

Price/Financial Bid

Format should be on the letter head of the agency submitting the tender

No. IAHE/GreenInitiatives/2018

Dated:

To

ADG & Director

Indian Academy of Highway Engineers (IAHE)

A-5, Sector-62, Institutional Area, Noida (UP)

Sir,

Please find quoted rates of items with respect to your tender bearing no.IAHE/GreenInitiatives/2018 dated

| Sl no | Particulars | Unit | Qty. | Supply | | Erection/Excavation | | Total Amount (Rs) |
|-------|--|--------|-------------|----------------|-------------|---------------------|-------------|-------------------|
| | | | | Rate/Unit (Rs) | Amount (Rs) | Rate/Unit (Rs) | Amount (Rs) | |
| 1 | Supply & Erection of LT Panel outdoor type atleast 120 kw , Development of two Charging Stations, plinth mounted including earthing, Cable termination, Testing & Commissioning in complete | Nos. | 01 LT Panel | | | | | |
| 2 | Construction of bus shelter atleast 20m x 6m (LxW) | Length | 20x6 (m) | | | | | |
| | Total (Rs) | | | | | | | |

Bidder will be permitted to enter the item rates only. No other modification shall be permitted. Bidders are required to sign each and every page.

Note:

- (i) Any discrepancy in unit rate and amount, unit rate stands.
- (ii) All rates are inclusive GST as applicable.
- (iii) Any column left blank shall be treated as nil/inclusive of.

Signature of the Bidder with Seal

TECHNICAL SPECIFICATION FOR LT FEEDER PILLAR PANEL

1. SCOPE:

- 1.1 This Specification covers design, manufacture, assembly, inspection and testing at works and supply of 8 way LT Feeder Pillar Panel Complete with accessories and other miscellaneous equipments specified in this specification.
- 1.2 The materials supply including loading at factory, transportation , unloading at work site and erection at specified locations including civil work, inspection, testing & commissioning up to satisfactory operation.

2. STANDARDS:

2.1 The equipment should conform in all respects to the relevant latest editions of the Bureau of Indian Standards or other equivalent National or International Standards.

2.2 If the specifications other than those mentioned below are applicable, the fact should be made clear in the bid and one copy of such standard specifications in the English language shall be enclosed with the bid.

2.3 The equipment shall also comply with the latest revision of the IE ACT & Indian Electricity Rules and any other applicable statutory provision, rules and regulations applicable in the location where these are to be installed.

2.4 THE APPLICABLE STANDARDS ARE LISTED HERE BELOW:

IS: 5-1994: Colour of ready mixed paints and enamels.

IS: 6875/1973: Control switches, push buttons and related Part I & II control switches.

IS: 13607/1992: Ready mixed paint, Finishing, General purpose, Synthetic.

IS: 13947/1993: Specification for Low-voltage Switchgear and Control gear.

IS: 2633/1972 : Specification for hot-dip galvanization .

3. CLIMATIC CONDITION:

The Feeder Pillar Boxes offered shall be suitable for being used in the Baripada city of Odisha, where heavy heat with cyclonic storm effect is heavily experienced along with following weather conditions.

- a) Minimum temperature of air in shade - 25° C
- b) Maximum temperature of air in shade - 50° C
- c) Relative Humidity - 85% - 100%
- d) Average No. of rainy days per annum - 90 days
- e) Rain fall - 750-3000mm

4. PRINCIPAL PARAMETERS:

The Feeder Pillar Box shall conform to the specific Technical requirement specified hereunder.

1. Rated Voltage - 400 V + 10%
2. Rated Frequency - 50 HZ
3. Continuous Current Rating - 630 Amps
4. Type - Out door
5. Mounting - On concrete foundation.
6. Suitable for - 3 ph 4 wire with earthed Neutral
7. Maximum system Voltage - 1.1KV
8. Rated short Circuit Level - 50KA @ 400V.

5. FEEDER PILLAR BOX DESCRIPTION:

- 5.1 Feeder Pillar Box shall be suitable for the purpose for which they are intended to be used.
- 5.2 Each box shall be complete with following accessories:
- a) 630 Amps HRC Fuse for incoming L.T. UG cable for 8 way panel,
 - b) 25 Amps DP MCB for single phase consumers.
 - c) 20A to 63 Amps TPN MCB for 3-Ph consumers,
 - d) Suitable capacity of Ameter , Voltmeter, Selector switch , Phase indicators
 - e) Lock & Key
- 5.3 Feeder Pillar Box shall have access for sufficient ventilation and head description.
- 5.4 The cable entry and exit shall be from bottom of the panel. The design of the panel/box must be such as to facilitate easy removal of the cable during erection and repair by suitable bolting the box cover and sliding the bottom gland plates.. The panel shall be provided with suitable gland and clamps for fixing the cable rigidly. The feeder pillar box shall be suitable for 1.1kV 3½ core 300sqmm/50 Sq.mm armored UG cable through 100mm PVC pipe and clearance inside the box must be such as to offer fair working facilities during erection and maintenance.
- 5.5 All service connection wire of existing individual consumer exit shall be from bottom of the panel with suitable size of PVC gland and with safe& protected by PVC pipe till raise on nearest pole to avoid rain water enter into the panel.
- 5.6 The inside surface of the box shall be insulated by fiber sheet to with stand 1.1 kV insulation to prevent flash over.
- 5.7 The box shall be vermin proof and dust proof.
- 5.8 Louvers of suitable size shall be provided in the front for ventilation and wire nets shall be provided on the back of the louvers to prevent the entry of dust and insect.
- 5.9 The box shall have double door (self closing type) fitted with internal type door lock with common key for all the boxes and shall given maximum protection to the interior of the box.
- 5.0 The feeder pillar boxes shall be made of 2.5 mm thickness GI sheet with permanent paint on clean surface after chemical treatment as per clause no. 12.0.
- 5.11 The Feeder Pillar Box shall be suitable to mount on brick concrete foundation. Necessary provision for foundation bolt in the pillar shall be made for GI foundation bolts of size 12mm. Nuts, Bolts and 2 Nos. of washers
- 5.12 The box shall be provided with suitable rain shed and all bolt and washers used shall be galvanized mild steel.
- 5.13 A danger board as shown in the sketch shall be provided in the front of the box.

6. EARTHING:

- 6.1 The FP box shall be provided with two Nos. of earthing points internally connected with accessible position on the sides. The earthing point shall be provided by 25mm M8 galvanized bolts and nuts and marked with S symbol.
- 6.2 All FP box shall be earthed by running 25x3 mm GI flat from the nearest two earth pits.
- 6.3 Earth pits shall be made with 40 mm dia, 2.5 mtr.long G.I pipe with pit chamber & RCC cover.

7. NAME PLATE AND CIRCUIT BOARD:

- 7.1 The Feeder Pillar Box shall be provided with transparent label or card of removable type and the following information are to be recorded.
 - (1) Title
 - (2) Cable Size
 - (3) Current Rating of I/C Cable
 - (4) Current Rating of O/G Cable
 - (5) Current Rating of MCBs.
 - (6) No. of Outgoing service mains with their code numbers
- 7.2 The label or card shall be fitted on the side of the door and circuit numbering means shall be indicated by symbol or diagram relating to the service mains.
- 7.3 The Circuit plate with following engraved information has to be riveted to the inside of the door of the feeder pillar box in an accessible position for easy reading.

Incoming Line from :
Incoming Line to :
Outgoing Line ___ Amps to : (1-24)SPh / (1-4)3-Ph.

8. FABRICATION: (3Ph, 4Wire 8 way feeder pillar Panel)

- 8.1 The feeder Pillar-Box shall be in conformity with relevant IS specification.
- 8.2 The feeder pillar-Box shall comprise of the following accessories.
 - (1) Feeder Pillar box Metal Body (GI) with weather proof permanent paint.
 - (2) Aluminum bus bar provided with 1.1 kV insulating PVC sleeves.
 - (3) HRC Fuse of 630 Amps for incoming cables for 8 way Panel.
 - (4) 630 Amps MCCB incoming site for 8 way panel
 - (5) Protection to the UG cable service mains by disconnecting the power supply in case of service main cable faults and excess drawl of power by the consumers than the sanctioned power.

9. FEEDER PILLAR BOX METAL BODY:

- 9.1 Feeder pillar box metal body shall be made out of high grade GI sheet confirming to latest IS specification, with 2.5 mm thick for the body and doors,
- 9.2 BUS BARS:

9.2.1 Feeder pillar box shall be provided with PVC insulated sleeved bus bar to with stand 1.1 kV.

The bus bar sizes shall be 1 layer of 60X10 mm aluminum.

9.2.2 The insulated sleeves shall be of high grade to with stand 1.1 kV with Red, Yellow and Blue colour for three phases and black for neutral.

9.2.3 The bus bar shall be made out of E.C. Grade Alluminium flats. The bus bar shall be suitably supported on an insulating base rigidly fitted to the metal box.

9.2.4 The connection to the neutral bus bar is by means of socket. Necessary holes may be drilled on the bus bar for mounting the bus bar.

9.3 MCBs

9.3.1 The feeder pillar box shall be provided with MCBs of reputed make and of the following rating:

| Sl. No. | MCBs (DP/TPN) | |
|---------|---|------------------|
| 1 | Rating | 8 WAY |
| | Sph25 Amp DP | 8 Nos. Per Phase |
| | 3ph 20 Amps to 63 Amp. depending on requirement TPN | 4 Nos |

9.4 MCCBs

9.4.1 MCCBs shall be suitable for 8 way FP box to work on 440 V, 630 Amps, four pole 50HZ, heavy duty, front operated type, with replaceable silver plate contacts conforming to IS 4064/1978, superior type arc chambers with necessary insulating barriers and enclosed in a compact insulating cover. The switch shall be designed break the current of 630A and able to withstand breaking stresses with quick and reliable spring loaded operating handle. The location of operating handle shall be so as to facilitate convenient operation. The position of ON & OFF must be clearly indicated. The utilization category of the switch shall be Ac-23.

10. TEST & TEST CERTIFICATES AND INSPECTION:

10.1 The following routine tests shall be carried out on the panels at the factory:

- Checking of overall dimension, thickness of box sheet and paint film.
- Checking correctness of continuity of circuits.
- One minute HV withstand test – All equipments on panel and internal wiring shall be tested to withstand a test voltage of 2KV to earth for one minute.
- Insulation resistance of the complete circuit by circuit with all equipments mounted on the panel using insulation Tester/Megger.
- Verification of degree of protection as per IS: 13947 (part-I).

10.2 The feeder pillar box shall be subjected to type test and acceptable test accessories with the standard to which it conform.

10.3 All routine and acceptance tests shall be conducted in presence of the owner's representative. No material shall be dispatched unless the owner communicated his written approval to these test certificates.

10.4 Copies of the type and routine test certificates for all the components used in the manufacture of the box from a recognized test house (to prove the conformity of the components to the relevant standards) shall be submitted along with the tender.

11. INSTALLATION:

- 11.1 The FP panel shall be installed in suitable position in series according to the consumer strength and feeding sub-station with concrete foundation fixing by 4 nos. bolts near to the underground cable trench .
- 11.2 The FP panel shall be made with suitable arrangement for termination of incoming & outgoing underground cables and no. of panels to be inter-connected through underground cable in a group in looping system.
- 11.3 Outgoing over head service connections of individual consumers shall be connected with the panel at upper part of the panel .
- 11.4 All type of termination & connection of cable , testing & commissioning to be covered in the contract
- 11.5 All FP panels shall be connected with proper earthing . At least one earth pits to be installed for one FP panel & connected with 25x3 mm GI flat at two distinct point.

12.0 PAINTING

All paints shall be applied on clean, dry surfaces under suitable atmospheric and other conditions in accordance with the paint manufacturer's instructions. All paints used shall be compatible with each other and capable of being used as a system. The system shall be capable of performance for minimum of five years in the environment specified without any need for maintenance.

All sheet steel surfaces shall be degreased, pickled and phosphated in accordance with IS6005.
—Code of Practice for phosphating of iron and steel

All rough surfaces of coatings shall be filled with approved two pack filler and rubbed down to a smooth finish.

Before pickling, all welding, drilling, cutting, grinding and other finishing operations must be completed and all grease, paint, varnish, oil, welding slag, and foreign bodies completely removed. All protuberances which would affect the life of painting shall also be removed.

Interior surfaces after preparation, cleaning and priming shall be painted with one coat of zinc chromate primer, one coat of phenolic based undercoating, followed by one coat of phenolic based finishing paint to grey colour followed by a final coat of anti-condensation paint of grey colour with shade slightly lighter than the exterior paint shade and of a type and make to the approval of the Purchaser. A minimum over all paint film thickness of 150 microns shall be maintained throughout. Exterior steel and metal surfaces, after preparation and priming shall be painted with one coat of zinc chromate primer, one coat of phenolic based under coating and two coats of micaceous iron oxide paint, then painted with a final coat of phenolic based hard glass finishing paint of the DA as per IS:5, to provide an overall minimum paint thickness of 200 microns.

The first coat of primer shall be applied within four hours of shot blasting.

13. General Technical Particulars for LT Distribution Boxes:-

- 13.1 The LT distribution boxes should be of the suitable dimensions to meet the requirement tentative size is 1200x800x600 mm.
- 13.2 The Bidders can quote with their own design with appropriate size suitably accommodating the components as indicated in this bid in conforming to the approved clearance and technical requirements. The dimensions are only illustrative. Tolerances of dimensions are 10% over & above the dimension specified. The bidder may specify their own dimensions and quote accordingly. The drawing and dimension should be submitted with the bidding document.
- 13.3 The distribution boxes shall be duly wired with suitable size of PVC insulated single core copper cable or equivalent section copper/ aluminum flat.
- 13.4 Terminal connectors the earth connections to be provided in the box.
- 13.5 The distribution cabinet should be preferably of IP-55 protective category, with provision for lighting inside the cabinet. NESCO Utility & SI. No. Punching Marks should be given on any one of the side walls of each box as an identification of NESCO Utility property, besides furnishing a non-detachable Nameplate, which should exhibit the details of LT Distribution Cabinet.
- 13.6 **Tests:** - The 4 pole & 2 poles M.C.C.Bs to be mounted with Distribution Boxes shall have been fully type tested as per relevant standard at CPRI/ Govt. Approved laboratory/NABL accredited laboratory. The bid shall be accompanying with type-test reports conducted at Central Power Research Institute / Govt. Approved laboratory for the offered materials conducted within five years before the date of opening of the tender. Copies of type test reports in respect of impulse and short circuit tests must be enclosed with the tender failing, which the Bid is liable for rejection. Purchaser reserves the right to demand repetition of the tests without any extra cost. Bids not accompanied with type test reports conducted within five years shall not be considered for evaluation.

13.07 Inspection:

- a) The inspection may be carried out by the Purchaser at any stage of manufacture. The successful Bidder shall grant free access to the Purchaser's representative at a reasonable time when the work is in progress. Inspection and acceptance of any equipment under this specification by the Purchaser shall not relieve the supplier or his obligation of furnishing equipment in accordance with the specification and shall not prevent subsequent rejection if the equipment is found to be defective.
- b) The supplier shall keep the Purchaser informed in advance about the manufacturing programme so that arrangement can be made for inspection
- c) The purchaser reserves the right to insist for witnessing the acceptance/routine testing of the bought out items.

13.8 Acceptance & Routine Test:

- a) All acceptance and routine tests as stipulated in the relevant standards shall be carried out by the supplier in presence of owner's representative.
- b) Immediately after finalization of the programme of type/acceptance/routine testing, the supplier shall give fifteen days advance intimation to the Purchaser to enable him to depute his representative for witnessing the tests.

13.9 DOCUMENTATION:-

The bidder shall furnish the following drawings along with offer.

- i. General outline and assembly drawing of the LT Distribution Box.
- ii. Cross sectional view.
- iii. Arrangement of terminals & details of connection studs provided.
- iv. Name Plate.
- v. Schematic Drawing.
- vi. Type test reports, in case MCCB has already been type tested.
- vii. Test reports, literature of the bought out items and raw materials.
- viii. Testing facilities available at the works.
- ix. List of customers with detailed address/purchase reference, quantity and year of supply with user certificate for such items.

13.10 COMPLETENESS OF EQUIPMENTS:-

Any fittings accessories or apparatus which may not have been specifically mentioned in this specification but which are usually necessary in equipment of similar plant shall be deemed to be included in the specification and shall be supplied by Bidder without extra charge. All plant and equipment shall be complete in all details whether such details are mentioned in the specification or not.

14. GENERAL TECHNICAL PARTICULARS:-

The Bidders are required to furnish the Guaranteed Technical Particulars duly filled in the format given below:

**GUARANTEED TECHNICAL PARTICULARS FOR SERVICE DISTRIBUTION BOX
(8 WAY)**

(To be furnished by the
Manufacturer)

(Separate Sheets should be filled up for 8 Way Service Distribution Boxes)

| Sl. No. | Description | Unit | Bidder's Offer |
|---------|--|-----------------|----------------|
| 1 | Name of the Manufacturer | | |
| 2 | Place of manufacturer | | |
| 3 | Manufacture's Part Number | | |
| 4 | International Standard it complies with | | |
| 5 | Maximum Mains Conductors it is suitable for | mm ² | |
| 6 | Range of Service Conductor Sizes | mm ² | |
| 7 | Max. number of single phase (P-N) services | No | |
| 8 | Max. number of three phase (3P+N) Services. | No. | |
| 9 | Location of Conductor Entries | | |
| 10 | Cable Glands for Mains Cable | | |
| 11 | Integral Sealable door lock on Enclosure | | |
| 12 | Degree of protection (IP rating) | | |
| 13 | Type of Open door/open cover retention | | |
| 14 | Current Rating of Busbars | A | |
| 15 | Material of Busbars | | |
| 16 | Minimum Cross Section of Busbars (P and N) | Mm | |
| 17 | Terminals suitable for copper and aluminum | | |
| 18 | Type and Grade Housing Material | | |
| 19 | Corrosion Protection of Housing Thickness of coating | Micron | |
| 20 | Fuse carrier and Base Standard | | |
| 21 | Fuse Type | | |
| 22 | Fuse Carrier and Base Rated Voltage | Volts | |
| 23 | Fuse Carrier and Base Current Rating | A | |
| 24 | Fuse Carrier and Base Rated Breaking Capacity | KA | |
| 25 | Makings | | |
| 26 | Colour of Housing | | |
| 27 | Dimensions | Mm | |
| 28 | Net Weight | Kg | |
| 29 | Whether drawing submitted along with Bid | | |

Bidder's Signature with Seal

Technical Specifications of Earthing Device

1. Scope :-

This specification provides for design, manufacturing, testing before dispatch, supply & delivery of Earthing Device (Heavy Duty) one no. for each panel to be earthed at two distinct point of the LT panel through GI flat..

2. APPLICABLE STANDARDS :-

The Earthing Device must be made out of 40 mm nominal Bore & 3.2 mm (Medium Gauge-No minus Tolerance allowed) wall thickness Hot Dip G.I. Pipe (as per IS :- 1239,m Part-1, 1990 & REC construction Standard –J-2) , ISI marked of reputed Make & 2.5 mtrs length tapered finished smooth at one end for a length of 75 mm & Clamp at the other end.

Staggered drills hole of 12 mm Dia of interval of 150mm shall be made before galvanization.

The GI Earthing Clamp/ Strip (C- Clamp Type) is to be of 50mm width, 6mm thickness & flange length of 65 mm in each side. This should be suitable for termination of 4 nos of GI Flat earth electrodes. The Clamp/ Strip & Earthing pipe after fabrication will be hot dip galvanized confirming to IS: 2629/85 with latest amendments. The clamp shall have two holes in both sides suitable for 5/8 x 2” Bolt & provided with two GI bolts& Nuts in each side of 5/8 x 2” long half threaded with spring washer as per IS: 3043/1982.The galvanization tests are to be conducted as per IS: 2633/72 & IS: 6745/72 &

its latest amendments.

Guaranteed Technical Particulars of Earthing Device

(To be submitted along with Offer)

| | Par | Bidder's Offer |
|----|--|-----------------------|
| 1. | Location of Factory or Place of Manufacture | |
| 2. | Maker's Name, Address & Country | |
| 3. | Size of | |
| a | Pipe | |
| b | Earthing Strips | |
| 4. | Length | |
| 5. | Thickness of Pipe | |
| 6. | Galvanization Process | |
| 7. | Galvanization thickness | |
| a | For Earthing device | |
| b | For Connecting Flat | |
| 8 | Galavanization tests to be conducted as per ISS | |
| 9 | Any other Particulars (like details of Clamp/ G.I. Bolts) | |
| 10 | Details of Drawings submitted | |

TECHNICAL SPECIFICATION OF 25X3 MM GI FLAT

1. SCOPE

This specification covers manufacture, testing and supply of hot dip galvanized MS solid flat of size 25x3 mm.

2. APPLICABLE STANDARDS ZINC

Zinc shall conform to grade Zen 98 specified in IS 209& IS: 4826-1979 with up to date amendments.

ZINC COATING

Zinc coating shall be in accordance with IS: 4826-1979 for heavily coated hard quality.

GALVANISING

Galvanizing shall be as per IS: 2629-1966, IS 4826-1979 with up to date amendments

UNIFORMITY OF ZINC COATING

Uniformity of zinc coating shall be as per IS: 2633-1972 with up to date amendments

TENSILE PROPERTIES

The tensile strength of the wire after galvanizing shall be between 55-95 Kg/sq.mm ensuring

MS wire mechanical properties as per IS-28:1972 8.1 to 8.3

FREEDOM FROM DEFECTS

As per IS: 2629-1966 & 4826-1979 & with up to date amendments be ensured

3. MATERIAL

The mild steel wire shall have chemical composition maximum sulphur- 0.055%, phosphorous -0.055%, Carbon 0.25%.

4. TESTS

During the process of manufacturer/fabrication and all tests for chemical, mechanical, galvanizing as per IS- 280-1979, IS1521-1972, IS-1755-1961, IS: 6745- 1972 & 4826-1979 shall be carried out. The certificate towards, chemical composition shall be submitted for each lot offered for inspection.

The following tests shall be conducted in presence of the representative of the purchaser: Visual physical inspection and measurement of specified dimension Coating test as per IS: 1755-1961, IS 2629-1966, IS: 2633-1972, IS: 4826-1969

Adhesion test as per IS: 1755-1961, IS: 2629-1966, IS: 2633-1972, IS: 4826-1969 & IS:6745-1972

Tensile strength and breaking load and elongation determined as per IS: 1521-1972 with up to date amendments.

Guaranteed Technical Particulars for No. 25x3 mm G.I flat

| Sl. No. | GENERAL TECHNICAL PARTICULARS | Guaranteed Value | Bidders Offer |
|----------------|--|--|----------------------|
| 1 | Nominal size in mm | 25x3 | |
| 2 | Tolerance in diameter in mm | + 2.5% | |
| 3 | Sectional Area (in Sq. mm.) | 75 | |
| 4 | Tensile strength of wire in N/mm ² / MPa | 550-900 | |
| 5 | Minimum breaking load (KN) | 8.79 | |
| 6 | Variety Hard/Soft | Soft | |
| 7 | Type of Galvanizing | Hot dip heavy coating | |
| 8 | Weight of Zinc coating (Gms/Sq. Mtr.) | 290 | |
| 9 | No. of dips the coating is able to withstand as 18 ± 20°C | 3 dip in Min | |
| 10 | Adhesion Test (Wrap Test at 1 turn per second coiling while stress not exceeding % nominal tensile strength) | To be specified by bidder | |
| | i) Min. complete turn of wrap | do | |
| | ii) Dia of mandrel on which wrapped | do | |
| 11 | Bend Test | do | |
| | i) Angle | do | |
| | ii) Dia round a format to be bent | do | |
| 12 | Freedom from defect | do | |
| 13 | Chemical composition the MS Wire used shall not | do | |
| | i) Sulphur 0.060% | do | |
| | ii) Phosphorous 0.065% | do | |
| 14 | Weight of wire in Kg/m | 0.6 | |
| 15 | Tolerance in wt. | + 5% | |
| 16 | Standard according to which the solid wire is manufactured and tested | IS: 280/1978 , IS: 4826/1979 , IS: 7887/1975 | |

Technical Specification for PVC Service Cable

1. SCOPE:

- 1.1 This specification covers the design, manufacturing, testing, supply, delivery at designated stores of NESCO of **ISI MARKED** PVC Service Cable insulated Cable indicated in our Schedule of Requirements for use in the LV network of NESCO.
- 1.2 The materials offered shall have been successfully type tested.
- 1.3 The PVC Cable shall conform in all respects to highest standards of engineering, design, workmanship, this specification and the latest revisions of relevant standards at the time of offer and the Purchaser shall have the power to reject any work or material, which, in his judgment is not in full accordance therewith.
- 1.4 The bidder should be specified the manufacturer / authorized dealer of PVC cables with brand name and submit the type test report.
- 1.5 The bidder shall be specified the manufacturer/ brand name of the cable having valid ISI License on the date of submission of tender.

Requirement

2.5mm²/4.0mm²/6.0mm² size of required for Single phase existing consumers if their when terminate into the LT distribution panel. PVC twin core service wire shall be service cable appeared short in length

2. STANDARDS:

2.1 Except where modified by this specification, the PVC Cable shall be designed, manufactured and tested in accordance with the latest editions of the following standards.

| Indian Standard | Material |
|---------------------------------|-----------------------------|
| IS: 694/1990 | PVC insulated cable |
| IS: 8130/1984 | Conductors for insulated |
| Electric cables. IS: 10810/1984 | Method of Tests for cables. |

Technical Specification of Service Cable

| SI No | Description | Requirement (for 2.5 mm ²) | Requirement (for 4 mm ²) |
|-------|---|--|--|
| | Name of the Manufacturer/ brand name and address | To be specified by the bidder | To be specified by the bidder |
| 01 | Applicable Standard | IS:694, IS: 8130/1984, IS: 10810/1984 | IS:694, IS: 8130/1984, IS:10810/1984 |
| 02 | Voltage grade and type of Cable | 1100V / AYY | 1100V / AYY |
| 03 | Suitable for earthed / un earthed system | Both | Both |
| 04 | Continuous current carrying | | |
| | a) In ground | 25 | 32 |
| | b) In Air | 21 | 27 |
| 05 | Maximum DC Resistance / core at 20° C (Ω/km) | 12.1 | 7.41 |
| 06 | Conductor | | |
| | Material and its composition | H2/H4 grade Aluminum Class-1 (IS-8130/84) | H2/H4 grade Aluminum Class- |
| | Cross-section Area | 2.5 sq. mm | 4 sq. mm |
| | c) no of Strands/Dia of each | 1/1.80 | 1 /2.30 |
| | d) formation of Conductor | Solid Circular | Solid Circular |
| | e) tensile strength | 100 N/ mm ² | 100 N/ mm ² |
| 7 | INSULATION | | |
| | a) Composition of Insulation | PVC Type-A | PVC Type-A |
| | b) Nom. Thickness of Insulation (In mm) | 0.70 | 0.80 |
| | c) Diameter of Over Insulation | 3.2 mm | 3.9 mm |
| | d) Min volume resistivity at 20° C | $1 \times 10^{13} \Omega \cdot \text{CM}$ | $1 \times 10^{13} \Omega \cdot \text{CM}$ |
| | e) Min volume resistivity at 70° C | $1 \times 10^{10} \Omega \cdot \text{CM}$ | $1 \times 10^{10} \Omega \cdot \text{CM}$ |
| | f) Min Elongation(%) at break | 150 | 150 |
| 8 | Methods of core Identification | RED & BLACK | RED & BLACK |
| | OUTER SHEATH | | |
| | a) Materials | PVC Type ST-1 | PVC Type ST-1 |
| | b) Thickness of sheath(mm) | 1.0 | 1.0 |
| | c) Min. Tensile Strength | 12.5 N/ mm ² | 12.5 N/ mm ² |
| | d) Min elongation at Break | 150 | 150 |
| 10 | Conductor temp. corresponding to continuous current (° C) | 70 | 70 |
| 11 | Packing Length of Cable | | |
| 12 | Other relevant particulars | Embossing on outer sheath will be done as per IS: 694/90 along with ISI mark and meter | Embossing on outer sheath will be done as per IS: 694/90 along with ISI mark and |
| 13 | High Voltage Test | 3 kv rms for 5 minute | 3 kv rms for 5 minute |

| | | | |
|-----|-------------|---|---|
| 14` | Other Tests | As per IS: 694, IS: 10810 | As per IS: 694, IS: 10810 |
| 15 | Drum length | To be supplied in drum/bobbin of 500 mtr length | To be supplied in drum/bobbin of 500 mtr length |

3. TESTS:

3.1 Routine Tests

The following measurement or tests shall be carried out on all drums and coils of cable: Conductor resistance. The DC resistance of each conductor shall not exceed the appropriate maximum values specified in IEC: 228/IS: 6474.

3.2 Acceptance Tests (Test before dispatch & will be witnessed by representatives of NESCO Utility. The following sample check, measurements and test shall be carried out under the Acceptance Tests as per IS 694, IS 8130 / 1984. The number of samples to be selected shall depend on the number of coils in the Kit. Sampling for conducting acceptance tests shall be in accordance to clause No.10.2.1 of IS: 14255/1995.

- a) Measurement of insulation wall thickness;
- b) Measurement of diameter of each strand, overall outside dia & Cross Sectional Area of the conducting Part.
- c) Measurement of diameter & cross sectional Area of each strand after entwining.
- d) Tensile strength of individual wires of conductor
- e) Wrapping test
- f) Breaking load test for Conductor.
- g) Elongation test for conductor.
- h) Conductor resistance test
- I) Insulation resistance test
- j) Tensile strength and elongation at break test.

These tests should be carried out on one length from each production batch of the same sample.

TECHNICAL SPECIFICATION OF 8 SWG GI WIRE

1. SCOPE

This specification covers manufacture, testing and supply of hot dip galvanized MS solid wire of size 8 SWG (4 MM) diameters.

2. APPLICABLE STANDARDS ZINC

Zinc shall conform to grade Zen 98 specified in IS 209& IS: 4826-1979 with up to date amendments.

ZINC COATING

Zinc coating shall be in accordance with IS: 4826-1979 for heavily coated hard quality.

GALVANISING

Galvanizing shall be as per IS: 2629-1966, IS 4826-1979 with up to date amendments

UNIFORMITY OF ZINC COATING

Uniformity of zinc coating shall be as per IS: 2633-1972 with up to date amendments

TENSILE PROPERTIES

The tensile strength of the wire after galvanizing shall be between 55-95 Kg/sq.mm ensuring MS wire mechanical properties as per IS-28:1972 8.1 to 8.3 **FREEDOM FROM DEFECTS**
As per IS: 2629-1966 & 4826-1979 & with up to date amendments be ensured

3. MATERIAL

The mild steel wire shall have chemical composition maximum sulphur- 0.055%, phosphorous -0.055%, Carbon 0.25%.

4. TESTS

During the process of manufacturer/fabrication and all tests for chemical, mechanical, galvanizing as per IS- 280-1979, IS1521-1972, IS-1755-1961, IS: 6745-1972 & 4826-1979 shall be carried out. The certificate towards, chemical composition shall be submitted for each lot offered for inspection.

The following tests shall be conducted in presence of the representative of the purchaser: Visual physical inspection and measurement of specified dimension Coating test as per IS: 1755-1961, IS 2629-1966, IS: 2633-1972, IS:4826-1969

Adhesion test as per IS: 1755-1961, IS: 2629-1966, IS: 2633-1972, IS: 4826-1969, & IS:6745-1972.
Tensile strength and breaking load and elongation determined as per IS: 1521-1972 with up to date amendments.

Guaranteed Technical Particulars for No. 8 G.I. wire

| Sl. | GENERAL TECHNICAL PARTICULARS | Guaranteed | Bidders Offer |
|-----|--|--|---------------|
| No. | | Value | |
| 1 | Nominal diameter of wire in mm | 4.06 mm | |
| 2 | Tolerance in diameter in mm | + 2.5% | |
| 3 | Sectional Area (in Sq. mm.) | 12.9462 | |
| 4 | Tensile strength of wire in N/mm ² / MPa | 550-900 | |
| 5 | Minimum breaking load (KN) | 8.79 | |
| 6 | Variety Hard/Soft | Soft | |
| 7 | Type of Galvanizing | Hot dip | |
| | | heavy coating | |
| 8 | Weight of Zinc coating (Gms/Sq. Mtr.) | 290 | |
| 9 | No. of dips the coating is able to withstand as 18 ± | 3 dip in Min | |
| 10 | Adhesion Test (Wrap Test at 1 turn per second coiling while stress not exceeding % nominal tensile strength) | To be specified by bidder | |
| | ii) Min. complete turn of wrap | do | |
| | ii) Dia of mandrel on which wrapped | do | |
| 11 | Bend Test | do | |
| | iii) Angle | do | |
| | iv) Dia round a format to be bent | do | |
| 12 | Freedom from defect | do | |
| 13 | Chemical composition the MS Wire used shall not | do | |
| | iii) Sulphur 0.060% | do | |
| | iv) Phosphorous 0.065% | do | |
| 14 | Weight of wire in Kg/Km | 103 | |
| 15 | Tolerance in wt. | + 5% | |
| 16 | Standard according to which the solid wire is manufactured and tested | IS: 280/1978 , IS: 4826/1979 , IS: 7887/1975 | |

LT XLPE /PVC Cable

1. SCOPE:

This specification covers the design, manufacturing, testing, supply, delivery and performance requirements of LV XLPE/PVC cable 1.1 KV grade as indicated in our Schedule of requirements for use in the LT network of size 3 ½ core / 4 core 10mm²/16mm²/25mm².

The materials offered shall have been successfully type tested and the design shall have been in satisfactory operation for a period of not less than one year on the date of bid opening. Compliance shall be demonstrated by submitting with the bid

(i) authenticated copies of the type test reports and (ii) performance certificates from the users.

However where the bidder offers similar but not identical material but higher size to that which has been type tested, the difference shall be stated in Test Certificate Schedule. The purchaser shall adjudge whether to accept or reject the offered material and type test data presented.

The scope of supply includes the provision of type tests. Rates for type tests shall be given in the appropriate price schedule of the bidding document and shall be considered for evaluation. The purchaser reserves the right to waive type tests as indicated in the section on Quality Assurance, Inspection and Testing in this specification.

The LT XLPE /PVC Cable shall conform in all respects to highest standards of engineering, design, workmanship, this specification and the latest revisions of relevant standards at the time of offer and the Purchaser shall have the power to reject any work or material, which, in his judgment is not in full accordance therewith.

Requirement : 3 ½ core / 4 core 10mm²/16mm²/25mm² size of XLPE / PVC cable shall be required for three phase existing consumers if their service cable appeared short in length when terminate into the LT distribution panel .

2. STANDARDS:

Except where modified by this specification, the LV Cable shall be designed, manufactured and tested in accordance with the latest editions of the following standards.

| IEC/ISO | Indian Standard | Material |
|-----------|---------------------|--|
| IEC: 1089 | IS:398/1994 | Round wire concentric lay Overhead electrical Stranded Conductors. |
| | IS:398(Part-4)/1994 | All Aluminum Alloy Conductors, Quality Management Systems. |
| ISO:9000 | IS:8130/1984 | Conductors for insulated Electric cables. |
| | IS:10810/1984 | Method of Tests for cables. |
| IEC:502 | IS:7098/1988 | XLPE Insulated PVC. Sheathed power cables.. |

The Bidder may propose alternative standards, provided it is demonstrated that they give a degree of quality and performance equivalent to or better than the referenced standards. The purchaser shall adjudge whether to accept or reject any standards. In case of conflict the order of the precedence shall be (1) IEC or ISO standards, (2) Indian Standards, (3) Other alternative standards. This list is not to be considered exhaustive and reference to a particular standard or recommendation in this specification does not relieve the Manufacturer or the necessity of providing the goods complying with other relevant standards or recommendation.

3. SERVICE CONDITIONS:

The service conditions shall be as follows:

- Maximum altitude above sea level 500m
- Maximum ambient air temperature 50⁰C
- Maximum daily average ambient air temperature 35⁰C
- Maximum ambient air temperature 5⁰C
- Maximum temperature attainable by an object exposed to sun 60⁰C
- Maximum yearly weighted average ambient temperature 32⁰C
- Maximum relative humidity 100%
- Average number of thunderstorm days per annum 70
- Average number of rainy days per annum 120
- Average annual rainfall 150cm
- Wind pressure as per IS:5613(Part-I/Sec.I) 1985

| Wind Zones IS:5613 Part-I/Sec-I | Light | Medium | Heavy |
|------------------------------------|-----------------------|-----------------------|-----------------------|
| Terrain Category | 100 Kg/m ² | 150 Kg/m ² | 200 Kg/m ² |

Environmentally, the region where the work will take place includes coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for outdoor insulators

Therefore, outdoor material shall be designed and protected for use in exposed, heavily polluted salty corrosive and humid coastal atmosphere.

4. SYSTEM CONDITIONS:

The materials shall be suitable for installation in supply systems of the following characteristics.

| | |
|---|-----------------|
| Frequency | 50Hz |
| Nominal System Voltage | 400/230V |
| Maximum System Voltage LV System | 440/250 V |
| Minimum LV Voltage | 370 V |
| Power frequency one minute withstand (set & dry) | 2KV |
| Neutral Earthing arrangement LV System | Solidly earthed |

5. GENERAL/ TECHNICAL

The LT Cable shall be of heavy duty, stranded circular Aluminum Conductor, Cross linked Polyethylene (XLPE) insulated provided with extruded PVC outer sheathed & unarmored cable.

6. CONDUCTORS:

The conductor shall be of round stranded aluminum of compacted circular cross- section as stipulated in Table 2 under clause5 of IS 8130. The aluminum shall comply with IS 8130

7. UN-ARMOURING :

Cable size 3 ½ C 10mm²/16mm²/25mm² mm² shall be unarmoured and the balance sizes shall be with armoured

8. OUTER SHEATH :

The Outer Sheaths shall be applied over the armouring. Minimum thickness of PVC outer sheath shall confirm to the requirement of IS 7098/ 1988.

9. INSULATION MARKING / EMBOSSING :

Each individual cable comprising a bundle shall have the markings on insulation at 1 mtr intervals listed below :-

- Purchaser's Name : NESCO Utility
- Manufacturer's trademark :
- Year of manufacture :
- Designation of Cable Type :
- Size of Cable :

The height of printed lettering shall be not less than 20% of the over all diameter of the conductor

10. CABLE DRUM LENGTH:

The cable shall be supplied in 250mtr Drum Lengths.

11. TESTS:

11.1 Type Tests

The bidder should submit copies of the type test reports of similar size or higher size of cable from any NABL accredited laboratory.

11.2 Routine Tests

The following measurement or tests shall be carried out on all drums and coils of Bunched cable:

- Conductor resistance
- Voltage test.

The conductor to be tested for conductor resistance shall be stored for at least 12 hours in a room at particular constant temperature. If it can not be established that the conductors have reached the room temperature, the test should be postponed for a period of further 12 hours. Alternatively, the test can be carried out on short sample after remaining one hour in a temperature controlled water bath. The test shall be carried out and the conversion

factors used to convert the resistance value to a base of 200⁰C and one Km. The DC resistance of each conductor shall not exceed the appropriate maximum values specified in IEC:228/IS:6474.

The voltage test shall be conducted by applying to each core 3.5KV AC (2.5 U₀ plus 2 KV) or 8.4 KV DC for 5 minutes with the specimen lying in a water bath at ambient temperature. The conductor shall pass the test if no electrical breakdown occurs.

11.3 Acceptance Tests

The following sample check, measurements and test shall be carried out Measurement of insulation wall thickness;

- Measurement of diameter of each strand, overall outside dia & Cross Sectional Area of the conducting Part in compacted condition.
- Measurement of diameter & cross sectional Area of each strand after entwining.
- Thermal expansion test;
- Check of physical characteristics
- Tensile strength of individual wires of conductor.
- Wrapping test
- Conductor resistance test
- Hot set test for insulation
- Tensile strength and elongation at break test for insulation and seat.
- Insulation resistance (volume resistivity) test.

This test should be carried out on one length form each production batch of the same sample.

The thickness of the insulation wall shall be measured on a piece removed from each end of the sample length. If either means or minimum values are not met, two further samples shall be removed at 0.5m from the end corresponding to the failed specimen. If these samples do not satisfy the mean and minimum thickness requirements, the test shall be deemed to have been failed.

The longitudinal projections used for phase identifications shall be ignored. The thermal expansion test need only be carried out on one core.

In relation to the tensile test, the tensile strength of the aluminum wires before stranding and that of the finished conductor shall comply with IEC:1089.

12. Stipulations for installation of Electric Vehicle Charging Stations:

Plug-in highbred electric vehicle (PHEV) & Battery Electric Vehicle (BEV)

The type of PEV purchased will determine the way people charge their vehicles. Homeowners may plug their vehicles into a conventional 120- volt household outlet or install a 240-volt circuit for faster charging.

PEVs come with a 120-volt charging cord that enables owners to charge their vehicle with a conventional outlet (Level 1 charging). This is a very practical solution for owners of plug-in hybrid electric vehicles (PHEVs), such as a Toyota Plug-in Prius or Chevrolet Volt.

A person who purchases a battery electric vehicle (BEV), such as the Nissan Leaf, may choose to use a Level 2 charging station. Level 2 chargers use 240 volts and cut the charging time by about one-half compared with 120 volt charging. Level 2 charging generally requires installation of a dedicated circuit and a charging station at your home (usually in the garage). In this case, the homeowner will be required to obtain a permit from their local jurisdiction.

Residential Electric Vehicle Supply Equipment

(EVSE) Permits

The following are submittal requirements to obtain a permit for a typical EVSE residential installation.

| Supporting Documentation | Description |
|------------------------------|--|
| Plot Plan | Identify the complete layout of existing parking spaces and proposed location of EVSE parking space(s) with respect to existing building and structures |
| Electrical Load Calculations | Home electrical load calculation that estimates if an existing electrical service will handle the extra load from residential EVSE and wiring methods based on the California Electrical Code (see sample electrical plan) |
| Electrical Plans | Single-line diagrams showing the system, point of connection to the power supply and the EVSE |
| EVSE Information | The EVSE manufacturer's installation instructions and charger specifications |

(Note: Jurisdictions may need to modify this list to reflect their specific requirements)

In most cases, homeowners or contractors simply need to submit the documentation outlined above to the local permitting office (usually the building and safety division) for review and permit issuance. PEV owners and contractors are encouraged to check their local jurisdiction's permitting website to see if this process is available online. If not, they will likely need to visit the permitting office for an over-the-counter review and permit issuance.

If all of the information is provided and the proposal complies with the applicable codes, the review and approval process occurs shortly thereafter. It is important to note that load calculations per California Electrical Code (CEC), Article 220, are required if the existing service panel is rated less than 200 amps. Electrical panel upgrades and electrical wiring must be in conformance with the current edition of the CEC.

Commercial EVSE Permits

Installation of EVSE at commercial locations can be more complex than residential installations and may require additional permits or submittal documentation. The following are considerations for commercial EVSE

- ✓ Zoning Requirements
- ✓ Community or Design Guidelines
- ✓ Existing Use Permits
- ✓ Electrical Source/Metering
- ✓ Parking and Signage Requirements
- ✓ Permit and Inspection Fees

A simple commercial EVSE installation may have similar permitting requirements as a residential installation with the addition of a tenant improvement electrical permit. A more complex commercial installation may require a modification to an existing use permit or site plan addressing specific

community or zoning design criteria. It is important to meet with staff at the jurisdiction's building department and, if necessary, planning department, to understand fully all of the requirements and fees prior to submitting permits.

Residential Installations

Installing residential EVSE may require changes to the home's electrical wiring and prompt selecting different utility electricity rates.

- For a step-by-step installation guideline, view the attached *Plug-in and Get Ready* document. For more information on PEV charging stations currently available on the market, visit www.GoElectricDrive.com.

Commercial Installations

Commercial EVSE installations are often specific to the location and the proposed use. It is advisable to consult the permitting and/or planning agency before breaking ground.

When installing a home or commercial charging station, property owners are encouraged to choose a local electrical contractor with the proper expertise, information, tools and training for installing EVSE to ensure a high-quality and efficient installation experience. The wiring methods should be adapted based on the California Electrical Code.

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE) INSPECTION CHECKLIST

INSPECTION CHECKLIST (non-inclusive)

| Item | Inspection Activity | Code Reference | Comments |
|------|--|--|----------|
| 1. | Verify permit is posted and all plans, calculations and installation instructions are available as required. May require use of examples in NEC Chapter 9. A calculation may be required to determine adequate capacity. | Local Regulations and NEC 90.8, 220.12, 220.14, 220.16, 220.82 | |
| 2. | Verify that the EVSE is listed by an NRTL and installation instructions are provided. | NEC 90.7, 625.5, 110.3(8) | |
| 3. | Verify the EVSE location and that it is securely fastened to the structure and guarded from physical damage as required. | NEC 110.13, 110.27(8), 625.29, 625.30 | |
| 4. | Determine if EVSE is directly wired to the branch circuit or is cord-and-plug connected. Must be listed for cord-and-plug connection. Individual receptacle reqd. | NEC 110.3(8), 625.13, 625.18, 625.19, 625.29 | |
| 5. | Verify an individual branch circuit is installed for the EVSE. Applies to Level 1, Level 2, and fast chargers. Branch circuit and feeders (if applicable) must be sized 125% of nameplate current. | NEC Article 100 continuous load, 210.19(A)(1), 215.2(A), 625.21 | |
| 6. | Verify installed branch circuit wiring method is listed and securely fastened to the structure. Listed wiring and fittings must be installed. Check fished and surface wiring. | NEC 300.11 and the applicable .30 section of article | |
| 7. | Verify the size of the branch circuit overcurrent protection is per nameplate and protects the conductors. | NEC 110.3(8), 240.4 | |
| 8. | Verify circuit conductors are sized not less than 125% of EVSE nameplate current. Be sure that the conductor ampacity complies with the rating of the overcurrent protection. | NEC 210.19(A)(1), 215.2(A), 110.3(8), Table 310.15(B)(16), 310.15(8). | |
| 9. | Verify properly sized equipment grounding conductor is installed with the branch circuit and connected at the EVSE and to panelboard or service. Verify the equipment grounding conductor is identified. | NEC 250.110, 250.112, 250.114, 250.120, 300.3(8), 250.119, 250.122. | |
| 10. | Check the electrical connections of the circuit conductors and equipment grounding conductor connections. | NEC 110.14, 250.148(A) Annex I | |
| 11. | Verify disconnecting means is provided and properly located for EVSE rated greater than 60 amperes and 150 volts. | NEC 625.23 | |
| 12. | Verify installation of EVSE is in a neat and workmanlike manner. | NEC 110.12, NECA 1, NECA 413 | |
| 13. | Verify existing service conductors are of adequate size. For Level 2 EVSE installations, identify any existing service conductor sizes that might have been installed using NEC 310.15(8)(7) and Table 310.15(8)(7) | NEC 230.31, 230.42, 310.15(8)(7) and Table 310.15(8)(7) | |

| | | | |
|-----|---|--|--|
| 14. | Verify circuit breaker compatibility with existing panelboard or service equipment. Must be manufactured by the panelboard or service equipment manufacturer. | NEC 110.3(8), Article 240 Part VII, Article 408 part I | |
| 15. | Branch circuit device and any disconnects must be identified as to the use. | NEC 408.4(A), 110.22(A) | |
| 16. | Where separate utility metering and enclosures are installed, verify NEC compliance for service equipment and conformance to applicable utility regulations. | Utility company regulations and NEC Article 230 | |
| 17. | Verify equipment is suitable for connection to the line side of the service disconnecting means. | NEC 230.82 | |
| 18. | Verify sufficient working space is provided at EVSE, Panelboards, service equipment, and disconnects. | NEC 110.26 | |
| 19. | Verify additional service disconnects (if installed) are grouped. | NEC 230.72 | |
| 20. | Verify the maximum number of service disconnects has not been exceeded | NEC 230.71 | |
| 21. | Verify that any additional service disconnect is properly rated. | NEC 230.79 | |
| 22. | Verify the wiring method used for the additional service conductors installed. | NEC 230.43 | |
| 23. | Verify that additional service disconnects are properly identified. | NEC 230.70(8) | |
| 24. | Verify service disconnect is listed as suitable for use as service equipment. | NEC 230.70(C) | |
| 25. | Verify the overcurrent protection for any newly installed service equipment and conductors. | NEC 230.90, 230.91 | |
| 26. | Verify grounded conductor (neutral) is brought to the service disconnect and bonded to the enclosure. | NEC 250.24(C) | |
| 27. | Verify metal service equipment enclosures and raceways are bonded together effectively. | NEC 250.92, 250.92(8) | |
| 28. | Supply-side bonding jumpers are sized properly | NEC 250.102(C), 250.66 | |
| 29. | Verify existing service grounding and bonding. | NEC 250.50, 250.104(A) and (B) | |
| 30. | Verify EVSE that is intended to be used as interactive systems, bi-directional, or optional standby systems be listed for that purpose. | NECA Articles 702 and 705 | |

** Note: These items included in the checklist are non-inclusive and are to serve as a guide or basis for inspection. They do not include any local Code requirements or regulations.*

OTHER HELPFUL INFORMATION FOR EV CHARGER INSTALLATIONS:

The Table below illustrates the type and size of wire and conduit to be used for various Electric Vehicle Charger circuits.

| Size of EV Charger Circuit Breaker | Required minimum size of Conductors (THHN wire) | Conduit Type and Size*** | | |
|------------------------------------|---|----------------------------------|---|------------------------------|
| | | Electrical Metallic Tubing (EMT) | Rigid Nonmetallic Conduit – Schedule 40 (RNC) | Flexible Metal Conduit (FMC) |
| 20 amp | #12 | 1/2" | 1/2" | 1/2" |
| 30 amp | #12 | 1/2" | 1/2" | 1/2" |
| 40 amp | #10 | 1/2" | 1/2" | 1/2" |
| 50 amp | #8 | 3/4" | 3/4" | 3/4" |
| 60 amp | #6 | 3/4" | 3/4" | 3/4" |
| 70 amp | #6 | 3/4" | 3/4" | 3/4" |

****Based on 4 wires in the conduit (2-current carrying conductors, 1-grounded conductor, 1-equipment ground).*

As an alternate, Nonmetallic Sheathed Cable (aka: Romex Cable or NMC) may be used if it is protected from physical damage by placing the cable inside a wall cavity or attic space which is separated from the occupied space by drywall or plywood.

The Table below illustrates the required supports for various types of electrical conduit or cable.

| Conduit Support | Electrical Metallic Tubing (EMT) | Rigid Nonmetallic Conduit – Schedule 40 (RNC) | Flexible Metal Conduit (FMC) | Nonmetallic Sheathed Cable (NMC) |
|--|----------------------------------|---|------------------------------|----------------------------------|
| Conduit Support Intervals | 10' | 3' | 4-1/2' | 4-1/2' |
| Maximum distance from box to conduit support | 3' | 3' | 1' | 1' |

In addition to the above noted requirements, the California Electrical Code contains many other provisions that may be applicable to the installation of a new electrical circuit. Installers are cautioned to be aware of all applicable requirements before beginning the installation. For additional information or guidance, consult with the Building and Safety Division staff or a qualified and experienced Electrical Contractor.