Sl. No.	Description of parameter in SBD	Specified Value in SBD
	Item Particulars	3 x 120 mm^2 + 1X95 mm^2
1.0	**GENERAL:**	
1.1	Brand Name or Trade Mark	
1.2	Name & Address of Manufacturer	
1.3	Reference Standard	Gen. to IS: 7098/II/2011 &Gen. to IS:398-4
1.4	Rated voltage	6.35/11 KV
1.5	Max. Voltage	12(KV)
2.0	**PHASE CONDUCTOR:**	
2.1	Material	Aluminium to IS 8130
2.2	Class	Class 2
2.3	Shape of conductor	Stranded Compacted circular
2.4	Nominal cross section area (mm Sq.)	120
2.5	Approximate dia. of conductor (mm)	12.8
2.6	Min. no. of wires	15
2.7	Max. d.c. resistance at 20 DegC(Ohm/km)	0.253
3.0	**CONDUCTOR SCREENING:**	
3.1	Material	Extruded semi conducting compound
3.2	Minimum thickness (mm)	0.5
4.0	**INSULATION**	
4.1	Material	XLPE to IS 7098/II/2011(Dry Cured)
4.2	Nominal thickness (mm)	3.6
5.0	**INSULATION SCREENING:**	
5.1	Material 1) Non Metallic	Extruded semi conducting compound
	2) Metallic	Plain Copper tape
5.2	Thickness (mm) 1) Non Metallic	0.6(Min.)
	2) Metallic (mm)	0.035 (Approx.)
6.0	**Outer Sheath**	
6.1	Material	Extruded PE Type ST-3 of IEC : 60502-2 (Black Colour)
6.2	Nominal thickness (mm)	2
6.3	Approx. dia.over sheath(mm)	27
7.0	**MESSENGER WIRE :**	
7.1	Material & its applicable standard	Bare Aluminium alloy Gen. to IS 398 (Pt-4)

Sl. No.	Description of parameter in SBD	Specified Value in SBD
	Item Particulars	3 x 120 mm^2 + 1X95 mm^2
7.2	Shape of conductor	Stranded compacted circular
7.3	Nominal cross section area (mm Sq.)	95
7.4	No of strands in conductor	7
7.5	Approx.dia. of conductor (mm)	12.0
7.6	DC resistance at 20° C (Ohm/Km) Max.	0.356
7.7	Approx. breaking load (KN)	27.9
7.8	Approx. mass (Kg/km)	
7.9	Modulus of Elasticity KG/Sqcm	
7.10	Coeefficient of linear expansion	
8.0	Identification of Power Core	By Ridges over sheath (1,2 & 3 ridges) & Colour strip Red,Yellow&Blue under copper tape
9	Laying up of Power Core and with Aluminium Alloy Messenger wire	3 power cores laid up around Bar Aluminium alloy messenger wire
10	Standard length of cable in each drum in meter Tolerance on drum length (metres)	500 +/- 5%
11	Cable Identification/Embossing (On Each phase over sheath)	Name of manuf.and /or Trade Name , Size(Sq.mm) ,Voltage grade,Year of manufacture
12	Max. contineous current in Air (Amp)	
13	Max. short ckt current rating of Conductor for 1 sec (KA)	
14	Overall dia of cable (Approx.) mm	

Sl. No.	Description of parameter in SBD	Specified Value in SBD
	Item Particulars	3 x 50 mm^2 + 1X70 mm^2
1.0	**GENERAL:**	
1.1	Brand Name or Trade Mark	
1.2	Name & Address of Manufacturer	
1.3	Reference Standard	Gen. to IS: 7098/II/2011 &Gen. to IS:398-4
1.4	Rated voltage	6.35/11 KV
1.5	Max. Voltage	12(KV)
2.0	**PHASE CONDUCTOR:**	
2.1	Material	Aluminium to IS 8130
2.2	Class	Class 2
2.3	Shape of conductor	Stranded Compacted circular
2.4	Nominal cross section area (mm Sq.)	50
2.5	Approximate dia. of conductor (mm)	7.9
2.6	Min. no. of wires	6
2.7	Max. d.c. resistance at 20 DegC(Ohm/km)	0.641
3.0	**CONDUCTOR SCREENING:**	
3.1	Material	Extruded semi conducting compound
3.2	Minimum thickness (mm)	0.5
4.0	**INSULATION**	
4.1	Material	XLPE to IS 7098/II/2011(Dry Cured)
4.2	Nominal thickness (mm)	3.6
5.0	**INSULATION SCREENING:**	
5.1	Material 1) Non Metallic	Extruded semi conducting compound
	2) Metallic	Plain Copper tape
5.2	Thickness (mm) 1) Non Metallic	0.6(Min.)
	2) Metallic (mm)	0.035 (Approx.)
6.0	**Outer Sheath**	
6.1	Material	Extruded PE Type ST-3 of IEC : 60502-2 (Black Colour)
6.2	Nominal thickness (mm)	2
6.3	Approx. dia.over sheath(mm)	22.5
7.0	**MESSENGER WIRE :**	
7.1	Material & its applicable standard	Bare Aluminium alloy Gen. to IS 398 (Pt-4)
7.2	Shape of conductor	Stranded compacted circular

Sl. No.	Description of parameter in SBD	Specified Value in SBD
	Item Particulars	3 x 50 mm^2 + 1X70 mm^2
7.3	Nominal cross section area (mm Sq.)	70
7.4	No of strands in conductor	7
7.5	Approx.dia. of conductor (mm)	10.0
7.6	DC resistance at 20° C (Ohm/Km) Max.	0.492
7.7	Approx. breaking load (KN)	20
7.8	Approx. mass (Kg/km)	
7.9	Modulus of Elasticity KG/Sqcm	
7.10	Coeefficient of linear expansion	
8.0	Identification of Power Core	By Ridges over sheath (1,2 & 3 ridges) & Colour strip Red,Yellow&Blue under copper tape
9	Laying up of Power Core and with AAAC Messenger wire	3 power cores laid up around Bare Aluminium alloy messenger wire
10	Standard length of cable in each drum in meter Tolerance on drum length (metres)	500 +/- 5%
11	Cable Identification/Embossing(On Each phase over sheath)	
12	Max. contineous current in Air (Amp)	
13	Max. short ckt current rating of Conductor for 1 sec (KA)	
14	Overall dia of cable (Approx.) mm	

2. **APPLICABLE STANDARDS:**

The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with the latest editions of the following Indian, International Standards and shall conform to the regulations of the local Statutory authorities:

- IS:4984-1995: Specification for High Density Polyethylene Pipe with latest amendment.

4. GENERAL TECHNICAL REQUIREMENTS

A) FOR HDPE PIPE 160MM DIA

Sl. No.	Item Description	Unit	Requirement
1	M.F.R. (190°C, 5kg load)	gm/10 mins	0.20 to 1.10
2	Specified base density	kg/mtr^3	940 to 958
3	Material Grade		PE-63
4	Wall Thickness	Mm	7.7 - 8.7
5	Carbon Black	%	2.5 ± 0.5
6	Antioxidant	% by mass	<0.3% by mass
7	Overall Migration	Mg/dm^2	10 Max
8	Reversion	%	<=3%
9	Hydraulic Characteristics		No sign of localized swelling, leakage or weeping (at 80°C for 48 & 165 hrs.)
10	Continuous Temperature withstand capacity	°C	120

B) FOR HDPE PIPE 125 MM DIA

Sl. No.	Item Description	Unit	Requirement
1	M.F.R. (190°C, 5kg load)	gm/10 mins	0.20 to 1.10
2	Specified base density	kg/mtr^3	940 to 958
3	Material Grade		PE-80
4	Wall Thickness	mm	4.9 - 5.6
5	Carbon Black	%	2.5 ± 0.5
6	Antioxidant	% by mass	<0.3% by mass
7	Overall Migration	Mg/dm²	10 Max
8	Reversion	%	<=3%
9	Hydraulic Characteristics		No sign of localized swelling, leakage or weeping (at 80°C for 48 & 165 hrs.)
10	Continuous Temperature withstand capacity	°C	110

C) FOR HDPE PIPE 200 MM DIA

Sl. No.	Item Description	Unit	Requirement	
			PN 4	PN 6
1	M.F.R. (190°C, 5kg load)	gm/10 mins	0.20 to 1.10	0.20 to 1.10
2	Specified base density	kg/mtr^3	940 to 958	940 to 958
3	Material Grade		PE-63	PE-63
4	Wall Thickness	mm	9.6-10.8	14 - 15.6
5	Carbon Black	%	2.5 ± 0.5	2.5 ± 0.5
6	Antioxidant	% by mass	<0.3% by mass	<0.3% by mass
7	Overall Migration	Mg/dm²	10 Max	10 Max
8	Reversion	%	<=3%	<=3%
9	Hydraulic Characteristics		No sign of localized swelling, leakage or weeping (at 80°C for 48 & 165 hrs.)	No sign of localized swelling, leakage or weeping (at 80°C for 48 & 165 hrs.)
10	Continuous Temperature withstand capacity	°C	110	110

D) FOR HDPE PIPE 140 MM DIA

Sl. No.	Item Description	Unit	Requirement
1	M.F.R. (190°C, 5kg load)	gm/10 mins	0.20 to 1.1
2	Specified base density	kg/mtr^3	940 to 958
3	Material Grade		PE-80
4	Wall Thickness	mm	8 - 9
5	Carbon Black	%	2.5 ± 0.5
6	Antioxidant	% by mass	<0.3% by mass
7	Overall Migration	Mg/dm^2	10 Max
8	Reversion	%	<=3%
9	Hydraulic Characteristics		No sign of localized swelling, leakage or weeping (at 80°C for 48 & 165 hrs.)
10	Continuous Temperature withstand capacity	°C	120

5. GENERAL CONSTRUCTIONS FOR HDPE PIPE

High-density polyethylene (HDPE) is a polyethylene thermoplastic made from petroleum. Known for its large strength to density ratio, HDPE is commonly used in the production of corrosion-resistant piping. The HDPE pipes required in size 125 mm dia. of material grade PE-80 and pressure rating is PN 4, in size 160 mm dia. of material grade PE-63 and pressure rating is PN 4 and in size 200 mm dia. of material grade PE-63 and pressure rating is PN 4 & PN 6. The HDPE pipes required in size 140 mm dia. Of material grade PE-80 and pressure rating is PN 6. The HDPE pipe material should be Fire Retardant or non-Flammable. All HDPE pipe Color should be Black.

7. TESTS

All routine, acceptance & type tests shall be carried out in accordance with the relevant IS. All Routine /acceptance tests shall be witnessed by the purchaser/his authorized representative.

TYPE TEST:

The following tests shall constitute the type tests and shall be carried out as per relevant IS: 4984-1995.with latest Amendment.

- Avg. Outer Diameter.
- Wall thickness.
- Measurement of Ovality.
- Heat Reversion.
- M.F.R. at 190 Degree C.
- Carbon Black Content.

- Carbon Dispersion.
- Density at 27 Degree C.
- Overall Migration.
- Hydraulic Characteristics.

ROUTINE/ACCEPTANCE TEST:

The following tests shall be got conducted in presence of purchaser representative as per relevant IS: 4984-1995.with latest Amendment on the samples taken from the offered lot material for the purpose of acceptance of that lot of material.

- Avg. Outer Diameter.
- Wall thickness.
- Measurement of Ovality.
- Heat Reversion.
- M.F.R. at 190 Degree C.
- Carbon Black Content.
- Carbon Dispersion.
- Density at 27 Degree C.
- Overall Migration.
- Hydraulic Characteristics.

1. SCOPE:

This specification covers the technical requirements of design, manufacture, test at manufacturer's works, packing & forwarding, supply at stores/ site, unloading at our stores/ site of Cable trays and Cabling accessories for efficient and trouble free operation.

2. APPLICABLE STANDARDS:-

The equipment shall conform to latest relevant applicable Indian Standards. Equipment's complying with any authoritative standards such as British, U.S.A., V.D.E. IEC etc. will also be considered if it assures performance equivalent to or superior to standards listed below. In such cases, bidder shall clearly indicate the latest standard / standards adopted and furnish a copy of the English version / translation of the same. Should there be any dispute of design, standard the most stringent shall be followed:-

IS-2629	Hot dip Galvanising for cable trays
IS-2148	Brass glands for PVC cables
IS-12943	Flame proof enclosures of Electrical apparatus
IS-8309	Compression type tubular terminal ends
IS-9537	Rifid steel conduits
IS-3837	Accessories for rigid steel conduits
IS-2667	Fittings for rigid non-metallic conduits
IS-3480	Flexible steel conduits
IS-4649	Adapters for flexible steel conduits
IS-1239	Mild steel tubes
	Indian Electricity Rules
	The Electricity Act 2003

The design, manufacture and performance of the equipment and services provided under this specification shall comply with the standards, rules, regulations and acts given in this specification.

4. GENERAL TECHNICAL REQUIREMENTS:

This specification covers Design, Engineering, Manufacturing, Testing, Packing at manufacturer's works and Delivery of Cable trays and accessories suitable for installation of cables in air, conduits, ducts; open concrete trenches, for direct burial in either wet, or dry locations for normal operating conditions. The technical details have been mentioned below alongwith the constructional details.

5. GENERAL CONSTRUCTIONS:

All material used in the manufacturing of these equipments shall be new and shall be selected as the best available for the intended use. The equipments covered are as follows :

a) Galvanised steel or MS with Aluminium Alkyd Paint or epoxy paint or Aluminium cable trays (ladder and perforated types), cable tray covers and vertical raceway covers.
b) Cable glands and lugs.
c) Trefoil clamps.
d) GI rigid and flexible conduits and pipes.

5.1 CABLE TRAYS AND ACCESSORIES

5.1.1 Cable trays shall be of Mild Steel with Aluminium Alkyd/Epoxy paint or of Galvanised Steel/Aluminium and of ladder/perforated type, complete with all necessary coupler plates, elbows, tees, bends, reducers, stiffeners and other accessories and hardware. All hardware (i.e. bolts, nuts, screws, washers, etc.) shall be hot dip galvanised.

5.1.2 Each 2.5 metre section of all types of cable trays and all elbows, tees, crosses, etc. shall be provided with two side coupler plates and associated bolts, nuts and washers.

5.2 Covers for Cable Trays and Vertical Raceways

Cable tray covers conforming to the relevant IS shall be provided for cable trays and vertical raceways. Covers for vertical raceways shall be in individual, easily removable sections to facilitate cable maintenance.

5.3 CABLE GLANDS

5.3.1 Cable glands shall be of double compression type. Cable glands shall be of robust construction, capable of clamping the cable and armour rigidly without injury to insulation and provide dust/leak proof termination. These cable glands shall be heavy duty brass casting, machine finished and tinned to avoid corrosion and oxidation. Rubber components used in cable glands shall be of neoprene and of tested quality. The maximum and minimum overall diameter and diameter under armour of the cable shall be furnished to the successful bidder. Cable sizes shall be marked on the cable glands for easy identification. Each gland shall comprise the following:

(a) Gland body.

(b) Nipple with cone for clamping armour and neoprene compression ring. Nipple shall have external threads.

(c) Checknut and 2.3 to 3 mm thick neoprene washer.

(d) Metallic compression ring having internal taper to match with armour wire diameter and outside diameter of cone.

(e) Compression nut having internal threads to fix to the nipple body.

(f) Compression nut with neoprene compression ring for outer sheath of cable. Such ring shall have a groove on the outer surface in order to obtain a firm grip on the cable and shall have wide range compression to suit varying sizes of cables.

(g) Single seal cone grip (SSCG) compression glands shall be similar to double seal cone grip type glands except that the neoprene compression ring for the inner sheath of the cable is not provided.

(h) Single seal (SS) compression glands for unarmoured cables shall be similar to item (g) above but without the cone and the clamping ring for armour.

(i) Flame-proof (FP) glands shall be similar to double seal cone grip type glands described above except that construction shall be suitable for installation in hazardous areas and axial length of threads shall be in accordance with the standards specified. Approval certificate of relevant authority on flame-proof apparatus shall be furnished.

5.3.2 Required quantity of cable glands shall be supplied where these are not already provided by the equipment suppliers. Separate unit rates shall be furnished for supply of cable glands suitable for various sizes of cables involved.

5.4 CABLE LUGS

5.4.1 The bidder shall quote unit rates for supply of various types and sizes of cable lugs for the PURCHASER's cables. Equipment supplied by the PURCHASER will normally be provided with suitable cable lugs for power cable connections. The current rating of the lugs shall be same as that of the respective cables. However, where these lugs are not provided the bidder shall supply them to suit PURCHASER's cables. Cable lugs shall be of tinned copper, solderless crimping type of reputed make conforming to relevant standards suitable for aluminium or copper conductor cable connections.

5.5 TREFOIL CLAMPS

The bidder shall supply trefoil clamps suitable for supporting the single core power cables of 3-phase A.C. circuits in trefoil formation. The trefoil clamps shall have a base and two cable clamping pieces hinged to the base . The sizes of trefoil clamps required shall be suitable for the type of cable sizes asked by the PURCHASER.

5.6 CONDUITS AND PIPES WITH ACCESSORIES

5.6.1 The bidder shall supply galvanised steel/coated conduits, galvanised mild steel pipes and flexible conduits required for the cabling work. The sizes of conduits and pipes shall be suitable for the cable sizes asked by the PURCHASER.

5.6.2 The conduits/pipes/flexible conduits and all the other accessories shall conform to the following:

(a) Conduits shall be seamed by welding and shall be hot dip galvanised both inside and outside. Conduits and fittings shall be as per relevant standards.

(b) Pipes shall be of heavy duty type as per relevant standards and shall be hot dip galvanised both inside and outside.

(c) Flexible conduits shall be made with bright, cold rolled, annealed and galvanised mild steel strips. Flexible conduits and adaptors shall be as per relevant standards.

5.7 CABLE ROUTE/JOINT MARKERS

5.7.1 At least, one cable marker shall be provided if the length of the buried cable is less than 15 metres. Buried single core cables laid in trefoil formation shall be tied by plastic tapes or 3 mm dia. nylon cord every 750 mm.

5.7.2 Joints in directly buried cables shall be identified by joint markers at each joint location. In each outdoor cable run greater than 60 metres, some extra cable length shall be kept at a suitable point to enable a straight through joint to be made, should the cable develop fault at a later date.

5.8 CABLE CLEATING

5.8.1 Control cables and small power cables in trenches, tunnels and racks shall be run in ladder type cable trays (maximum tray width 600 mm) supported on trench/ tunnel/rack carrier arms. The cables shall be tied to tray rungs by means of 3 mm dia. nylon cord at an interval not exceeding 5000 mm and also at bends.

5.8.2 Single core power cables for 3 phase AC circuits laid in trays/racks/trenches in tre-foil groups shall be held in trefoil clamps placed at an interval not exceeding 3 metres. The tre-foil groups of cables shall be additionally tied by means of 3 mm dia. nylon cord as follows:

a) At an interval not exceeding 1 metre when laid in cable trays/racks.

b) At an interval not exceeding 750 mm when laid in trenches without cable trays.

5.8.3 Cables in vertical raceways shall be clamped by saddle type cleats to the horizontal slotted angles. Cleats shall be fabricated from 3 mm aluminium strip at site by the bidder to suit cable groups. Single core cables shall be clamped with tre-foil clamps .

5.9 CABLE LAYING FOR DIFFERENT VOLTAGES

5.9.1 DIfferent voltage grade cables shall be laid in separate trays when trays are arranged in tiers. H.V. cables shall be laid in top trays and cables of subsequent voltage grade in lower tier of trays.

5.9.2 The HV power cables of 3.3 kV and above shall be laid in trays/on racks as follows:

a) In single layer only without exception.

b) 3 core cables shall be laid in touching formation.

c) Single core cables shall be laid in tre-foil groups with a spacing equal to diameter of the cable between edges of the trefoils.

d) Cables in trefoil groups of the same circuit shall be laid as indicated below so as to ensure balanced current distribution:

5.9.3 1100V grade power cables of 120 mm^2 size and above shall normally be laid in single layer in trays/on racks. In exceptional cases, these may be laid in double layer, if shown on the drawings or with the permission of the purchaser.

5.9.4 1100V grade power cables below 120 mm^2 may be run in double layers in case of space restrictions. Control and instrumentation cables can be laid upto a maximum of three layers in each tray/rack.

7. TESTS:

All the equipments shall be subjected to routine & acceptance tests in accordance with the relevant standards in addition to physical tests at the Manufacturer's plant in accordance with applicable standards. All the test certificates shall be furnished for the PURCHASER's approval 2 weeks before the date of despatch. All costs of such tests, including replacement of damaged material shall be borne by the Manufacturer.

8. TYPE TEST CERTIFICATES:

Type test certificates for cable glands, lugs, conduits and pipes shall be furnished by the bidder. The type test certificates shall be forwarded within 3 months from the receipt of order . Where the equipment does not conform to any standard, results of any tests carried out on the equipment shall be furnished. Copies of the approved test certificates/results shall be furnished to the PURCHASER within 1 month from the date of despatch of the equipment.

9. PRE-DISPATCH INSPECTION:

The following documents shall be submitted for approval prior to dispatches

Copies of certified test reports
Packing List

10. INSPECTION AFTER RECEIPT AT STORES:

The Material shall be checked as per the detailed list submitted by the vendor and one copy of the receipt list shall be sent to PE Dept.

11. GUARANTEE:

The material shall be guaranteed for satisfactory performance for a period of 12 months from the date of commissioning or 18 months from the date of receipt whichever is earlier. Any supplies found

18. GUARANTEED TECHNICAL PARTICULARS.

S.NO	ITEM	UNIT	PARTICULARS BY BIDDER
1.0	**CABLE TRAYS**		
1.1	Manufacturer's Name		
1.2	Thickness of sheet steel used for tray fabrication	mm	
1.3	Trays are Galvanised	YES/NO	
1.4	Other requirements as per Specification	YES/NO	
2.0	**CABLE GLANDS**		
2.1	COMPRESSION GLANDS		
	(a) Manufacturer's Name		
	(b) Material		
	(c) Type		
	(d) Dimensioned drawings, catalogues, literature enclosed	YES/NO	
2.2	FLAME-PROOF GLANDS		
	(a) Manufacturer's Name		
	(b) Material		
	(c) Type		
	(d) Standard to which conforms		
	(e) Dimensioned drawings, catalogues, literature enclosed	YES/NO	
	(f) Approval certificate of relevant authority enclosed	YES/NO	
3.0	**CABLE LUGS**		
3.1	Manufacturer's Name		
3.2	Material		
3.3	Current Rating		
3.4	Dimensioned drawings, literature enclosed	YES/NO	
3.5	Applicable standard		

4.0 CONDUITS/PIPES

4.1 Metallic / Non-Metallic
Rigid/Flexible

(a)	Manufacturer's Name	
(b)	Material	
(c)	Applicable standards	
(d)	Range of sizes and wall thicknesses	
(e)	Standard length in metres	
(f)	Couplings included	YES/NO
(g)	Dimensioned drawings catalogues, literature enclosed	YES/NO