age of workers in case of doubts. Pre-Medical exam prior entering the site is mandatory for all workmen (Refer total fall protection plan)</p> <p>Women workers shall be discouraged considering the risk involved in construction. In case it is not avoidable, Contractor shall ensure separate accommodation, lavatory and crèche (for kids).</p> <p>All individuals engaged in the project should have authorised Identification document issued by Government authorities.</p> <p>All workers shall be issued Identity Card by the Contractor. In addition to basic information about worker, ID shall indicate the blood group, date of birth, father/husband name and complete address. Workers will not be permitted entry in the work area without ID Card. Refer MLDL EHS Plan for Standard ID Card Template.</p> <p>Applicable check list shall be used as per the monthly programme and shall be submitted to MLDL EHS Department.</p> <p>Before commencing the work, contractor has to obtain the permit to Work at least one day before.</p> <p>Safety committee shall be formed and conducted as Refer SOP for participation and consultation. Its mandatory for all the committee member to attend meeting and safety committee shall be reconstituted every after two years</p> <p>Work wise Method Statement &amp; Risk Assessment shall be prepared by the Contractor for review and approval by MLDL. Work shall not commence without Method Statement &amp; Risk Assessment</p> <p>Appropriate Health and Safety Signage in Hindi &amp; in the language understood by the majority of workers shall be displayed conspicuously in orderly manner.</p> <p>Engage workers through mass awareness programmes – celebration of Safety Day/Week, World AIDS Day and organizing skit, health camp etc. Refer Project EHS Plan for details</p> <p>Safety Engineering adopted/adapted by Contractor shall conform to applicable IS Codes and/or accepted best practices.</p> <p>Accident victims shall be duly compensated by Contractor as per law of land and evidence shall be submitted to MLDL.</p> <p>Mobile Phone in all form shall be prohibited while on work. However, mobile phone can be used in common areas designated for the purpose.</p> <p>All statute requirement identified in Project EHS plan of MLDL shall be adhered.</p>
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2	All practicable measures shall be taken to avoid Spillage, High Noise & high dust in work area, also other parameters of regulation shall be followed (Refer Project EHS plan & Legal register)
	Debris chute shall be provided in every tower of HDPE material & throwing of materials /debris from tower is strictly prohibited.
3	Training and Awareness
	Induction Room to accommodate 50 workers at a time. MUST be fitted with fans, tube lights, safety posters, dummy (Mannequin) and audio-visual aids. USE of INDUCTION FILM of MLDL is a MUST.
	Safety Parks – may also be part of Induction room
	All workers must be inducted before commencement of work. Induction Sticker shall be placed on helmet and shall be indicated in the ID Card. (Refer total fall protection plan)
	Contractor shall submit Training Calendar for specialized training of workers (of different trade), supervisors, staffs and line managers.
	Workers Should be trained on usage of safety Harness and risk involved while working at height. Refer SOP & Total Fall Protection Plan.
	SMARRT card shall be used for conducting the daily training for all work fronts by work supervisors before start of the work. The Group not to exceed more than 20 numbers. 100% workforce to be covered on a daily basis.
	Personal Protective Equipment
	Basic Personal Protective Equipment (helmet, shoes/wellington boots) is compulsory for all in the construction zone.
	Special PPE (Safety Goggle, Nose Mask, Ear Plug, Hand Gloves & Shoulder Pad etc.) shall be used by workers as per the hazard/risk associated with their work.
4	Standard PPE qualifying the defined test shall only be used. The same shall be sourced from approved vendors only. Refer EHS Plan and PPE Matrix for PPE.
	No Single Lanyard Harness permitted, double lanyard safety harness with scaffold grade double action snap hooks and energy absorber to be used. The lanyard length shall not exceed more than 1.8 meter and lower height Self Retractable Lanyard Can be used. (Refer SOP for personal protective equipment).
	Staffing
	Deploy adequate number of competent EHS Personnel. Number of EHS Personnel shall depend upon number of workers deployed at any point of time.
	Up to 50 workers- 1 Safety Officer and one Safety Steward for every additional 50 workers. NB- in the night shift appropriate no. of safety steward/supervisor/officer shall be deployed by the Contractor considering the no. of workers engaged in the night.
	Competency of EHS Personnel shall conform to the following (as a minimum):
	Safety Steward/Safety Supervisor – 10 <sup>th</sup> pass with 3 years of experience as safety steward/safety supervisor in construction
	Safety Officer – Graduate (Science/Engineering) + Diploma (ADIS) in EHS with 5 years of experience as safety officer in construction, good communication skill (Hindi & English)
	Appointment of EHS In-charge of Contractor shall be approved by EHS Department of MLDL by reviewing the credentials.
	A supervisor/ Charge hand who has minimum five years and good knowledge of the work shall be provided for every 20 workers.
	Contractor EHS Team shall work in close coordination with MLDL EHS In-charge, who shall provide direction and lead from the front. In conflicting situations views of MLDL In-charge shall prevail.
	All appointments shall be made with the approval of Site Project head and Site EHS Manager.

- 5 Documents and reporting
  - Contractor shall manage EHS in conformance with MLDL processes detailed in EHSMS Manual, SOP, Process Manual & Technical Manual.
  - Contractor shall execute work with due respect and recognition of MLDL EHS Policy and Mahindra Code of Conduct.
  - All EHS reporting formats by Contractor shall be in accordance with MLDL process and formats.
  - Comply with all applicable Legal/ statutory Requirements and submit compliance status before 7<sup>th</sup> of every month.
  - Mahindra Litespace Developers Ltd team has the full right to contact contractor associates / workers, their subcontractors, vendors and workers through electronic medium like Mobile / E-mail for the promotions related to Occupational Health and Safety.
- 6 Labour Camps (Not applicable if labours are Local and Coming from their own/ rented homes on daily basis,) Refer SOP for Labour Camp. SOP 25 Standard for onsite workers housing quarters
  - Labour camp shall be erected on a non-water logging land. There MUST be sufficient gap (8-10 feet) between the rows of rooms. Rooms shall be ventilated and well-lit in the night. Asbestos sheet shall not be used in any form.
  - Camp amenities (toilet, urinal, wash room, bath room, canteen & drinking water) shall conform to requirements stipulated under BOCW Act/Rule. The amenities shall be maintained in hygienic condition.
  - Waste water generated from labour camp shall be collected and treated before discharging.
  - Maintain area lighting and sanitation in camp area. Appoint a Camp Boss as caretaker. Install adequate type and quantity of Fire Extinguisher.
  - Resort to regular pest control including snake repellent & fogging
  - Provide and manage Crèche for kids.
  - Provide common cooking area. Cooking inside the room is prohibited.
  - SOP no 25 supersedes all relevant applicable norms.
  - Proper arrangement shall be made for regular disposal of waste generated inside camp & dedicated housekeeping team shall be kept for maintaining health & hygiene in labour camp.
- 7 Welfare
  - The extracts of the statute regulations shall be displayed prominently at a conspicuous location for the benefit of operatives.
  - No workmen shall be allowed to work more than 9 hours in a day and 48 hours in a week.
  - Sanitation facilities shall be provided to workmen i.e. 1 for 20 till 100 and afterward 1 for every 50 workers. The same shall be provided at site (i.e. 1 toilet minimum on every 4 floors)
  - Washing facility shall be provided in hutment
  - Canteen facility shall be provided inside site if the workmen number exceed 100 no.
  - Rest room shall be provided for workmen if the number exceeds 100.
  - Separate sanitation and bathing facility shall be provided for women worker at site with sign board mentioning the same in local language (or in the language easily understood by the labours).(Refer procedure for occupational health & Hygiene)
  - Drinking water facility shall be provided at least 5 liter /workmen and the drinking water tank shall be kept away minimum 6m from toilets and washing facilities
  - Drinking water test shall be done every after 3 months in accordance to IS 10500 :2012.
  - The welfare facilities such as toilets, rest rooms and wash rooms shall be continued till completion of project or till any alternate arrangements are made by the developer.
- 8 Emergency Plan
  - Develop and deploy "Emergency Preparedness & Response Plan – EPRP". Constitute a Joint Emergency Response Team with Project Head (MLDL) as the Leader. (Refer procedure for Emergency response plan)



Necessary resources towards prevention, response and mitigation of emergency shall be deployed by the Contractor. Example – Public Address System, Emergency Siren, Assembly Points, Stretchers, Ambulances etc.

EPRP shall be tested regularly through Mock Drill and/or Table top Test.

Tie up with government & non-government organization for assistance during emergency.

Regular briefing to all on emergency process and display of contact numbers in prominent location.

#### 9 Assurance Plan

Steel scaffold and work platform with approach, toe board and protecting rails as stipulated under applicable IS Codes. Refer MLDL EHS Plan and SOP for scaffolds.

100% planking shall be done for external scaffold with proper arrangement of access ladder. Scaffold shall be well supported in a ratio of 3:1 (Refer Project EHS plan & SOP for scaffolding and working platform).

Underneath the shuttering level Horizontal safety net shall be installed to arrest any falling object and on the ground floor meter. Scaffold erected outside the building shall be covered with Vertical safety net (i.e. Green net /Argo net).

Aluminum Ladder as per specification of relevant IS Codes. In special cases, safe wooden ladder is permitted only with approval of EHS In-charge of MLDL.

Construction equipment & vehicle shall be fitted with safety devices designed and approved by the manufacturer and maintained in sound working condition as per the provision of BOCW Act/Rules. Signal man shall be deployed to help operator.

Pre-employment medical fitness test and competency certification of all operators shall be done as per the provision of BOCW Act/Rules.

Pre-employment medical fitness test of all workers engaged in hazardous operations such as height work, work in confined spaces, work over/under water etc. shall be done.

Any test/vaccination/medical attention mandated by the local/state/central government shall be complied by the contractor at their cost.

Vertigo Test is Mandatory for the work at height above 1.8 meter.

Height Pass shall be issued for working at height after due fitness certification by the competent doctor as per the relevant process.

Temporary connection/Captive generation, distribution and use of electricity shall conform to the requirements of Indian Electricity Act & Rule. Only standard equipment, accessories and tools shall be used. Certified electrician shall be deployed.

Edge protection of excavation and provision of safe access and egress as per provision of IS Codes.

Excavated earth shall be kept minimum 2 meters away from edge and vehicle movement around excavation is strictly prohibited.

Sloping of 45 degree or benching shall be done to prevent collapse of excavation.

Hard Barricading of excavation, dangerous work/equipment, opening on ground or floor, edges of stairs/floor and others as advised by the EHS In-charge. (Shall be capable withstand an impact of 100 Kg from all directions).

Soft Barricading using cautioning tape etc. allowed only for temporary and in non-hazardous situation.

Vertical & Horizontal Safety Net for area protection as per applicable IS Codes and/or accepted best practices.

Maintain Housekeeping to avoid slip, trip & fall hazards in all areas occupied by the Contractor. All materials to be stacked with proper signage as per type and size in designated area as per logistic plan. 5S concept of housekeeping to be followed.

Material Handling and storage as per code recommendation and/or accepted best practices.

Scrap segregation and storage in exclusively marked area.

Area lighting as per the need to facilitate movement of man and materials. Refer EHS Plan for details.

Collect and treat Waste water generated in the Batching Plant (washing of drum mixture and transit mixer). Use the treated water for dust suppression and/or curing.

Provide and enforce use of Full Body Harness for height work (>1.8 m). Make provision for anchoring lifeline. Individual Rope grabber vertical life line required for any work on RSP with suitable anchorage. Bosun's chair/ Spiderman kit or any rope suspended working not allowed.

For height work beyond G+4, install Emergency Rescue System. Train workers & supervisor in rescue operation. Refer SOP for Total Fall Protection.

Fuel (petrol, diesel) store shall be protected against unauthorized entry and fire. Catch Bins shall be used to trap accidental spills.

Use of alcohol & smoking shall be prohibited in construction zone.

Apply speed restriction to all types of vehicle/equipment in the construction zone.

All Safety precautionary arrangements / welfare measures/ urinals installed as per MLDL EHS Plan during the construction stage shall continue up until the completion of project or permanent control measures are in place or no more requirement of same is identified by MLDL Project management team.

#### 10 Medical Care Centre

Provide and maintain Medical Care Centre as per EHS Plan. Maintain record of treatment.

MCC shall be manned by the competent Male Nurse during the work hours. First Aid Boxes shall be provided and maintained.

Qualified Medical Officer shall be made available free of cost to workers for health check-up and consultation. Doctor shall be available minimum twice a week at least.

Tie up with Hospital for Ambulance and medical aid in the emergency. If the Ambulance provider is away by a traveling time of more than 10 minutes (Considering the traveling distance and general traffic), Ambulance should be stationed in project with driver during the active working hours.

Regular training on health, hygiene, first aid and CPR to all.

Resort to regular pest control including snake repellent & fogging in work areas.

Adequate provision for potable water. Regular testing of water quality. At least once in every quarter.

AIDS awareness – HIV testing & counselling.

Preventive Health Screening of operators and height workers.

Regular counselling by qualified councilors and practice on employee wellbeing.

#### 11 Mechanical & Electrical equipment

ELCB/RCCB of 63A & 30Ma & enclosure /shed shall be provided to every distribution board. IP65 Distribution board shall be provided.

Rubber mat and earthing for every distribution board & firefighting equipment shall be deployed near DB

Access for firefighting equipment & Electrical distribution board shall be kept free from any obstruction

Contractor to submit SLD (Single Line Diagram for Electrical distribution of site).

Earthing pit shall be marked properly and testing of same shall be done every quarterly to check its resistance. (shall be between 0 to 8 ohm).

All electrical portable tools shall be tested weekly subsequently inspection tagging shall be done & record of same shall be maintained. Winch driven hoist not allowed. Refer EHS Plan for hoist.

Electricians deployed at site shall have valid license.

All the lifting tools & tackles shall be inspected by third party (Refer project EHS plan).

Passenger hoist, suspended scaffold shall be inspected half yearly and builder hoist & tower crane shall be inspected yearly or after every alteration or modification

Colour coding shall be followed



Operator provided for Mechanical equipment shall be competent enough and competency document shall be submitted to MLDL EHS department.

Rigger shall be provided for tower crane, operation will not be allowed without rigger

Damage tools & tackles shall not be allowed.

## 12 Aluminum Shuttering

Cantilevered access bracket with extended vertical support till next floor height and Working platform with 6 railings covering the entire perimeter of building during the shuttering.

Provision of access ladders (Light weight).

1.5-meter vertical Guard rails with double railing where work progresses (Leading edge fall protection at shuttering level at 1.5-meter, two layer of railing covering entire shuttering span with green net).

1.5-meter vertical Guard rails with double railing must be in place during work progresses (Larger openings/voids/ MEP shafts where a fall from height is possible).

Lid for material shifting penetration in Aluminium, painted in Yellow colour and imprinted in black as "Hole below do not remove" for two floors for all the penetrations. Lid provided shall fix in the penetration.

Perforated, scaffold boards with proper seating on cantilevered brackets for working platform covering the entire cantilevered brackets without any gaps.

Provision of proper footing, bracing for formwork, falsework and temporary supports.

## 13 Accident Investigation

Preliminary report shall be shared with Corporate EHS team within 4 hours of incidence occurrence and detailed accident investigation report shall be shared within 24 hours

All the functional head and MLDL project manager shall be part of Accident investigation team .

Corrective action & preventive action implementation shall be the responsibility of Project Head & Safety manager of respective site.

Risk Matrix for activity hold.

## 13 Risk Matrix

Probability	5	5	10	15	20	25	<u>Probability</u>		<u>Severity</u>	
	4	4	8	12	16	20	1 = Very unlikely		1 = First aid injury or illness	
	3	3	6	9	12	15	2 = Unlikely		2 = Minor injury or illness	
	2	2	4	6	8	10	3 = Likely		3 = Injury or illness >48 Hrs	
	1	1	2	3	4	5	4 = Very likely		4 = Major injury or illness	
	1	2	3	4	5		5 = Almost certain		5 = Fatality, disabling injury, etc.	
<u>Severity</u>							Acceptable	Review	Not acceptable	
Risk = Probability X Severity										

Rating	Probability	Rating	Severity	Risk Index
1	Very Unlikely	1	First aid injury or illness	1
2	Unlikely	2	Minor Injury or illness	4

3	Likely	3	Lost time injury or illness	9
4	Very Likely	4	Major injury or illness	16
5	Almost Certain	5	Fatality, disabling injury	25

Risk level from 1-3 is acceptable risk and work can be allowed.

Risk level for 4: work can be allowed but the deviation needs to be rectified within 24 hours.

Risk level from 5-25, work needs to be stopped with immediate effect till rectification and confirmation from MLDL Safety personnel /Execution staff.

#### 14. EHS PENALTY MATRIX

SN.	Definitions	Amount of Penalty
1	Failure to provide ID Card to workers	Rs. 1000/- per person
2	Failure to provide requisite amenities in the Labour Camp including crèche	Rs. 50,000/- per amenity
3	Failure to provide well equipped Induction Room	Rs. 50,000/- on first instance and multiplies by two for non-rectification within stipulated time.
4	Smoking in the construction zone and/or working under influence of alcohol/prohibited drugs.	Rs. 2000/- per violation
5	Burning of waste or smoldering of combustible materials on site without written permission.	Rs. 5000/-
6	Failure to wear Personal Protective Equipment (PPE) or its improper use.	Rs. 1000/- per individual if PPE supplied but not worn by personal; Rs. 1,000/- per individual if PPE not provided by the contractor
7	Working without EHS Induction.	Rs. 5000/- per personal and working day to be dismissed
8	Not attending EHS Meetings or any other EHS Programme/Function	Rs. 1,000/- per individual
9	Failure to submit EHS Documents (EHS Plan, Work Method Statement, Emergency Plan) with in stipulated time	Rs. 10,000/- each instance
10	Failure to submit report on incident, accidents and near misses with in the stipulated time	Rs. 10,000/- each instance
11	Failure to comply with infringement notice	Rs. 10,000/- each instance

12	Misuse/damage to property/equipment/infrastructure	Rs. 10,000/-; in addition, contractor to pay for the cost of items damaged
13	Unsafe work (act/condition) not covered otherwise	Rs. 5,000/-; & immediate rectification
14	Poor Housekeeping and stacking of materials	Rs. 10,000/- & cessation of work till satisfactory rectification.
15	Obstruction of passageways, entrances, doorways, stairs, access to Fire Fighting Equipment etc.	Rs. 2,000/- & immediate rectification
16	Use of equipment without Inspection tag or its unauthorized use and alterations	Rs. 2,000/-& immediate rectification
17	Use of damaged or uncertified lifting tackles	Rs. 10,000/- & confiscation of such items
18	Unsafe lifting method	Rs. 10,000/- & cessation of work till satisfactory rectification
19	Failure to provide for and use unsafe working platforms, means of access to the work place, where work is required to be carried out beyond a person's normal reach	Rs. 10,000/-& cessation of work till satisfactory rectification
20	Permitting/Forcing personal to work unsafe manner	Rs. 20,000/- each instance to supervisor/work in-charge
21	Failure to provide EHS signage	Rs. 5,000/-
22	Not providing collective fall protection	Rs. 10,000/- & cessation of work till satisfactory rectification
23	Allowing fall of materials from height or throwing materials from height or not barricading dangerous zone on ground and not providing flagman to warn the possibility of falling materials.	Rs. 20,000/-
24	Violation of Work Method Statement or Violation of Permit to Work or Violation of Work Instructions	Rs. 10,000/-
25	Absence of well-equipped Medical Care Centre or non-availability of First Aiders or no tie up with hospitals for emergency health care	Rs. 25,000/-
26	Lack of pre-& periodical post-employment health screening.	Rs. 10,000/-
27	Failure to implement Height Pass for height work (Refer SOP on Total fall protection.	Rs. 5,000/-
28	Non-compliance to Permit to work procedure. Refer SOP for permit to work.	Rs. 10,000/-

29	Unauthorized use of any safety appliances/equipment	Rs. 10,000/-
30	Adopting unsafe tapping/connections/termination of electrical lines or use of defective electrical fittings, cables and electrical tools or allowing cables / equipment to be submerged in water or not providing Earth Leakage Circuit Breaker/not maintaining Earthing	Rs. 10,000/- & cessation of work till satisfactory rectification
31	Failure to comply with an order (written or otherwise) issued by the MLDL Project Manager or representative, or EHS In-charge in regard to EHS matter	Rs. 20,000/-
32	Threatening EHS personnel, misbehaving, fighting or intentionally causing harm to any person	Rs. 50,000/- and Personal to be banned from the site and a report will be made to the police
33	Failure to deploy competent EHS Personnel in adequate number as per the EHS Plan	Rs. 20,000/- per incidence
34	Lost Time Injury as a result of negligence as established by Accident Investigation Report	Rs. 25,000/- per incidence
35	Fatality	Rs. 10,00,000/-
36	Failure to constitute and run Safety Committee or non- representation of workers in the committee	Rs. 25,000/-
37	Failure to constitute Emergency Response Team	Rs. 25,000/-
38	Use of Mobile Phone in any form while on work	Rs. 500/- per person per incidence
39	Noncompliance of statute/ legal requirements.	Rs 500,000/- + Fine imposed by authorities & Stoppage of work till rectification
40	Failure to provide supervisor on every 20 labours.	Rs. 10,000/-
41	Failure to provide Medical facilities	Rs 25,000/-

**Note:** -The penalty mentioned are for the first incident and the fine amount will be doubled for every repetition or non-rectification with in the time stipulated. For eg. If the fine is yy for first time it will be 2 X yy for the repetition and further 2 X 2 X yy, keeps doubling for every repetition.  
The penalty will be deducted from the RA bill and will be used for safety promotional activities and corrections.

### Legal and statutory requirements

#### 15. Mandatory Statutory and regulatory obligation of PMC/vendors/ Contractors engaged in MLDL Projects

1.	Every Vendor and their sub vendors who likely to cross the threshold no. required to obtain the Labour license should complete the required formalities and obtain CLRA license from respective authority.
2.	Copy of licenses like CLRA or BOCW should be submitted to the Principal Employer (MLDL) within a reasonable time from date of appointment as Every Vendor and their sub-vendors and employees.
3.	Every Vendor and their sub vendors who are likely to deploy migratory labours shall obtain migratory labour license from the competent authority.
4.	To whomever CLRA is applicable should be obtained before commencement of contract certificate from the Principal Employer (MLDL).
5.	Should ensure that the No. contract labour working on site are lesser or equal to the no. mentioned in License. In case higher requirement is there due to additional work, then Every Vendor and their sub vendors should obtain the revised license from the competent authority.
6.	Should not carry out any work other than the nature of work, which is specified in license obtained.
7.	Should deploy only the contract labour who has valid identity proof like Aadhar card, Election card, PAN card etc.
8.	Should get police verification done for each his contract labour deployed at MLDL project.
9.	Every Vendor and their sub vendors should maintain the following registers.
10.	Illegal migrant labours are not allowed in MLDL Projects and contactor shall give an undertaking that no illegal migrant labours are engaged.
11.	<div><div>a) Wage register</div><div>b) Attendance register</div><div>c) Leave register</div><div>d) Accident register,</div><div>e) Overtime Register,</div><div>f) Loss &amp; Damage register</div><div>g) Bonus register</div><div>h) Fine Register,</div><div>i) Advance Register</div><div>j) Maternity register</div><div>k) Equal Remuneration Register</div><div>l) Inspection book</div></div>
12.	Should pay following statutory dues on given time and make available necessary supporting to MLDL on demand or at the time of an audit.
13.	<div><div>Sr. No.</div><div>Nature of Payment</div><div>Due date of payment</div></div> <div><div>1</div><div>Provident fund Contribution</div><div>15th day of the next month</div></div> <div><div>2</div><div>ESIC</div><div>15TH day of the next month</div></div> <div><div>3</div><div>Profession Tax</div><div>Due dates vary from state to state.</div></div> <div><div>4</div><div>Labour Welfare Fund</div><div>Due dates vary from state to state.</div></div>
14.	Will be responsible to pay overtime at double the ordinary rate of wages to the workmen working overtime (more than 9 hours a day or more than 48 hours in a week).

15.	Should prepare and provide monthly wages slip to all his contract labour.
16.	Should prepare and provide service certificate to left contract labour.
17.	Every Vendor and their sub vendors should provide Crèche facility where more 50 workers are deputed.
18.	Where Every Vendor and their sub vendors are registered under BOCW, Nomination form of each contract labour should submit to BOCW Welfare Board.
19.	Wages or Bonus should be paid to the contract employees other than in cash mode (Against bank account in individuals name).
20.	Every Vendor and their sub vendors having contract labour less than 1000 should pay the wage to his labour on or before the 7th day of the next month through savings bank account and the applicable remuneration according to applicable rules and regulation shall be transferred to their respective account. In case of contract labour strength is more than 1000 then he can pay the salary up to 10th Day of the next month.

**The intention is to provide 100% compliance to statute and legal requirements and thus the above-mentioned points are not limited to it. Any sort Statute/ legal violation will be taken seriously and a penalty of 1 Lakh + Applicable fine imposed on MLDL by authority + Any other cost such as court/ legal/ consultation charges will be debited from RA bill.**

## **ANNEXURE - G**

**Suggested list of makes and brand**



LIST OF MANUFACTURERS & SUPPLIERS		
S.NO.	PRODUCT	MANUFACTURERS / SUPPLIERS
1	HT CABLES	HAVELLS,POLYCAB,KEI
2	HT HEAT SHRINK END JOINTS	RAYCHEM,3M,M - SEAL
3	DISTRIBUTION TRANSFORMERS	VOLTECH, IPL, VOLTAMP, WILSON,TANGEDCO approved make
4	PANEL BOARDS	CPRI APPROVED PANEL BUILDERS
5	LT CABLES	HAVELL'S,POLYCAB,KEI
6	LT END TERMINATIONS	AEI, MULTI, DOWELLS & JAINSONS
7	DISTRIBUTION BOARDS	LEGRAND,HAGER,SCHNEIDER, L&T
8	MCB's	LEGRAND,HAGER,SCHNEIDER, L&T
9	ACB'S	L & T,ABB, Siemens,SCHNEIDER, L&T
10	MCCB's	L & T,ABB, Siemens,SCHNEIDER, L&T
11	PANEL METER's EXCEPT POWER METERS	ELMEASURE, RISHABH,CONZERV
12	POWER & AUX. CONTACTORS	L & T,ABB, Siemens,SCHNEIDER
13	LED INDICATION LAMPS	L & T, JAI BALAJI & ESSEN
14	FR/ FRLS/ HFFR PVC INSULATED COPPER WIRES	ORBIT,FINOLEX,POLYCAB, HAVELLS, KEI
15	LIGHT FIXTURES - LED	PHILLIPS,WIPRO, BAJAJ OR EQUIVALENT
16	STREET LIGHT POLE	PHILLIPS,WIPRO, BAJAJ,ORIENT OR EQUIVALENT
17	EARTH FAULT RELAY	L & T( HAGER), NEPTUNE, MIKRO & AREVA
18	PLUG & SOCKETS	JAI BALAJI,HENSEL,LEGRAND
19	LIGHT CONTROL MODULAR SWITCHES,BOXES & ACCESSORIES	MK,LEGRAND,ANCHOR ROMA
20	RELAYS	AREVA, ABB, L&T,



**ANNEXURE - H**  
**Quality Assurance Violation Clauses**

Mahindra LIFESPACES		happinest <small>A Mahindra Lifespaces Initiative</small>		Mahindra WORLD CITY	
QUALITY ASSURANCE VIOLATION CLAUSES					
S.No	Description	1st Instance	2nd Instance	3rd Instance	Remarks
1	Violation to approved work sequence	NCR	Repetitive NCR+Penalty	SWN	20k for each violation+ Hold Amount- 1.5 times of estimated repair cost
2	Work commencement without MLDL/ PMC approval ( <b>work method Statement, ITP, Checklist and mock-up Approval</b> )	Obs	NCR	SWN	Work to start only after MLDL/ PMC approval
3	Work commencement without stage clearance	NCR	Repititive NCR+Penalty	SWN	10k for each violation+ Hold amount against estimated repair cost
4	Work Commencement without Quality Induction to Engineer, Supervisor, Workmen who is new to site	Obs	NCR	NCR+ Penalty	10K for each violation
5	Work commencement (For RCC) without structural consultant approval	NCR	Repititive NCR+Penalty	SWN	10K for each violation
6	Work commencement (For Civil, Finishes & MEP) without Architect and mock-up approval	NCR	Repititive NCR+Penalty	SWN	10K for each violation
7	Work commencement without approved GFC drawings / approved sketches / approved shop drawings	NCR	Repititive NCR+Penalty	SWN	10k for each violation
8	Work Commencement without Conducting Training for Engineers, Supervisors and Workmen while starting New activity	Obs	NCR	Penalty	10k for each violation
9	Work Commencement without Quality Tool Box Talk for every trade	obs	NCR	Repititive NCR+Penalty	5k for each violation
10	Use of unapproved / Substandard materials (Without approved test Reports)	Obs	NCR	SWN	-
11	<b>Contractual Documents</b> : Work commencement without BOQ / LOI / Contractual documents etc	NCR	SWN	-	-
12	<b>QC Documents</b> : Incomplete / non updated documents ( Like Concrete cube register / Concrete pour register / Incoming material register / Material rejection register / Concrete pour cards / Pour log sheet / Curing time sheet / Lab testing formats / Work process checklist / Incoming material checklist / Drawing register / WMS / MAS / ITP's etc. )	Obs	NCR	Repititive NCR+Penalty	20k for each violation
13	Structure defects like Honey comb / offsets / deviation in plum / deviation in alignment / Waviness / undulations / <b>Exposed steel on surface/ Corrosion in tensile members/ Any foreign material embeded in casted concrete</b> etc.	NCR	Repetitive NCR	Hold amount +Penalty	Hold Amount- 1.5 times of estimated repair cost for each violation Penalty- 20k for each violation
14	Defects in Finishes and MEP workmanship like Deviation in plum / deviation in alignment / Waviness / Use of Untreated <b>steel etc.</b>	NCR	Repetitive NCR	Hold amount +Penalty	Hold Amount- 1.5 times of estimated repair cost for each violation Penalty- 20k for each violation
15	<b>Materials</b> : Improper / substandard material stacking / presevation / handling	Obs	NCR	Hold amount +Penalty	10k for each violation+ 1.5 times Hold amount against estimated repair cost
16	Incoming material unloading without checking / intimation to MLDL/ PMC	Obs	NCR	Repititive NCR+ Hold Amount	Unloaded material not to be used unless tested and approved by MLDL/ PMC, Hold amount- 1.5 times of estimated repair cost for each violation
17	Non closure of FOR ( Field Observations ) within the stipulated time	1st reminder for closure	2nd reminder for closure	Penalty+ Hold amount	10k for each violation+ Hold amount minimum 1.5 times of estimated repair cost for each violation
18	Non closure of NCR within the stipulated time, Non-implementation of Correction/Corrective Action approved by MLDL/ PMC QA	1st reminder for closure	2nd reminder for closure	Penalty+ Hold amount	20k for each violation+ Hold amount minimum 1.5 times of estimated repair cost for each violation
19	Concrete quality ( Cube failure / variation in cube strength / yield / standard deviation / Curing / skippence of testing / slab cracks / unfinished slab surface etc )	NCR	Repetitive NCR	Hold amount +Penalty	Hold Amount- 1.5 times of estimated repair cost for each violation Penalty- 20k for each violation
20	Deployment of non qualified / inexperienced / unskilled staff / labour where Skilled workmen is required e.g. Use of Helper as Mason/Fitter/Carpenter	Obs	NCR	Penalty	5k for each violation
21	Use of non-calibrated equipment/apparatus/instrument	obs	NCR	Repititive NCR	Penalty for Repititive NC
22	Use of non specific construction tools	Obs	NCR	Repititive NCR	Penalty for Repititive NC
23	Deviation of Process and Product requirements mentioned in PQP/Quality Assurance Plan/ITP/Formats/Checklist	NCR	Repititive NCR+ Hold amount	Penalty	Hold Amount- 1.5 times of estimated repair cost for each violation Penalty- 10k for each violation
24	Non-compliance to activity checklists (inspections not being done as per approved checklists)	Obs	NCR	Repititive NC+ Penalty	5k for each violation
25	Contractor's QAQC Engineer's absence in Planned & Communicated Quality Walk/Quality Meetings	Written Instruction	Penalty	Penalty	5k for each violation
26	No Internal NC system implementation at site	Written Instruction	NCR	Repititive NC	Penalty for Repititive NC
27	<b>Repititive NC</b> (NC with same root cause)	10k Penalty	20k Penalty	40k Penalty	NC repiting with same root cause
28	Manipulation of official records and reports	NCR	Repititive NC	20k Penalty	-
29	Non follownace of site instructions of MLDL/ PMC Staff in terms of quality management systems	Written Instruction	Penalty	Penalty	20k for each violation

Notes	
1	All penalty is applicable and will be imposed to Contractor/Agency, this Penalty matrix is not for the Individuals/Workers
2	Any field oservation/ NCR/ Stop Work Notice/ Penalty will be imposed by MLDL/ PMC staff to the Contractor based on 1st/2nd/3rd instances as per Categorization done in above Penalty matrix.
3	Penalty amount mentioned is for each violation
4	Contractor has to perform applicable correction / Corrective Action at his own cost in addition to Imposed penalty
5	Contractor on repeated Process violation shall be blacklisted from MLDL in future Prequalifications
6	Hold amount in RA Bill during Quality certification until closure of NCR with appropriate and approved corrections and corrective actions

Abbreviations
<b>NCR</b> - Non Conformance
<b>SWN</b> - Stop Work Notice
<b>Obs</b> - Field Observation
<b>K</b> - Thousand ( rs. )

## **ANNEXURE - I**

### **Supplier and contractor code of conduct**

## Mahindra Lifespace Developer Limited (MLDL)

**Background:** MLDL believes that it is in the mutual interest of both MLDL and its suppliers/contractors to meet the present and future requirements of business and the society. This includes demonstrating responsibility towards the environment and people involved in the manufacture and delivery of products and services. In order to make it's position clear and provide a guidance, MLDL has established the supplier code of conduct. The code describes the environmental and social responsibility requirements for Suppliers/Contractors. As a condition for doing business with MLDL we expect compliance with these requirements. It is our intention to maintain this code in spirit of maintaining a constructive dialogue and collaborative partnership approach for benefit for both parties. The code of conduct is dynamic and evolving and is meant to encourage suppliers/contractors to continually improve their metrics. Code of conduct has to be used in conjunction with the MOU that is signed for each deal.

**Scope:** Mahindra Lifespaces Supplier/Contractor code of conduct is applicable to contractors and Supplier construction materials. Suppliers/contractors to ensure that all the sub-suppliers/sub-contractors must meet the principles in the Code of conduct.

### Levels and grouping

As per this code of conduct there is a provision of :Level 1 – Minimum Standards, Level 2 - Qualifying standard and Level 3 - Leadership standard.

The standards are grouped into three sections

- A. Environment – MLDL expects its suppliers to have an effective environmental policy and to comply with existing legislation and regulations regarding the protection of the environment. Suppliers should wherever possible support a precautionary approach to environmental matters, undertake initiatives to promote greater environmental responsibility and encourage the diffusion of environmentally friendly technologies thereby implementing sound life cycles practices. Suppliers should strive to implement recognized management systems and guidelines such as ISO 14001.
- B. Labour – MLDL expects its suppliers to support and respect the protection of internationally proclaimed human rights and to ensure that they are not complicit in human rights abuses.
- C. Business Ethics – MLDL expects all suppliers to adhere to the highest standard of ethical conduct.

### Level 1 – Minimum Standards

All MLDL suppliers are obliged to fulfill the level 1 as described below. It is expected that all suppliers/contractors comply all statutory ESG compliances.

#### A. Environment

MLDL requires its suppliers to have an environmental policy statement.

Supplier/Contractors shall comply with all the applicable local/regional and national environmental regulatory requirements for the region they operate. Environmental permits/licenses (e.g. discharge

monitoring), endorsements and registrations shall be maintained and updated for all the operational and reporting requirements.

## **B. Labour**

### **i) Child Labour**

MLDL respects the children's right to development and education. Therefore, MLDL does not accept the use of child labor as a part of work force at the Supplier. This means not to employ Children under the age of 18, children younger than the legal minimum age.

### **ii) Discrimination**

MLDL respects cultural differences and does not do business with a Supplier if the Supplier practices discrimination at work based on race, religion, gender, age, nationality or sexual orientation, expression or marital status.

### **iii) Forced Labour**

The Code does not permit forced or involuntary labour at the Supplier. This includes forced prison work; work on a forced contract, slavery and other forms of work, which are done against one's will or choice. MLDL does not tolerate employment which confines the employee in unreasonable debt bondage etc.

### **iv) Harassment, Harsh or Inhumane Treatment:**

MLDL requires its suppliers to create and maintain an environment that treats all employees with dignity and respect and will not use any threats of violence, sexual exploitation or abuse, verbal or psychological harassment or abuse. No harsh or inhumane treatment or coercion or corporal punishment of any kind is tolerated, not is there to be the threat of any such treatment.

### **v) Health and Safety**

MLDL supports the fundamental human right to have safe working conditions. Supplier must ensure a good and safe working environment which complies to all applicable rules and laws. As a minimum:

- i) Workers must not be exposed to dangerous work without being properly protected.
- ii) Workers must be provided personal protection equipment and be trained & instructed in its proper use.
- iii) Facilities must comply with applicable laws and rules about construction safety as well as fire protection and fire alarms.
- iv) Facilities must provide appropriate illumination, ventilation and noise protection.
- v) All dangerous materials must be stored in safe places and used in safe and controlled ways.
- vi) All machinery must be properly maintained and shielded.
- vii) Facilities for meals and resting must, if provided, be kept clean and safe.

Suppliers/Contractor should strive to implement recognized management systems and guidelines such as OHSAS 18001.

## C. Business Ethics

### i) Anti bribery

The Company has a zero-tolerance approach to acts of bribery and corruption, by employees or anyone acting on behalf of the Company. Bribery and corruption are recognized as barriers to sustainable development and free trade. MLDL does not accept these practices and therefore does not offer or accept any kind of undue payment in any of our business transactions. Supplier shall act accordingly.

### ii) Conflict of Interest

Suppliers must ensure that if the Supplier's employee or his or her family member has a relationship with MLDL employee who can make decisions that will affect the supplier's business, then the supplier must disclose these types of relationships to the Head of Purchase of the concerned MLDL before entering negotiations.

### iii) Gifts and Hospitality:

MLDL accept gifts or entertainments if they are consistent with common business practices (Mahindra Code of Conduct), are not excessive in value and cannot reasonably be construed as a bribe or payoff and if they do not violate applicable law. MLDL will, however, not accept any benefit to a MLDL employee in order to facilitate the supplier's business with MLDL.

**Level 2 standards – Qualifying standards: All MLDL suppliers/contractors are expected, in case of noncompliance with the qualifying standards in the time of signing a contract with MLDL, to have targets and action plans for reaching the qualifying standards, as they are described below.**

## A. Environment

Supplier/Contractors should recognize environmental responsibility by managing, measuring and minimizing the environmental impact of their facilities. In all the business operations, adverse effects on the community, environment and natural resources are to be minimized while safeguarding the health and safety of the public. Specific focus areas include statutory requirements, waste reduction, water re-use disposal, recovery & management, and greenhouse gas emissions. Recognized management systems such as ISO 14001:2015, the Eco Management and Audit System (EMAS) are used as references in preparing the Code and may be a useful source of additional information. The environmental standards are:

### i.) Compliance with Statutory Regulations

Same as in Level 1

### ii.) Waste reduction and recycling

Supplier/Contractor shall ensure that wastewater and solid waste generated from operations, processes and sanitation facilities are to be monitored, controlled and treated as required by law prior to discharge or disposal.

Other type of waste is to be reduced or eliminated at the source or by practices such as modifying production, maintenance and facility processes, materials substitution, conservation, recycling and reusing materials.

Contractors shall focus on C&D waste management and reduction

### **iii) Air emissions**

Air emissions of dust, volatile organic chemicals, aerosols, corrosives, particulates, ozone depleting chemicals and combustion by-products due to contractual work/ supplier operations are to be characterized, monitored, controlled and treated as required prior to discharge.

### **iv) Hazardous Substances**

Chemical and other materials posing a hazard if released to the environment are to be identified and managed to ensure their safe handling, movement, storage, use, recycling or reuse and legitimate disposal.

### **v) Restriction of specific substances**

Supplier/Contractors shall comply adhere to all applicable laws, regulations and customer requirements regarding prohibition of restricted substances (substances covered under RoHS & REACH)\* in their product and process.

These regulations include, but are not limited to:

- Waste Electrical and Electronic Equipment (WEEE)
- REACH = Regulation on Registration, Evaluation, Authorization and Restriction of Chemicals

### **vi) Greenhouse Gas Emissions**

The supplier/contractor shall strive for continuously decreasing greenhouse gas emissions caused by its business operations, primarily carbon dioxide (CO<sub>2</sub>) emissions. The monitoring and documentation of CO<sub>2</sub> emissions connected to MLDL part of use will be encouraged. Information about the CO<sub>2</sub> management shall be provided to MLDL on request – already part of contractor data requirements.

### **vii) Energy management**

Energy management with focus on minimizing the waste of energy shall be applied in all business operations. Suppliers should strive to implement recognized management system & guidelines such as ISO 50001. Suppliers/contractors are encouraged for adoption of renewable energy in their overall mix of energy used.

### **viii) Reduction in Water consumption**

Suppliers shall take all effective measures to reduce their intensity of water consumption from operations & processes.

## **B. Labour**

# Supplier/Contractor Code of Conduct

All applicable clauses in level 1 in child labour, forced labour, inhuman or harsh treatment and discrimination.

## **a) The Right to Organize and Collective Bargaining**

The Supplier must not interfere with the worker's right to form and join unions or to bargain collectively. This means that Supplier must recognize his employees' right to choose whether or not to associate with or establish any organisation including labour organisations. If trade unions are not allowed in the area of operation, or only state authorized organisations are allowed, the Supplier shall facilitate alternative measures to allow employees to access management to discuss work related matters.

## **b) Working Hours and Salary**

MLDL recognizes the need for a sound balance between working time and leisure time for all employees. Unless the law provides otherwise, the maximum working time at the Supplier's sites is 48 hours per week plus maximum 12 hours overtime work. All workers shall be allowed to have at least one day off in a period of seven days unless the national law/rules provides otherwise. Salaries for work and overtime shall be in accordance with the applicable national law or applicable national rules. Deductions in salary due to company fines or penalties must never compromise minimum salary/ wages as stipulated by relevant law.

c) **Health & Safety** : Same as in level 1 plus the points below.

### **Incident Reporting and Tracking**

Supplier/Contractors shall define procedures to prevent, manage, track and report occupational injury and illness, including provisions to:

- a) Inspire worker reporting;
- b) Categorize and record injury/illness cases;
- c) Deliver essential medical treatment;
- d) Incident analysis and implement corrective actions to eliminate their root causes;
- e) Facilitate return of workers to work, debriefing and post-traumatic stress procedure. Follow MLDL incident reporting processes.

### **Sanitation, Food & Housing**

Supplier/Contractors shall provide ready access to clean toilet facilities, potable water and sanitary food preparation, storage, and eating facilities. Worker dormitories provided by the Supplier/Contractor or a labor agent are to be maintained clean and safe, and provided with appropriate emergency egress and adequate heat and ventilation with appropriate entry and exit privileges. Contractors to follow MLDL guidelines for labor camps.

## **d) Right to privacy**



# Supplier/Contractor Code of Conduct

Supplier/contractor shall respect his/her employees' right to privacy when it gathers or keeps personal information or implements employee-monitoring practices.

## **C. Business ethics**

a) Anti bribery, Conflict of Interest and Gifts & Hospitality criteria as mentioned before.

## **b) Information Security**

Suppliers/contractors must ensure secure use and distribution of information and data in their workplace. Suppliers/contractors must maintain physical and electronic security for all confidential information received from MLDL for fulfilling their commitment. Suppliers' employees must use extreme care in protecting confidential and proprietary information of any kind from MLDL.

## **c) Governance**

Suppliers must follow highest standards of ethical behavior in all the processes of operation of business and ensure

- a. Sustainable Development as an integral part of their business.
- b. Internal Auditing Process and actions on the audit findings.
- c. Compliance to the Quality Management System.
- d. Correct Financial Reporting.

## **d) Political Activity**

Suppliers should desist making use of MLDL's association with them for getting any political gain or use the name of MLDL to participate in political campaigns.

## **e) Emergency Preparedness Planning**

The supplier shall be prepared for any disruptions (e.g., extreme weather events, natural disasters, terrorism, software viruses, illness, pandemic, infectious diseases) affecting its business and supplies to MLDL companies. This preparedness especially includes disaster management plans to protect both employees as well as the material and facilities as far as possible from the effects of possible disasters that arise within the domain of operations.

## **Level 3: Leadership standard**

**All suppliers/contractors must strive to move to leadership standards**

## **A. Labour**

All points as per qualifying standards, plus best in class labour welfare and engagement programs which have won external recognition.

## **B. Environment**

## Supplier/Contractor Code of Conduct

All points as per qualifying standards, plus best in class EHS program which have won external recognition.

Suppliers – materials are green rated, green initiatives on energy, waste, water reduction and circular economy (take back, packaging waste reduction)

Contractors – services demonstrate initiatives on energy, water, waste and circulate economy beyond management systems and compliances

### C. Business Ethics and Governance

All points in qualifying standards, plus board leadership in climate action with ESG integrated into strategy. ESG review by board. Reporting as NVG BRR, or per GRI framework.

#### Compliance to Supplier Code of Conduct –

By signing this Code of Conduct, Suppliers agree to comply with the requirements stated in this Code of Conduct. MLDL reserves the right, upon reasonable notice, to check the compliance.

Signature

I acknowledge that I have read and understand the MLDL Code of Conduct for Suppliers and agree to comply with the requirements of the Code (fill in using block letters or company stamp):

Supplier's name: \_\_\_\_\_

Address: \_\_\_\_\_

Factory name: \_\_\_\_\_

M LDL Project name: \_\_\_\_\_

#### Supplier Signature:

Name:

Date

**ANNEXURE - J**

**Energy & Environment Conservation Measures**

## Context

With a mission of 'Transforming urban landscapes by creating sustainable communities', we uphold the philosophy of Urboonisation and build, promote and maintain dynamic, inclusive and environment-friendly ecosystems. Concurrently, we also seek to achieve the highest possible returns, to strengthen the faith reposed by our shareholders.

As part of our commitment we adhere strictly to our policies and legal requirements. We practice resource conservation, waste minimization and reduce environmental pollution.

As our partner in work it is therefore mandatory for our contractors also to follow our footsteps and adhere to our high stand. Therefore, we have laid out our mandatory requirement for our contractors to follow in the following section along with what we aspire our contractors to achieve while working with us.

## Contractor Responsibilities on MLDL Site

- ✓ **Mandatory and non-negotiable requirements for energy and environment and pollution abatement:**
  - All the rule of the land (as per MLDL policy and applicable legal/ statutory environmental regulations as per Environmental Clearance and Consent To Establish/ operate) to be abide by. All the requirement as per the environmental compliance to be adhered to.
  - Initiatives for the following with help from MLDL to be implemented
    1. Energy: Conservation / reduction in consumption
    2. Water: Conservation / reduction in consumption
    3. Waste: Segregation and storage at designated place. Reduction reuse or recycle of the waste generation.
  - Data requirements as per MLDL requirements
- ✓ **Mandatory and non-negotiable requirements for social (OHS and Human Rights)**
  - As per our policy Child labour, Forced Compulsory Labour, workers' family onsite is not allowed
  - All mandatory PPE must be used as and when required.
  - Site hygiene and housekeeping should be maintained throughout the work tenure.
- ✓ **Aspirational requirements**
  - The contractor shall progressively move towards ISO 14001:2015 certification

**Environmental management Plan: Protection of the Environment:**

The Contractor shall take all reasonable steps to protect the environment (both on and off the Site) and to limit damage and nuisance to people and property resulting from pollution, noise and other results of his operations.

The Contractor shall ensure that emissions, surface discharges and effluent from the Contractor's activities shall not exceed the values indicated in the Specification and shall not exceed the values prescribed by applicable Laws.

The Contractor shall follow the Developer's Environment Management System (EMS) established at site. The Contractor shall read Developer's- Sustainability Policy, Integrated EMS Policy, Standard Operating Procedures, and relevant documents prior to commencement of Works. Developer will give necessary awareness to the contractor's personnel on EMS and Green building implementation requirements at site. Specific details are provided herewith:

- a) Existing numbered trees should be maintained in healthy condition till final handover of site by contractor. No damage to existing trees due to construction activities should be done. Any damage and cost implication due to damage should be borne by contractor.
- b) No dry wood should be used in site labour camps area as burning fuel.
- c) All building material like broken bricks, tiles and damaged shuttering material should be reused by contractor at suitable work areas. Unused or damaged/broken bricks, tiles, glass, wooden frames, shutters, steel etc. and shuttering material should either be reused up to max possible or donated or sold to another party for reuse. All records related to reuse/sale like challans etc are to be kept by the contractors and submitted to the Developer. These initiatives are towards sustainable development and contractors should perform all as stated at his own cost.
- d) Avoiding spillage of oil over the soil in workplace.
- e) If batching plant is established at site, its Consent to operate to be in place there should be a waste water treatment system installed along with the plant at site. Treated water should be reused in construction after approval from In charge QA at site.
- f) Existing well if any should be properly covered. As per the design intent or execution teams instructions
- g) for existing well/ bore well, (post confirmation of CGWA permissions) Optimum use of bore well water – if permitted under Contract - should be done by contractor, avoiding wastage. Water meter should be installed in all bore wells and record of water drawn should be maintained on monthly basis and same should be reported to Project Manager and/or Developer.
- h) All necessary precaution should be taken by contractor to avoid ground water table contamination.
- i) Hygiene at labour camp should be maintained. Proper sanitation facility for labours should be established. Developer and/or Engineer has the right to inspect the labour colony any time and instruct

contractor to modify /upgrade the condition of labour camp at any time during the tenure of the project. Temporary surface drainage should be provided in bathing and washing areas at labour camps.

j) Optimum utilization of electricity should be done, by planning electricity cut off in labour camps every day when not required as labour camps are empty during working hours.

k) The contractor will share data and take measures/initiatives to adhere to MLDL Sustainability requirements as provided in the Sustainability SOPs (list enclosed below).

l) Environment management plan (EMP) to be implemented on site as per the set frequency mentioned in the EMP and to be monitored annually.

**Mitigation of the significant construction and operational environmental impacts are provided below:**

**Site Clearing:**

**Dos:**

- The Contractor shall at all times carefully consider what machinery is appropriate to the task while minimising the extent of environmental damage.
- Topsoil shall be cleared of woody vegetation, and specifically requirements of retention of exotic vegetation if any, trees to be preserved, before ripping and removing in consultation with MLDL sustainability team.
- The topsoil is regarded as the top 200 mm of the soil profile and to be covered with Green netting material or geotextile sheets • Topsoil is to be handled twice only – once during clearing and stockpiling & once during rehabilitation • The topsoil, including the existing grass cover is to be shallowly ripped (only the depth of the topsoil) before removal. This is to ensure that organic plant material, and the natural seed base is included in the stripping process.
- The Contractor shall apply soil conservation measures to the stockpiles to prevent erosion. This can include the use of erosion control fabric or grass seeding
- To prevent soil erosion on the site, contractor to implement sedimentation trenches and basin prior to the monsoon

**Donts**

- Soil stockpiles shall not be higher than 2.5m or stored for a period longer than one year. The slopes of soil stockpiles shall not be steeper than 1 vertical to 2.5 horizontal.
- No vehicles shall be allowed access onto the stockpiles after they have been placed.
- Stockpiles shall not be allowed to become contaminated with oil, diesel, petrol, garbage or any other material, which may inhibit the later growth of vegetation.

**Dust Abatement at site:**

Site operators need to demonstrate both:

- (a) control of 'visible' dust in particular besides
- (b) fine dust from activities within their premises.

Dust abatement due to construction and transport activities can also include the following:

**Do's:**

- Monitor movement of vehicles (incoming/outgoing) - Regular check and maintenance of vehicles (all need valid PUC)
- Prevent vehicle idling during loading and unloading.
- Smooth movement of incoming & out going vehicles / trucks
- Earmark areas for parking vehicles
- Regular water sprinkling on pathways for dust suppression – use of 'treated waste water' (preferably from STP) in sprinklers for dust suppression
- Cover materials with tarpaulin in case of sand/cement
- Topsoil preservation covering with vegetation

**Don'ts:**

- Transportation of materials and waste should be done in covered vehicles to prevent fugitive dust emission.
- Don't use fresh water for dust suppression

**Water pollution management:****Do's**

- Avoid excavation during monsoon season
- Take adequate care should be taken to avoid soil erosion
- To prevent surface and ground water contamination by oil/grease, leak proof containers should be used for storage and transportation of oil/grease. The floors of oil/grease handling area should be kept effectively impervious. Any wash off from the oil/grease handling area or workshop shall be drained through impervious drains, Clarifiers or oil/water separators shall be constructed and effluents should be treated appropriately before releasing it.
- Construction activities generate disturbed soil, concrete fines, oils and other wastes. On-site collection and settling of storm water, prohibition of equipment wash downs, and prevention of soil loss and toxic releases from the construction site are necessary to minimize water pollution.
- All stacking and loading areas should be provided with proper garland drains equipped with baffles to prevent run off from the site to enter any water body

**Minimizing water consumption****Do's:**

- Contractor must take measures to reduce water consumption for curing. Bunding must be created to minimize wastage
- Reuse of collected rain water for various purposes as permitted by MLDL team

**Fauna and Flora****Do's:**

- Natural vegetation shall be kept in as undisturbed a state as possible. Special attention shall be paid to preserve trees and plant communities in conjunction with the design plan.
- Indigenous plants or wild animals (including reptiles, amphibians or birds etc.) may not be damaged or harmed.
- Report all incidents of harm to any animal or natural vegetation (apart from the agreed vegetation areas) must be reported to the MLDL project manager.
- **30 feet barricading/ whichever is stringent as per the local bye laws**
- **Stack height to be provided as per the CTE conditions**
- **Environment parameters monitoring to be done on a monthly basis/ as per EC/ CTE conditions for Air, water, waste and noise parameters**

### **Spoil Material**

- All suitable materials excavated shall be used in the construction of the works. Quantities used at site must be noted.
- All unsuitable and surplus spoil rock shall be removed from the site to govt approved designation dumping site or sites, as per instructions of Project/Site Manager. Quantities sent to dumping site to be noted.
- No dumpsite shall be used without the prior written approval of the Project/Site Manager.
- No spoil material shall be stockpiled in violation of any legal requirement or to obstruct any watercourse or drainage channel.

### **Site Hygiene, Clean Up and Rehabilitation**

#### **Dos:**

- Contractor must ensure regular housekeeping so that no material is waste or causes safety hazard
- Contractor must ensure labelling of waste bins to ensure that construction and demolition wastes as per
- The Contractor must ensure that all structures, equipment, materials and facilities used or created on site for or during construction activities are removed once the project has been completed.
- The construction site shall be cleared, cleaned and rehabilitated to the satisfaction of the MLDL project manager, prior to revegetation.

#### **Don'ts:**

- Contractor must not leave materials in a haphazard fashion
- No material of value will be wasted due to poor housekeeping

### **Waste management**

#### **Dos:**

- Recycled aggregates will be used for filler application, and as a sub-base for road construction. Mixed debris with high gypsum, plaster, shall not be used as fillers, as they are highly susceptible to contamination, and will be given to recyclers.
- Construction contractors shall remove metal scrap from structural steel, piping, concrete reinforcement and sheet metal work from the site. A significant portion of wood scrap can be



reused on site. Recyclable wastes such as plastics, glass fiber insulation, roofing etc shall be sold to recyclers.

### Record keeping

- Data as per the following table must be provide to the project manager with evidence as per mentioned frequency:

Data	Detail	Frequency	Evidence
<b>Diesel consumption</b>	Data for diesel consumption to be provided bifurcated as per use (formats to be provided by MLDL)	Monthly	Diesel purchase bills
<b>Electricity consumption</b>	Electricity consumption is to be provided bifurcated as per use (formats to be provided by MLDL)	Monthly	Electricity bill/Meter reading register (incase separate meter is not available see annexure 1)
<b>Water consumption</b>	Water consumed from different sources (formats to be provided by MLDL)	Monthly	Purchase bill
<b>Waste Generated</b>	a. Quantity of waste generated by type b. Written information on destination of waste (where the waste is taken to) c. Written information on disposal method of waste (landfill/reuse/recycle) d. Distance of the treatment/landfill/reuse/recycle facility	Monthly	
<b>Material Purchased</b>	Materials purchased by weight or volume	Monthly	Purchase bill/SAP entry

**Any other data requirement as the need arises.**

**All payments shall be released only if the mandatory and non-negotiable requirements for environment, energy and social criteria are meet.**

### Annexure 1.

In case there is no separate meter available the information to be provided by the contractors as per the table below (names of the equipment are indicative and not exhaustive; the project SPOC should add more equipment as required)

Name of the contractor				
Equipment	Crain	Drilling machine	Light	Fan
Quantity				
Wattage				
Unit	Watt			
Total Wattage	Formula: (Quantity x Wattage)			
consumption of 1 Hr/day-Kwhr	Formula: Total wattage/1000			
Consumption @ 8 Hrs/ Day	Formula: (consumption of 1 Hr/day-Kwhr)*8			
Total for 30 days	Formula: (Consumption @ 8 Hrs/ Day)*30			
Rate				
Amount for Month	Total for 30 days * Rate	Total for 30 days * Rate	Total for 30 days * Rate	Total for 30 days * Rate

**List of SoPs:**

1. EMS.A.01 Procedure for Significant aspect identification
2. EMS.A.02 Environmental Management Program
3. EMS.A.03 Environmental Monitoring
4. EMS.A.04 Statutory Requirement
5. EMS.A.05 External & Internal Communication
6. EMS.A.06 Procedure for Top Soil
7. EMS. A. 07 Environmental Emergency and response plan
8. EMS.A.08 Setting of Objective & Target
9. EMS.A.09 Operational Control
10. EMS.A.10 Hazardous waste management

## **ANNEXURE - K**

### **Basic Rate Approval & Payment Process**

## **Process of Basic Rate Approvals & Payments**

1. MLDL shall recommend the list of approved pre-qualified manufacturer / supplier for the material which is to be procured on basic rate basis by the appointed contractor.
  - a. The Contractor may also suggest the additional manufacturer/supplier to MLDL for procurement of the materials on basic rate.
  - b. If the suggested manufacturer/supplier is found acceptable to MLDL, their pre-qualification process shall be carried out by MLDL within 15 days. Once pre-qualified, this manufacturer/supplier shall also be added to the list of approved manufacturer/supplier.
2. MLDL shall then circulate the details of the appointed contractor to all the pre-qualified manufacturers/suppliers to enable them to provide quotations to the appointed contractor upon receipt of Contractor's enquiry.
3. Within 2 weeks after appointment, the Contractor shall submit advance procurement schedule (jointly signed by the Contractor & MLDL's Project Manager) for all basic rate items as per agreed lead time to MLDL.
4. Contractor shall then float enquiries & obtain quotations from these manufacturers/suppliers in accordance with mutually agreed advance procurement schedule. Contractor shall ensure that the list of approved manufacturer/supplier is strictly adhered to without any deviation.
5. Upon receipt of quotations & subsequent negotiations, the Contractor shall submit the detailed techno-commercial comparative statement to MLDL Contracts Department. This comparative statement shall indicate all quotes (initial & negotiated) received from the suppliers along with details like payment terms, delivery period, inclusions/exclusions et. all and shall be backed-up with substantiating quotes for further approval.
6. MLDL reserves the rights to directly negotiate further the rates & other conditions mentioned in the comparative statement.
7. Once the negotiation process is completed, MLDL shall notify the contractor about finalized rates along with agreed terms & conditions with manufacturer/supplier.
8. After receiving confirmation from MLDL, Contractor shall initiate the process of issuance of purchase order to the approved manufacturer with terms and conditions mentioned in the approval note/email from MLDL.

9. The credit period for the materials shall be considered after receipt of material at site along with all bill, challan and all other necessary documents which are required for the processing a bill
10. Contractor shall ensure disbursement of payment to the manufacturer/supplier as per agreed terms and conditions. If the contractor fails to make the payment within agreed timeline, MLDL reserves the right to make direct payment to the manufacturer & recover the same along with interest at 18% per annum (on delayed duration) + 2% of the bill value as an administration cost from the contractor.

## **ANNEXURE - L**

**Standard for onsite workers housing quarters**

**SAFE METHODS AND RISK REDUCTION TECHNIQUES(SMARRT)**

**STANDARD FOR ON-SITE WORKERS HOUSING QUARTERS**

Doc No: OHSM.A.24

Revision No.: 01

Revision date: 05/12/2018

Document uploaded and approved through DMS

## SAFE METHODS AND RISK REDUCTION TECHNIQUES(SMARRT)

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**SAFE METHODS AND RISK REDUCTION TECHNIQUES(SMARRT)****History of Revisions**

<b>Revision No.</b>	<b>Revision issue date</b>	<b>Chapter/clause no. &amp; text affected</b>	<b>Reason for revision</b>
Revision 0	01/06/2016	NA	First Issue
Revision 1	05/12/2019		Document reviewed, no changes required

## SAFE METHODS AND RISK REDUCTION TECHNIQUES(SMARRT)

### 1.0 Purpose:

To establish a minimum standard for the provision and maintenance of living conditions for the wellbeing and welfare of the workforce in construction projects of Mahindra Lifespaces Developers Ltd (hereafter mentioned as Developer).

### 2.0 Scope:

This standard gives advice to adopting minimum basic requirements of design, construction, installation and maintenance of temporary workers' housing quarters (Labour Camp) on construction site.

At national or regional level of India, regulations tend to contain only general provisions for workers to provide an accommodation by contractor.

These provisions also available in form of policy, guidelines or codes of practice adopted by a wide variety of agencies such as international bodies, industry associations; national, regional or local authorities. However, no specific standards has mentioned, which bound to provided minimum requirement for accommodation of workers. Although, compliance with national and local law is the basic and essential requirement. However, in the absence or clear-cut guideline of such requirement Developer would like to implement and provide minimum requirement for accommodation facilities to workers working on site.

These standards shall be applicable to all real estate project development in India under the influence of Developers.

The site management shall provide, free of cost temporary accommodation as the regulatory requirement to all workers engaged in Developers Project.

This document aims to provide the Project Teams and Contractors with guidance on the planning, design, construction, operation and decommissioning of Construction Camps in a sustainable way:

- Create adequate, respectable living conditions for the Project construction workforce.
- Maximise value over the entire lifecycle of the construction camp (maintenance, cleaning, waste management, energy and water usage management) and minimise footprint.
- Take into account ethnic, religious and cultural differences and managing those.
- Create a secure, safe and hygienic environment, including the logistics.
- Minimise impact on the local communities.
- Lower disease incidence and/or food poisoning outbreaks.
- Promote Health & Wellness and create a facility and community that exudes care for people.

## SAFE METHODS AND RISK REDUCTION TECHNIQUES(SMARRT)

- Maximise opportunities for beneficial use of the site, infrastructure, or parts thereof after project execution.
- It is assumed in this document that the facilities will be intended for single or bachelor status occupancy only, unless the Developer specifies differently.

This document does not cover permanent residential areas, neither temporary nor permanent office Units nor buildings located inside fence of hydrocarbon processing projects.

### 3.0 RESPONSIBILITIES

Following are the responsibilities of Project In charge

- Allocating Sufficient Resources for set up and operation of camp
- Ensuring camp operates with respect to the standards

Following are the responsibilities of OHS In charge

- Support in implementation of the standard
- Conduct frequent compliance audits to ensure that standards are followed.

### 4.0 CROSS REFERENCES:

- Clause 7.1, 8.0 of ISO 45001 : 2018
- OHS Plan – MLDL/ OHSM. PLAN.01 Rev 01
- The Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996
- 8.3 The Municipal Solid Wastes (Management & Handling) Rules, 2000.
- 8.4 The India Electricity Act, 1910 and the Indian Electricity Rules, 1956
- 8.5 IS : 10500 Drinking Water Standards

### 5.0 OTHER RELATED PROCEDURES

### 6.0 FLOW CHART NIL

### 7.0 PROCEDURE

#### DESIGN OF TEMPORARY WORKERS' HOUSING QUARTERS

#### 7.1 Plot

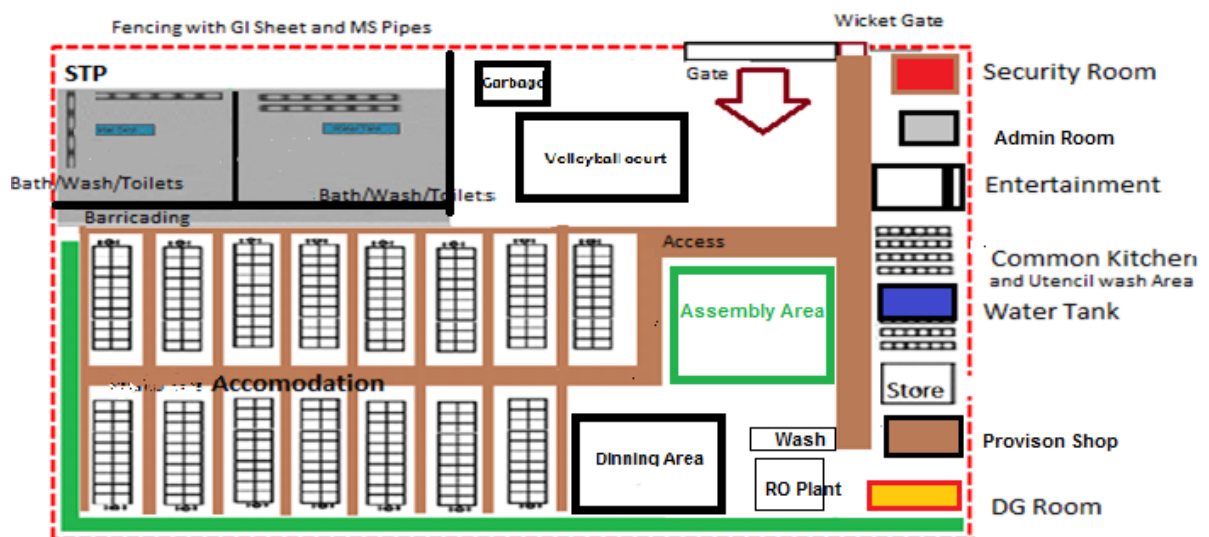
About 20 sq m per occupant is the indicative requirement that may be applied gross for campsite selection purposes, including space required for roads, general facilities, and recreational areas,

## SAFE METHODS AND RISK REDUCTION TECHNIQUES(SMARRT)

depending on existing infrastructure, topography and shape of the available plot. Necessary site investigations required to be produced on technical data for the design of foundations and camp grading layout with sufficient drainage to prevent flooding during rainstorms.

Provision Shop

### 7.2 Layout



The labour camp shall be located in elevated and well drained ground in the locality and at least 500 meters (m) away from sites.

The site location of labour camp (camp) shall be close to the boundary of any public road or any internal site access that is accessible by emergency services like ambulances and fire engines. If the camps are located adjacent to a common boundary of any property regardless of public or private entity or owned by individual, it shall have a setback distance of minimum 4 meter (m) from the common boundary. Where the minimum 4 m setback cannot be achieved, it shall have walls that are facing the common boundary to be without openings and protected by any material that has a resistance to fire for a minimum of 1 hour.

Parallel positioning of the buildings is preferred over a courtyard type configuration. The minimum distance between the various (parallel) buildings should be 8 m, to reduce the chances of

## SAFE METHODS AND RISK REDUCTION TECHNIQUES(SMARRT)

spreading of flames in case of a fire and allow for emergency services access. Where this is not possible other measures shall be taken to prevent spreading of fire.

Number and concentration of various people based on their communities/ language/ region shall be considered for dedicated sections of the construction accommodation. (This may influence the size and number of mess halls and kitchens).

### 7.3 General Facilities required within the camp.

General facilities may include one or more of the following functions next to the common accommodation units:

- Access control system
- Clinic/First Aid
- Common Recreational Area
- Potable water supply, storage and distribution
- Drainage
- Electrical power generation and distribution
- Emergency assembly points/ Muster areas
- Facility management building/estate house (general admin, maintenance, services,)
- Fencing
- Fire station / emergency response
- Food store
- Shop
- General maintenance shop
- Security building/ Guard house
- IT/Telecommunications
- Dedicated cloth washing area Mess hall or Restaurant + Kitchen for the various categories of personnel
- Parking areas for buses and private vehicles
- Potable water supply
- Public telephone
- Training facilities
- Service water supply and distribution

### 7.4 Barricading

Barricading to be provided using painted GI sheet up to height of 7 feet without gap and shall be fixed using GI/MS pipe/Ankle fixed using the concrete. Must be of adequate strength and raking to be provided where same are required. Single point of entry to be maintained using the main gate (6 M wide) for vehicular movement and wicket gate (1M wide) for personal movement.

**SAFE METHODS AND RISK REDUCTION TECHNIQUES(SMARRT)****7.5 Access control, Security Cabin and other requirement.**

Access to camp should be controlled to prevent any unauthorized entry and Stay. Security to allow entry only if, the ID card is produced. Single point of entry to be maintained. Visitors to enter their details in the register maintained with security. No Visitor shall be permitted to stay in the camp for more than four hours without approval of Project Head.

Minimum Dimensions of the cabin should be of the 7' x 5' x 8.5. Window 3' x 2.5'

One Table, Two Office Chairs and One Cupboard.

Search Light with charger.

Tube Lighting and fan.

Two external lights (One focusing the gate and access and other focusing the Camp.

First Aid Kit

Walky-talkies

Registers.

1. Visitors Entry, 2. Vehicle Entry 3. Occupants Details, 4. Duty Roster 5. First Aid Register

**7.6 Structural Requirement**

The structures of the camps shall be weather-tight and comparable material. All measures shall be taken to reduce radiant heat. While air pockets between roof and ceiling together with the use of materials with good heat insulation properties is one of the method to prevent radiant heat especially so in the summer. I. Floors used in camp shall be constructed of stone tiles/ concrete or other comparable material with smooth finishing, so that proposed floor can be easily cleanable and maintained in good condition.

The construction of camp area shall be provided minimum 700-750 square (sq) m for 60 labours for camp, which include living rooms, common area, cooking area, toilets, bathrooms etc.

The design for the labour camp need to be certified by an authorised agency for its rigidity and adequateness and approval shall be taken from the Developer before erection.

The ceiling height of camp shall provide at least 3m from plinth level. While camp roof shall have recommended to be pitched type constriction to prevent collection of water and become a potential habitat for mosquitoes.

Sr. No.	Particular	Specification
1	External & Internal	The Wall Panels made of PPGI Puff panels in overall thickness of 50 mm The skin thickness of the Panel to be 0.40mm PPGI Sheet both site .

**SAFE METHODS AND RISK REDUCTION TECHNIQUES(SMARRT)**

2	Roof	The Wall Panels made of PPGI Puff panels in overall thickness of 50 mm The skin thickness of the Panel to be 0.40mm PPGI Hi-Rib on top .
3	Flashing	The all Flashing like - 'U' Channel, 'L' Channels etc will be 0.35mm thick galvanised precoted Sheet
4	Structure	Structure- Superstructure work for roofing structure comprising of 80*40*1.8mm for Column and Truss, 100*60*20*2mm for Truss first floor and 60*40*15*1.4mm for Purling and framework.
5	Floor	The first Floor covered by 18mm commercial plywood fixed with suitable anchor fastener.
6	Staircase	The Staircase will be made of MS Section with chequered plate of 3mm thick and MS railing on one side (Height will be 3').
7	Corridor	The first floor corridor will be made of MS Section grid system covered with chequered plate of 3mm thick and MS railing on one side (Height will be 3').
8	Finishing	The steel structure will be finished with one coat of Red Oxide and two coat of good quality synthetic enamel paint.
9	Flush Door	The door will be wooden flush door size - 7' X 3' X 32mm one Aldrop, 4 no. Hinges, 2 no. Handle and 1 no. tower bolt.
10	Window	Two track Aluminium Anodize Window will be sliding type and all necessary hardware with 4mm thick clear glass (Size- 1800*900mm).
11	Electrical	Two numbers of Socket and one 10 W LED/ CFL, One number of fan common to two bunk beds, one-night lamp common for the room. Distribution Panel for every room with ELCB and proper earthing.
12	Sanitory	Toilet Indian seat with 1 no. tap with internal CPVC fitting and over head wall mounted flush. Refer the standard requirement mentioned in Sanitory requirement.
13	Bunk Bed	Double decker 6.5' X 3' with side railing for top bed and flat bed top with 1 mm GI sheet/12 mm comercial ply board and adequately supported and fastened to frame. Frame, laddar and internal support for the bed flat should be of 25 X 25 having a minimum gauge of 2 mm thickness / 16 Gauge.

**7.7 Living Space**

The floor area of living rooms shall be recommended to consider approximately rate of 2.5 to 3 sq M per worker. All living rooms of the camp shall have proper ventilated system or window size to opening

**SAFE METHODS AND RISK REDUCTION TECHNIQUES(SMARRT)**

directly outside for natural light and air. The minimum total window area of living room shall be considered equal ten per cent of the floor area of each room.

**7.8 Cooking Area**

A designated common cooking area shall be provided in the camp. This area shall locate at least 2M to 3M away from the external walls of the living room. Where space constraint does not allow the minimum distance, it shall be compartmented from any room by walls, floors and ceiling of non-combustible materials having a minimum of ½hr fire resistance rating.

The proposed cooking area shall be at least area of 3.0 X 2.0 sq M with minimum 3m ceiling height from plinth level. All practical measures shall be taken to provide the natural ventilation and lighting by means of windows, doors, louvers or other similar openings. Otherwise, mechanical ventilation shall be alternative option to adopt for proper ventilation in cooking area.

A water connection shall be provided in the cooking area with the proper size of sink for washing purpose and final drain of this sink shall be connected to the common sump.

Where firewood used for cooking, a safe storage area shall be provided inside the camp and adequate number of stoves shall be erected in cooking area. The number of stoves to be determine by the size of the workforce and different groups (ethnic or religion) of personnel using the cooking area.

If gas is used for cooking then the cylinders must be stored in a secure external, well-ventilated open area and supplied to stoves via suitable connections and pipe networks. Spare and empty cylinders must be segregated and kept in a separate secure area away from any buildings.

Where electrical cooking equipment are used, adequate power points shall be provided to prevent illegal tapping of electricity and overloading of power points due to inadequate supplies.

Measures shall be taken to ensure that no smell, smoke and other public nuisance arise from the cooking activities. Effective measures shall be taken to prevent infestation by and harbourage of animal or insect vectors or pests.

Suitable sanitary facilities shall be provided for kitchen personnel. Floor shall be concrete with a covering that is easily cleaned, durable, non-absorbent, non-slip and without joints and crevices where dirt, bacteria and insects can lodge. Angles and junctions between floor and wall shall be coved. To prevent ingress of pests, a concrete plinth of at least 30 cm height shall be constructed all-round the structure. Walls shall be smooth, easy to clean, impervious, light in cooler and durable from floor to ceiling. They shall also be provided with adequate insulation to maintain required temperatures. A ceiling shall be provided which is smooth, fire-resistant, light coloured, covered at wall joints and easy to clean. No item shall be kept on window ledges. All windows shall be fixed with mesh fly screens. Suitable extractor fan shall be provided.



**SAFE METHODS AND RISK REDUCTION TECHNIQUES(SMARRT)****7.9 Lighting**

The site management shall ensure that living room and cooking area at least equipped with one ceiling type lighting arrangement with capable of providing about 150 to 200 lux and 75 to 100 lux respectively.

In addition, interior areas of the camp like bathroom, toilet etc shall be provided with a minimum of one ceiling or wall type lighting arrangement with capable of providing at least about 50 to 75 lux of light. While, external areas like assembly, corridor or lane between rooms shall be equipped with minimum 75 to 100 lux of light.

All electrical installations and internal/ external wirings of the camp shall installed according to Indian Standard (IS) and undertaken by competent person. All safety measures shall be taken during installation of electrical equipment. All distribution boxes shall be fitted with 30 mA ELCB to avoid any electrical incident. Internal wiring should be routed through the PVC conduit one plug point should be provided for every bed provided. Stand by Power Supply shall be made available in case power failure.

**7.10 Water Supply**

The site management shall ensure sufficient uncontaminated and uninterrupted water available for cooking, washing and other purposes. Depending on climate, weather conditions at least 40 to 80 litres per person per day water shall be available.

Adequate quantity of drinking water shall be available. In case of water supply from intermittent source, filtered /chlorination treatment facility of water shall be provided.

All water tanks provide in camp shall be ensured properly covered to prevent water contamination.

The site management shall ensure that the drinking water provided meets test standards stipulated under IS10500.

For drinking water, RO Plant having suitable capacity enough meet the requirement of camp occupants is recommended.

**7.11 Garbage and Refuse Disposal**

An adequate number of receptacles with proper cover shall be provided at appropriate location in the camp for maximise use for disposal of waste martial. However, ensure that capacity of receptacles should meet the requirement of the camp. Final disposable of the garbage shall be accordance with Municipal Solid Wastes (Management and Handling) Rules, 2000.

**SAFE METHODS AND RISK REDUCTION TECHNIQUES(SMARRT)****7.12 Sanitary and Toilet Facilities**

Sanitary and toilet facilities are basic facility of camp, which support the hygiene condition in the camp. It is essential to allow workers to maintain good practices of personal hygiene but also to prevent contamination and the spread of diseases outside the camp. Hence, all Sanitary and toilet facilities provided in camp shall keep in a clean and working condition. Sanitary and toilet shall construct with suitable materials that are easily cleanable. Sanitary and toilet facilities of the camp shall at last 15 to 20 meters away from the nearest living room.

A special precaution shall be taken to maintained the privacy; therefore, every toilet shall be cover from top and appropriate partitioned off as to secure privacy and with provision of proper door and fastening from inside.

An adequate number of sanitary and toilet facilities shall be provided to workers, If there are women worker same ratio shall be maintained. The Sanitary and toilet facilities proved in the camp shall be based on every 15 workers or less in the following Table and there after repetition of same for every 25 nos.

Water Closet (WC)	Urinal (UR)	Wash Basin (WB)	Bath Room (BR)
1	1	1	1
Indian seat with overhead mounted flush tank and 1 tap.	Flush tap fitted	With Tap	Tap and drain

It must be taken in to consideration of proper spacing inside the sanitary and toilet facilities in the camp. It shall be recommended that all sanitary and toilet facilities must be constructed as rate of 1.1 X 1.1 m to provide sufficient space with proper smooth surface and gradient so that proposed floor can be easily clean and maintained in good condition.

Every bathroom shall be under cover and shall have a proper door and fastening. The flooring for bathroom should be of hard washable materials, damp-proof and properly drained. Adequate space must be provided for hanging of clothes. Suitable lighting and ventilation should be provided.

**7.13 Sewage and Liquid Waste Disposal**

**SAFE METHODS AND RISK REDUCTION TECHNIQUES(SMARRT)**

The sewage system for the camp shall be properly designed, built and operated so that no health hazard occurs and no pollution to the in air, ground or adjacent watercourses.

Drainage system for the wastewater generate from kitchen, washing shall be discharge through underground drainage pipe to final common sump provided. This sump shall maintain capacity of at least 1.3 times the maximum volume of wastewater discharge from various sources of the camp.

The sanitary facilities of the camp shall be connected to the underground pipes, which divert all discharge in the final sewage treatment system of adequate capacity considering the inflow and occupants. Approved facilities like septic tank with sock pit shall provide for treatment and final disposal waste generate from toilets and urinals.

**7.14 First Aid Facilities**

First-aid unit including an adequate supply of sterilized dressing materials, medicines and appliances shall make available. A Special training of first aid from authorized hospital shall be provided to all the security staff deployed at labour camp and to two percentage of occupants of camp. Suitable transport shall be provided to facilitate taking injured and ill persons to the nearest hospital.

Health problems of the workers shall be taken care of by providing basic health care facilities through health centres temporarily set up for the construction camp. The health centre shall have at least a visiting doctor, nurses and duty staff with basic medicines and linkage with nearest higher order hospital to refer patients of major illnesses or critical cases.

**7.15 Individual requirements****7.15.1 Beds.**

Double decker bunker beds shall be provided and should be meeting requirement such as Double decker 6.5' X 3' with side railing for top bed and flatbed top with 1 mm GI sheet/12 mm commercial ply board and adequately supported and fastened to frame. Frame, ladder and internal support for the bed flat should be of 25 X 25 having a minimum gauge of 2 mm thickness / 16 Gauge.

**7.15.2 Electrical**

**SAFE METHODS AND RISK REDUCTION TECHNIQUES(SMARRT)**

Two numbers of Socket and one 10 W LED/ CFL, One number of fan common to two bunk beds, one night lamp common for the room.

**7.15.3 Storage.**

Arrangement of Four partition MS storage cabinet of the size 6' H X 2'W X 1 D shall be provided for every two double decker bunk beds. This can be placed close to the wall between bunk beds provided and bottom portion can shared by occupants in bottom and to by occupants in top.

**7.15.4 Provision Store.**

Provision store shall run on no loss, no profit basis and no alcohol or unauthorised items as listed by local statute bodies shall not be sold/ present. No drugs or medicine in any form shall not be kept or sold.

**7.16 LAYOUT AND MEANS OF ESCAPE**

All internal corridors have a minimum clear width of 3-3.5 meter for emergency exit. The special exist gate/s shall be provided to escape from camp to out side public road. All exit gate shall be properly marked in local language and language understood by the majority of labours resident in camp.

Exit gate/s shall provide close to the any public road or any internal site access that is accessible by emergency services like ambulances and fire engines in side the camp.

**7.17 HAZARDOUS AREAS**

The storage of highly flammable substances like kerosene and diesel or lubricant shall not allowed to store near occupant area of the camp. A separate storage location shall identify for storage of inflammable substance in the camp. This storage area shall be minimum 15 meters away from occupancy in the isolated area of the camp. Secondary containment or dip try shall make available to containers of kerosene and diesel or lubricant to avoided spillage or leakage.

Adequate no of fire extinguishers based on substances and quantity stored shall be provided. It shall be responsibility of the camp operator to maintain the logbook or register of substance stored in one time in the storage area.

**7.18 FIRE SAFETY**

**SAFE METHODS AND RISK REDUCTION TECHNIQUES(SMARRT)****7.18.1.1 Exits, Escape Routes and Passageways**

All exits, escape routes and passageways in the labour camp shall keep free of obstruction, and dumping of unwanted material.

Occupants of the camp shall not be permitted to store their personal material or items along the corridors or internal lanes.

**7.18.1.2 Fire Fighting Equipment**

Fire alarm smoke detector of Independent type produces the sound and flash alarm which is of dustproof charged by DC9v battery shall be provided for every five bunker beds.



Provisions for fire prevention step in labour camp shall be undertake in the initial stage of construction and based on assessment adequate number of fire equipment like fire extinguishers, fire detection system etc. provided. In addition, means of escape root and access for fire fighters shall defined in the camp.

A special trained firefighting team shall be form internally for handling of the fire. The fire extinguisher requirements for the particular area can determine in numbers by the following formula:

Number Required = Floor Area (m2) X 0.065/ Rating of Fire Extinguisher or consulate with the competent person/ local fire department or every 10 meter one extinguisher. The extinguisher shall be placed at conspicuous locations and at meter base of the extinguisher shall at one meter height from the ground and should be easily detachable.

**7.19 ELECTRICAL SAFETY**

All electrical supplies shall be planned and adequately provided. Lack of electrical power points will promote the occurrence of illegal tapping and modification.

Electrical installation and wirings shall be done by proper electrical workers / electricians. Electrical installation shall comply with Electrical Installation Code of practices stipulated under IS Code. All electrical installations and internal/ external wirings of the camp shall installed according to Indian Standard (IS) and undertaken by competent person. All safety measures shall be taken during installation of electrical equipment. All distribution boxes shall be fitted with 30 mA ELCB to avoid any electrical incident. Internal wiring should be routed through the PVC conduit one plug

## SAFE METHODS AND RISK REDUCTION TECHNIQUES(SMARRT)

point should be provided for every bed provided. Stand by Power Supply shall be made available in case power failure.

### 7.20 LIGHTNING PROTECTION

Where temporary workers' housing quarters could potentially be struck by lightning, it shall be planned that the workers housing quarters is either constructed with lightning protection or in a safe zone protected by buildings or facilities with lightning protection.

### 7.21 GUIDELINES ON USE OF TEMPORARY LABOUR CAMPS

- Project Manager of site shall be responsible for complying with all statutory requirements and rules issued thereunder relating to labour camp. He /she shall be responsibility of site management to comply with the Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and other respective regional and local regulations applicable to maintain the labour camp associate with the construction site.
- Site management shall be liable to take written permission or No Objection Certificate/ agreement with owner of the land used for construction of temporary labour camp.
- Site management of the construction site shall appoint an authorised person to maintain the standard of camp. This person will directly report to Project Manager regarding day-to-day update of the camp.
- Authorised person shall be liable to inspect daily common-use areas including toilets, kitchens area, corridors etc to ensure that each facility properly maintained in a clean, satisfactory operating condition.
- Authorised person shall be responsible for safety of camp. He/she shall maintain all documents regarding storage of material, internal changes of camp layout, maintenance of consent/ authorisation, first aid facility, hygiene of camp etc,
- No construction materials or unwanted material shall allow to store in the camp. All internal unwanted material shall store in designated storage areas.
- Authorised person shall be coordinate to labour camp representatives to resolve day-to-day issues.
- Authorised person shall form a representative team from occupant labours for coordination and maintenance of camp.
- Project management shall not accommodate any employees who have criminal records or attached to any banned organization by State or Central government.
- Alcoholic beverages will not be consumed, brought onto, or manufactured in to Housing Premises.
- Non-prescription drugs, intoxicants or alike substances will not be used, brought onto or manufactured to Housing Premises.
- Tobacco in any form is prohibited.

**SAFE METHODS AND RISK REDUCTION TECHNIQUES(SMARRT)**

- Firearms, explosives, knives or other types of weapons will not be allowed to Housing quarters except in approved kind of knife in kitchen.
- Gambling or any other form of betting game is prohibited.
- Discrimination or intimidation on the basis of race, sex or national origin is prohibited.
- Aggressive or abnormal behaviour is prohibited.
- Individuals under the influence of alcohol, drugs or any other narcotics will not be permitted entry to Housing Premises.
- Violation and / or failure to comply with the above requirements will require a written report detailing facts and corrective actions taken.
- It shall be responsibility of representative of labour camp to marinate entire premises of a camp free from rubbish, waste paper, garbage and other litter.
- Provision shall be made by site management to display in-house rules for occupants to minimize disturbance, nuisance and smooth functioning of the camp including code of conducts for occupants.
- After completion of the site work, it shall be responsibility of the site management to demolish and remove all temporary structures of the camp and transform the respective land in its actual/ virgin condition, which is in no way inferior to the condition prior to commencement of work. All rubbish, waste paper, garbage litter and assorted waste, pits, UST/ AST tanks, pipelines etc. shall be removed and clean the site before handover to respective person or authority for clearance

**8.0 QUALITY METRICS: (Effectiveness & Efficiency Measures)**

Measures	Description
Effectiveness	
Efficiency	

**9.0 RECORDS**

The project site management shall ensure the proper records and particulars of the occupants are kept in proper documents. Copies of Government approved ID cards of all individuals must be available. These documents will allow proper accounting of occupants and facilities head count during any occurrence of emergency situations. All the rooms/ Block need to be numbered and the list of occupants along with details like 1. Name 2. Contact Number 3. Blood Group with

**SAFE METHODS AND RISK REDUCTION TECHNIQUES(SMARRT)**

Rh factor 4. Emergency contact details (Name, Relation, Contact Number) 5. Previous Medical History (If any?) 6. Allergenic to Medicine (If Any?)

Name of Record	Retention Period and Disposition Method
All work permit	Till completion of project
All Checklist	Post this the hard copies shall be disposed by shredding

**10.0 ATTACHMENTS**

Check List - ML D L / OH S / CT 40

Location		Date/ time	
Inspected by		Company	



**SAFE METHODS AND RISK REDUCTION TECHNIQUES(SMARRT)**

SI No:	Items	Yes	No
1	Is labour camp safety ensured like sheds are constructed properly, roof sheets are properly locked, Fire Extinguishers availability etc?		
2	Are welfare facilities such as basic amenities like drinking water, proper sanitation facilities provided at labour camp?		
3	Are hygienic conditions ensured at labour camps by maintaining cleanliness?		
4	Are first aid facilities are available in labour camps?		
5	Are sufficient fire extinguishers are available in the labour camps?		
6	Is the security and labour contractor sufficiently trained in firefighting in case of a fire outbreak in labour camp?		
7	Is Day care facility/school facility arrangements in place?		
8	Is provision for regular supply of drinking water made?		
9	Is drainage system found to be efficient in labour camp?		
10	Is medical check-up done periodically to prevent the spread of diseases?		
11	Is proper lighting arrangement provided at labour camps?		
12	Are toilets in labour camp ensured separately for male and female workers and maintained properly?		
13	Are pesticides sprayed every fortnight after removing eatables from the place of application?		
14	Is fogging done every week to prevent mosquitoes?		
15	Is care taken to ensure whether all the water sources are covered and cleaned and disinfected frequently to avoid outbreak of any water borne diseases?		
16	Does the security maintain register for visitors?		
17	Are emergency contact numbers displayed in labour camps?		
18 19	Is register maintained for drinking water cleaning, authorized vendor for removal waste food, and pest control?		
20	Are separate electrical sockets provided for each room at labour camp?		

# MAHINDRA LIFESPACES DEVELOPERS LTD

## SAFE METHODS AND RISK REDUCTION TECHNIQUES(SMARRT)

Observation / Areas of Concern / Recommendations

**Volume II B**  
**Tender drawing**

Master Plan - Phase 1 -307.11 Acres  
[Tentative Saleable]

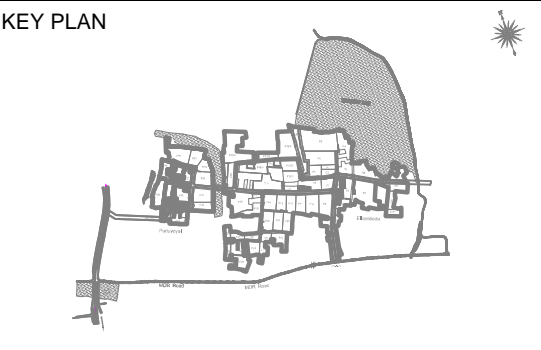
**General notes:**

(1) This drawing is the property of Mahindra Consulting Engineers Ltd, Chennai India and must not be passed on to any person or body not authorized by us neither to receive it nor to be copied or otherwise made use of either in full or in part by such person or body without our prior permission in writing. This drawing cannot be handed over to a third party or used for any purpose, other than that for which it has been intended.

(2) Do not scale from the drawings.

(3) All dimensions are in millimeters and levels are metres unless noted otherwise.

(4) All dimensions to be verified on site & approved by the engineer.



**Legend :-**

○ - 9.5m Street light pole with 1X90W LED fitting - 96 Nos.

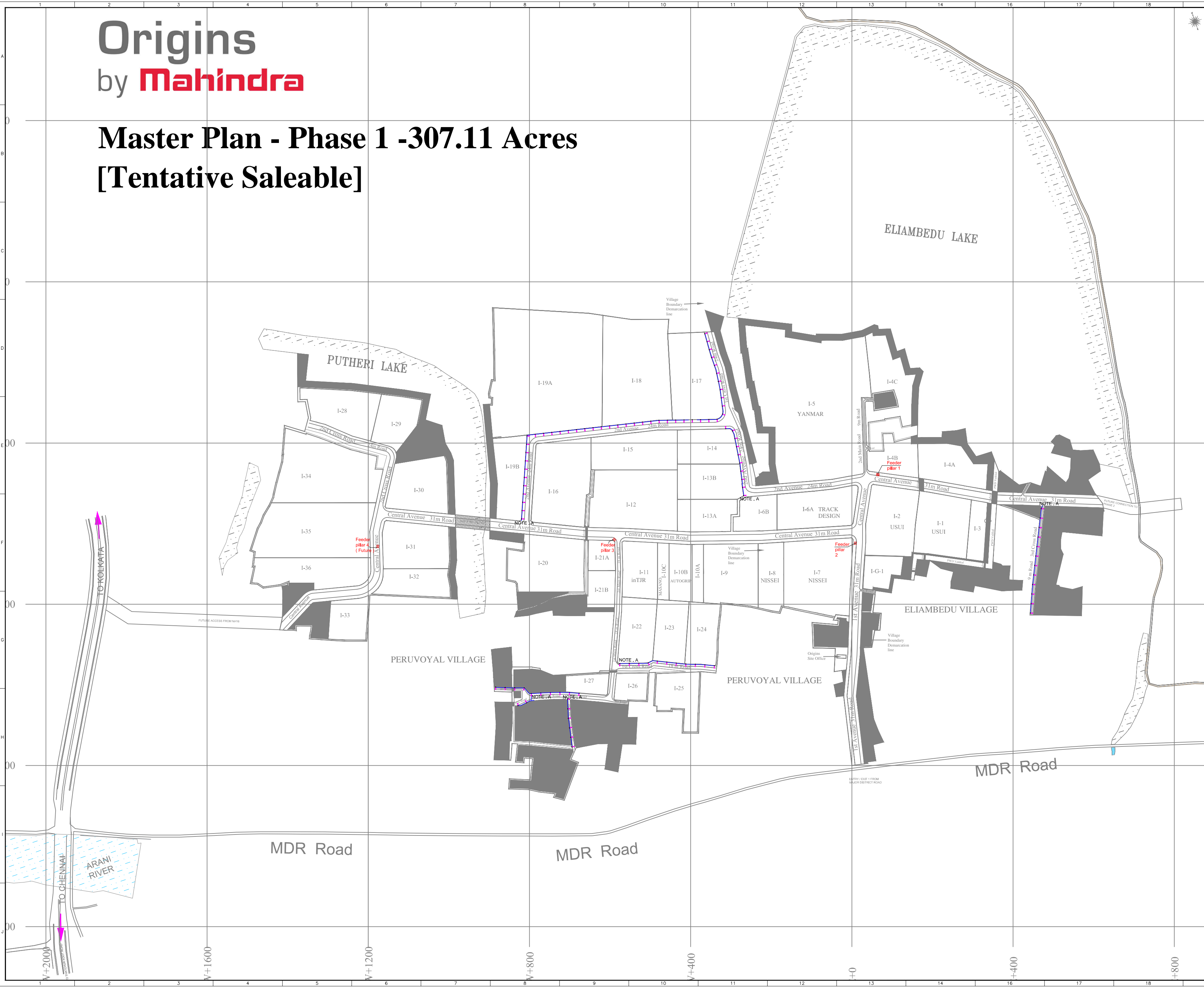
— - Lighting cable

**Note :**

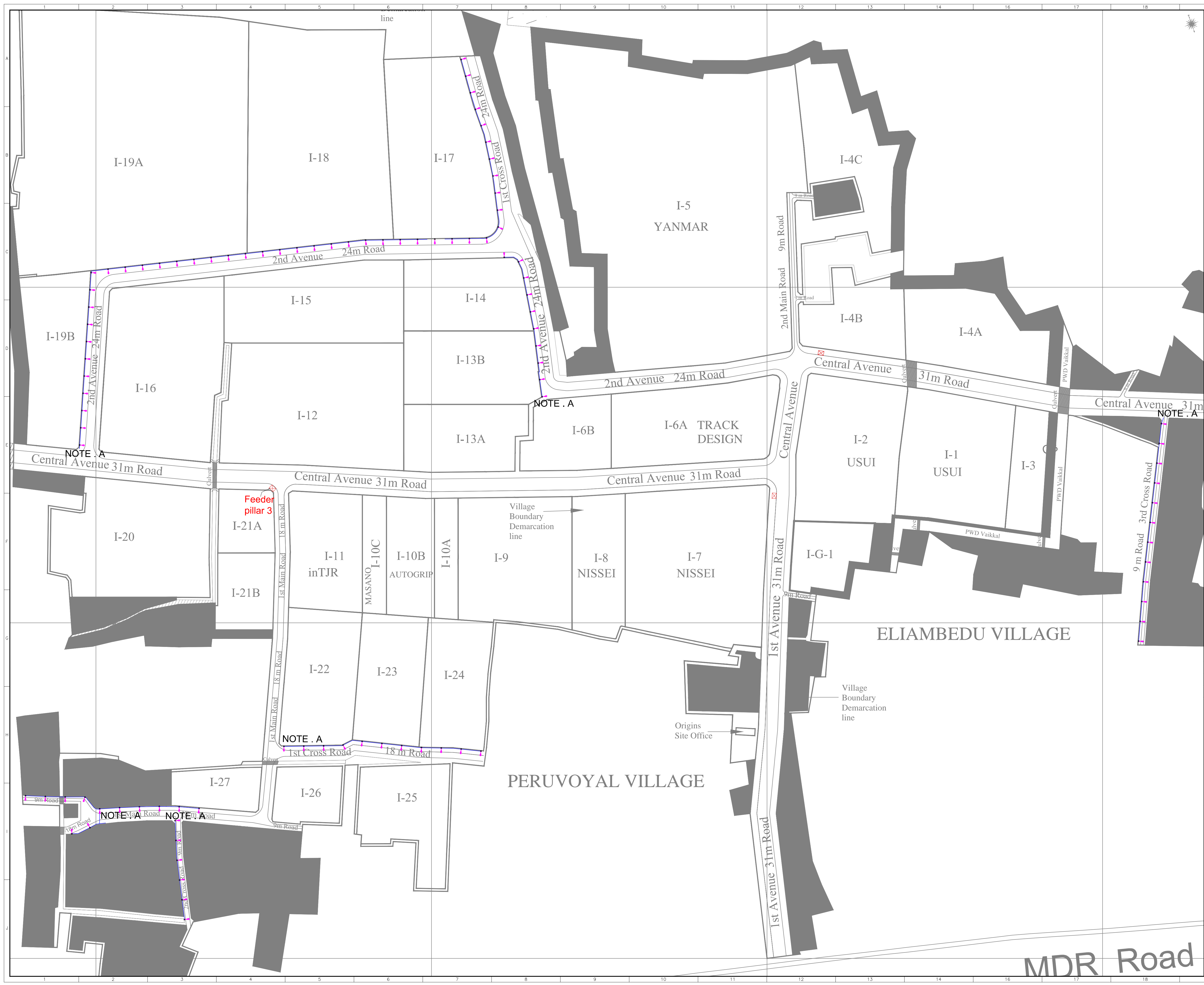
A. Incoming power cable shall be taped from the nearest existing street light fitting

**FOR TENDER PURPOSE ONLY**

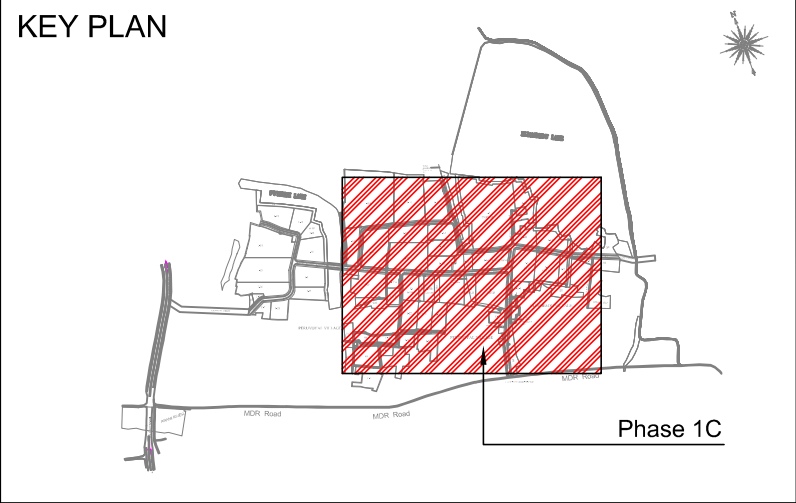
Rev	Description	Date
<b>CLIENT :-</b>		
<b>Mahindra INDUSTRIAL PARK</b> Mahindra Industrial Park Chennai limited . Chennai.		
<b>PROJECT:</b>		
Industrial Park at NH16		
<b>PROJECT CONSULTANT:</b>		
<b>Mahindra</b> Consulting Engineers		
TEL :044-28542325,28542326      Mahindra Towers. Ground FAX :044-28542324      Floor, No.17/18, Pattulious e-mail:mace@mahindra.com      Road, Chennai-600 002. Website:mahindramace.com		
<b>DRAWING TITLE:</b>		
Street light layout - Phase 1C		
Scale: NTS@A0	Date: 15.11.2022	Sheet: Sheet 1 of 3
Job No.: MACE-P926	Drawing No.: MACE-P926-MIPCL-E001	Rev: R0







- General notes:**
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  - (2) Do not scale from the drawings.
  - (3) All dimensions are in millimeters and levels are metres unless noted otherwise.
  - (4) All dimensions to be verified on site & approved by the engineer.



- Legend :-**
- 9.5m Street light pole with 1X90W LED fitting
  - Lighting cable

**Note :**

A . Incoming power cable shall be taped from the nearest existing street light fitting

**FOR TENDER PURPOSE ONLY**

Rev	Description	Date
CLIENT :-		
Mahindra INDUSTRIAL PARK		
Mahindra Industrial Park Chennai limited . Chennai.		
PROJECT:		
Industrial Park at NH16		
PROJECT CONSULTANT:		
Mahindra Consulting Engineers		
TEL :044-28542325,28542326		
FAX :044-28542324		
e-mail:mace@mahindra.com		
Website:mahindramace.com		
Mahindra Towers. Ground Floor, No.17/18, Pattullious Road, Chennai-600 002.		
DRAWING TITLE:		
Street light layout - Phase 1C		
Scale: NTS@A1	Date: 15.11.2022	Sheet: Sheet 2 of 3
Job No.: MACE-P926	Drawing No.: MACE-P926-MIPCL-E001	Rev: R0

