

Ref. No. 92/DIV/CAB/05

9th October 2019

All Members of Cable Division & All SEBs, Utilities & Listed Purchasing organisations

Sub: Revision in Price Variation Formulae for EHV Power Cables

IEEMA has been discussing internally on evolution of standards weight factors of metals and polymers applicable for EHV Cables for various standard rating and for specific short circuit test requirements.

After compilation of all inputs of factors from major manufacturers, the revised Price Variation Formulae for EHV Cables including conductor and metallic screen factor (Cu tape) have been prepared. The same in the draft form was circulated vide cir. No. 73/DIV/CAB/05 dated 23rd August 2019 for your reviews.

Since there are no adverse comments received; we are making these formulae operational from 1st September 2019. We request and recommend all the users & stakeholders including Utilities, PSUs etc. to incorporate these PV formulae in all the new tenders/contracts.



Director

Encl: Revised PV Formulae for EHV Cables

IEEMA (PVC)/EHV CABLE/2019 (R-1)**Effective from: 1st September 2019****Material Price Variation Clause for XLPE Insulated EHV Cables (66 kV to 500 KV)**

The Price quoted/confirmed is based on the input cost of raw materials/components as on the date of quotation, and the same is deemed to be related to the prices of raw materials as specified in the price variation clause given below. In case of any variation in these prices, the price payable shall be subject to adjustment up or down in accordance with the formulae provided in this document.

Terms used in price variation formulae:

- P Price payable as adjusted in accordance with above appropriate formula **(in Rs/Km)**
 Po Price quoted/confirmed **(in Rs/Km)**

1) Conductor Metal

- MIF Variation factor for Conductor
 MIF2 Price of Respective Conductor Material as below (from a to b); this price is as applicable on Two months prior to the date of delivery.
 MIF1 Price of Respective Conductor Material as below (from a to b); this price is as applicable on One month prior to the date of tendering.

a) ALUMINIUM (Conductor)

- AIF Variation factor for Aluminium
 AI Price of Aluminium; this price is as applicable on Two months prior to the date of delivery.
 Alo Price of Aluminium; this price is as applicable on One month prior to the date of tendering.

b) COPPER (Conductor)

- CuF Variation factor for copper
 Cu Price of CC Copper rods. This price is as applicable on Two months prior to the date of delivery.
 Cuo Price of CC copper rods. This price is as applicable on One month prior to the date of tendering.

2) XLPE Compound

- XL3 Variation factor for XLPE Compound
 XLFAI Variation factor for XLPE Compound for Aluminium Conductor Cable
 XLFCu Variation factor for XLPE Compound for Copper Conductor Cable
 CC Price of XLPE Compound. This price is as applicable on Two months prior to the date of delivery.
 Cco Price of XLPE Compound. This price is as applicable on One month prior to the date of tendering.

3) Polymer Compound

- XL5 Variation factor for Polymer Compound
 CCFAI Variation factor for PE Compound for Aluminium Conductor Cable
 CCFCu Variation factor for PE Compound for Copper Conductor Cable

IEEMA (PVC)/EHV CABLE/2019 (R-1)

Effective from: 1st September 2019

POC Price of Polymer Compound. This price is as applicable on Two months prior to the date of delivery.

POCo Price of Polymer Compound. This price is as applicable on One month prior to the date of tendering.

4) Metallic Screen / Sheath

SMIF Variation factor for Sheath/Screen material

SMIF2 Price of Respective Sheath/Screen Material as below (from a to d); this price is as applicable on Two months prior to the date of delivery.

SMIF1 Price of Respective Sheath/Screen Material as below (from a to d); this price is as applicable on One month prior to the date of tendering.

a) COPPER (Screen) : In Copper Wire Screen + PolyAl Construction

CuFc Variation factor for copper screen

Cu Price of CC copper rods. This price is as applicable on Two months prior to the date of delivery.

Cuo Price of CC copper rods. This price is as applicable on One month prior to the date of tendering.

b) COPPER (Screen) : In Lead Sheath Construction

CuFpb Variation factor for copper screen

Cu Price of CC copper rods. This price is as applicable on Two months prior to the date of delivery.

Cuo Price of CC copper rods. This price is as applicable on One month prior to the date of tendering.

c) LEAD : In Lead Sheath Construction

PbF Variation factor for Lead

Pb Price of Pig lead (99.97%). This price is as applicable on Two months prior to the date of delivery.

Pbo Price of Pig lead (99.97%). This price is as applicable on One month days prior to the date of tendering.

d) Corrugated Aluminium Sheath

AlFs Variation factor for corrugated Aluminium sheath

Al Price of Aluminium. This price is as applicable on Two months prior to the date of delivery.

AlO Price of Aluminium). This price is as applicable on One month prior to the date of tendering.

The above prices and indices are as published by IEEMA vide Circular reference

IEEMA(PVC)/CABLE(R-1)/--/-- prevailing as on 1st working day of the month i.e. one month prior to the date of tendering.

The date of delivery is the date on which the cable is notified as being ready for inspection/dispatch (in the absence of such notification, the date of manufacturer's dispatch note is to be considered as the date of delivery) or the contracted delivery date (including any agreed extension thereto), whichever is earlier.

IEEMA (PVC)/EHV CABLE/2019 (R-1)

Effective from: 1st September 2019

Notes

- All prices of raw materials are exclusive of GST amount.
- All prices excluding Aluminium & Copper are as on first working day of the month.
- The details of prices are as under:
 - Price of Aluminium is LME average Cash SELLER Settlement price of Primary Aluminium in US\$ per MT as published by London Metal Bulletin (LME) including Premium for Aluminium Ingot in US\$ per MT is converted in Indian Rs./MT.
 - Price of CC copper rods (in Rs/MT) is ex-works price as quoted by the primary producer.
 - Price of Pig lead (in Rs/MT) is ex-works price as quoted by the primary producer.
 - Price of Polymer Compound (in Rs/MT) is the ex-work price, as quoted by the manufacturer/s
 - Price of XLPE Compound (in Rs/MT) is the ex-works price, as quoted by the manufacturer/s

PV Formulae

a) For Aluminium /copper Conductor XLPE insulated copper wire screen + polyal PE/PVC sheathed cables

$$P = P_o + MIF (MIF2 - MIF1) + XL3 (CC-Cco) + SMIF (SMIF2-SMIF1) + XL5 (POC - POC_o)$$

Table references:-

Table 1 (MIF) : Aluminium Conductor AIF / Copper Conductor CuF

Table 2 (XL3) : Aluminium Conductor XLFAI / Copper Conductor XLFCu

Table 3a (SMIF) : Copper Wire Screen in Copper Wire Screen + Polyal Construction (CUFc)

Table 4 (XL5) : Aluminium Conductor CCFAl / Copper Conductor CCFCu

Note:

For cases where Short Circuit Current through Screen/Sheath is required & is not available in the Reference Tables, in that case Screen/Sheath area as approved by the customer in Datasheet / Short Circuit Current calculation of Screen/Sheath shall be used to derive SMIF as below:

If A= Area of Metallic Screen/Sheath in Approved Datasheet / Calculation Sheet

D= Density= 8.89 for Cu

$$SMIF=(A*D)/1000$$

b) For Aluminium /Copper Conductor XLPE insulated copper wire screen +Lead metallic sheathed PE/PVC sheathed cables

$$P = P_o + MIF (MIF2 - MIF1) + XL3 (CC-Cco) + SMIF_{Pbf} (SMIF2-SMIF1) + SMIF_{CuFpb} (SMIF2-SMIF1) + XL5 (POC - POC_{co})$$

Table references:-

Table 1 (MIF) : Aluminium Conductor AIF / Copper Conductor CuF

Table 2 (XL3) : Aluminium Conductor XLFAI / Copper Conductor XLFCu

Table 3c (SMIF) : Lead in Lead Sheath Construction PbF

Table 3d (SMIF) : Copper wire screen in Lead Sheath Construction CuFpb

Table 4 (XL5) : Aluminium Conductor CCFAl / Copper Conductor CCFCu

IEEMA (PVC)/EHV CABLE/2019 (R-1)

Effective from: 1st September 2019

Note:

For cases where Short Circuit Current through Screen/Sheath is required & is not available in the Reference Tables, in that case Screen/Sheath area as approved by the customer in Datasheet / Short Circuit Current calculation of Screen/Sheath shall be used to derive SMIF as below:

If A= Area of Metallic Screen/Sheath in Approved Datasheet / Calculation Sheet

D= Density= 8.89 for Cu & 11.3 for Pb

$SMIF = (A * D) / 1000$

c) For Aluminium /Copper Conductor XLPE insulated Corrugated Aluminium metallic sheathed PE/PVC sheathed cables

$$P = P_o + MIF (MIF2 - MIF1) + XL3 (CC-Cco) + SMIF (SMIF2-SMIF1) + XL5 (POC - POCco)$$

Table references:-

Table 1 (MIF) : Aluminium Conductor AIF / Copper Conductor CuF

Table 2 (XL3) : Aluminium Conductor XLFAI / Copper Conductor XLFCu

Table 3b (SMIF) : Corrugated Aluminium in CAS Construction AIFs

Table 4 (XL5) : Aluminium Conductor CCFAI / Copper Conductor CCFCu

Note:

For cases where Short Circuit Current through Screen/Sheath is required & is not available in the Reference Tables, in that case Screen/Sheath area as approved by the customer in Datasheet / Short Circuit Current calculation of Screen/Sheath shall be used to derive SMIF as below:

If A= Area of Metallic Screen/Sheath in Approved Datasheet / Calculation Sheet

D= Density= 2.703 for Al

$SMIF = (A * D) / 1000$



Authorised Signatory

TABLE 1 MIF

VARIATION FACTOR FOR ALUMINIUM & COPPER CONDUCTOR (AIF & CuF)
EHV CABLES WITH ALUMINIUM & COPPER CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm.)	ALUMINIUM FACTORS (AIF)		COPPER FACTORS (CuF)	
	1 core	3 core	1 core	3 core
95	0.274	0.821	0.901	2.700
120	0.346	1.036	1.138	3.407
150	0.425	1.279	1.398	4.207
185	0.533	1.605	1.753	5.279
225	0.655	1.965	2.154	6.463
240	0.703	2.099	2.312	6.904
300	0.879	2.635	2.891	8.667
400	1.126		3.703	
500	1.418		4.664	
630	1.828		6.012	
800	2.340		7.696	
1000	2.951		9.706	
1200	3.562		11.619	
1400	4.154		13.578	
1600	4.741		15.509	
1800	5.352		17.346	
2000	5.922		19.430	
2500	7.176		24.287	

Note :

XLPE factors include Semicons for Conductor & Insulation screen (based on IS 7098 (Part- 3 &4) proposed

For 3 core cables from 66 to 150 kV and sizes 185 to 400 sq.mm XLPE factors will be multiplied by 3

IEEMA (PVC)/EHV CABLE/2019 (R-1)

Effective from: 1st September 2019

Table 2 : XL3 (For XLPE Compound Factor)				
Nominal Cross Sectional Area (in Sq. mm.)	XLPE Factor for Armoured/ Unarmoured Cable with AL /CU Conductor (XLFAI/XLFCu)			
	38/66 kV	64/110 kV	76/132 kV	87/150 kV
185	1.072	1.814	2.332	
240	1.259	2.057	2.562	3.102
300	1.345	2.175	2.570	3.148
400	1.467	2.345	2.761	3.262
500	1.597	2.463	2.966	3.496
630	1.743	2.663	3.193	3.750
800	1.963	2.940	3.504	4.051
1000	2.135	3.172	3.769	4.352
1200	2.370	3.487	4.127	4.727
1400	2.514	3.684	4.357	4.971
1600	2.657	3.967	4.567	5.218
1800	2.815	4.177	4.798	5.480
2000	2.939	4.347	4.989	5.700
2500	3.262	4.784	5.473	6.241

Table 2 : XL3 (For XLPE Compound Factor)					
Nominal Cross Sectional Area (in Sq. mm.)	XLPE Factor for Armoured/ Unarmoured Cable with AL /CU Conductor (XLFAI/XLFCu)				
	127/220 kV	160/275 kV	190/330 kV	220/400 kV	290/500 kV
185					
240					
300					
400	5.283	5.701			
500	5.596	5.765	6.331		
630	5.751	6.122	6.710	7.170	
800	5.970	6.480	6.773	7.247	10.337
1000	6.349	6.581	6.881	7.351	10.115
1200	6.805	7.022	7.353	7.549	10.336
1400	6.907	6.995	7.347	7.898	10.367
1600	7.196	7.290	7.653	8.219	10.338
1800	7.471	7.553	7.925	8.523	10.274
2000	7.737	7.834	8.217	8.816	10.222
2500	8.357	8.512	8.918	9.534	11.013

Note : XLPE factors include Semicons for Conductor & Insulation screen (based on IS 7098 (Part-3&4) Proposed

IEEMA (PVC)/EHV CABLE/2019 (R-1)

Effective from: 1st September 2019

Table 4 : XL5 (For Polymer Compound Factor)									
Nominal Cross Sectional Area (in Sq. mm.)	Polymer Factor for Armoured/ Unarmoured Cable with AL /CU Conductor (CCFAI/CCFCu)								
	38/66 kV	64/110 kV	76/132 kV	87/150 kV	127/220 kV	160/275 kV	190/330 kV	220/400 kV	290/500 kV
185	0.447	0.624	0.710						
240	0.540	0.707	0.805	0.921					
300	0.585	0.747	0.832	0.966					
400	0.646	0.857	0.917	0.992	1.789	2.099			
500	0.710	0.881	1.140	1.082	1.848	2.124	2.201		
630	0.792	1.115	1.223	1.158	1.887	2.193	2.269	2.326	
800	0.867	1.177	1.287	1.206	1.932	2.376	2.416	2.365	3.118
1000	1.092	1.266	1.366	1.266	2.008	2.420	2.461	2.405	3.119
1200	1.185	1.365	1.442	1.331	2.103	2.652	2.696	2.561	3.177
1400	1.267	1.417	1.499	1.379	2.212	2.677	2.723	2.644	3.205
1600	1.312	1.488	1.545	1.423	2.278	2.758	2.809	2.708	3.230
1800	1.380	1.534	1.597	1.462	2.343	2.820	2.870	2.768	3.247
2000	1.422	1.576	1.640	1.503	2.396	2.882	2.933	2.839	3.281
2500	1.527	1.680	1.741	1.590	2.531	3.161	3.209	3.063	3.597

Note : For PVC Factor the above factor will be multiplied by 1.58

Table 3a (SMIF) Variation factor for Copper screen in CU wire + polyal construction (CuFc)	
Short Circuit capacity of Metallic screen	CuFc
	Variation factor for Copper screen in CU wire + polyal construction
31.5 kA for 1 sec	2.104
31.5 kA for 2 sec	2.963
31.5 kA for 3 sec	3.614
40 kA for 1 sec	2.660
40 kA for 2 sec	3.752
40 kA for 3 sec	4.579

IEEMA (PVC)/EHV CABLE/2019 (R-1)

Effective from: 1st September 2019

Table 3b (SMIF) : Variation factor for Aluminium in Corr Al construction (AIFs)												
Nominal Cross Sectional Area (in Sq. mm)	38/66 KV						64/110 kV					
SC Current in KA	31.5			40			31.5			40		
Duration in sec	1	2	3	1	2	3	1	2	3	1	2	3
185	1.100	1.381	1.628	1.259	1.729	2.138	1.079	1.385	1.677	1.213	1.795	2.094
240	1.110	1.398	1.708	1.220	1.708	2.078	1.186	1.472	1.745	1.322	1.745	2.116
300	1.167	1.508	0.887	1.482	1.774	2.157	1.183	1.461	0.908	1.483	1.816	2.137
400	1.190	1.656	2.027	1.529	2.195	2.173	1.207	1.676	2.050	1.547	2.134	2.300
500	1.206	1.696	2.085	1.526	2.139	2.621	1.255	1.689	2.045	1.530	2.122	2.585
630	1.219	1.712	2.083	1.492	2.120	2.580	1.369	1.685	2.007	1.538	2.138	2.536
800	1.279	1.760	2.141	1.490	2.138	2.601	1.503	1.651	2.001	1.561	2.080	2.539
1000	1.426	1.777	2.127	1.533	2.125	2.599	1.647	1.669	2.054	1.647	2.098	2.539
1200	1.531	1.792	2.185	1.535	2.117	2.582	1.819	1.819	2.020	1.819	2.073	2.557
1400	1.730	1.781	2.186	1.730	2.168	2.544	2.055	2.055	2.080	2.055	2.104	2.546
1600	1.890	1.890	2.189	1.890	2.193	2.536	2.261	2.261	2.261	2.261	2.261	2.576
1800	2.068	1.974	2.198	2.068	2.186	2.495	2.389	2.389	2.389	2.389	2.389	2.522
2000	2.234	2.159	2.258	2.234	2.280	2.669	2.623	2.623	2.623	2.623	2.623	2.679
2500	2.611	2.611	2.611	2.611	2.611	2.744	2.971	2.971	2.971	2.971	2.971	2.971

Table 3b (SMIF) : Variation factor for Aluminium in Corr Al construction (AIFs)												
Nominal Cross Sectional Area (in Sq. mm)	76/132 kV						87/150 kV					
SC Current in KA	31.5			40			31.5			40		
Duration in sec	1	2	3	1	2	3	1	2	3	1	2	3
185	1.098	1.354	1.740	1.227	1.740	2.133	-	-	-	-	-	-
240	1.236	1.404	1.703	1.272	1.736	2.142	1.319	1.391	1.787	1.248	1.823	2.263
300	1.237	1.522	0.834	1.494	1.734	2.138	1.329	1.389	1.785	1.562	1.821	2.260
400	1.304	1.698	2.037	1.553	2.109	2.171	1.400	1.687	2.038	1.584	2.147	2.223
500	1.404	1.665	2.045	1.522	2.098	2.545	1.460	1.643	2.074	1.575	2.112	2.571
630	1.519	1.650	2.032	1.587	2.107	2.578	1.528	1.667	2.046	1.667	2.105	2.638
800	1.652	1.712	2.039	1.691	2.067	2.519	1.637	1.744	2.011	1.744	2.011	2.501
1000	1.813	1.813	2.029	1.792	2.088	2.566	1.867	1.867	1.998	1.867	2.057	2.542
1200	1.972	2.068	2.060	1.994	2.115	2.543	1.953	2.165	2.087	1.953	2.165	2.558
1400	2.193	2.193	2.193	2.216	2.238	2.555	2.281	2.281	2.281	2.281	2.281	2.590
1600	2.355	2.355	2.355	2.355	2.355	2.581	2.460	2.460	2.460	2.460	2.460	2.612
1800	2.519	2.519	2.519	2.519	2.519	2.556	2.676	2.676	2.676	2.676	2.676	2.676
2000	2.788	2.788	2.788	2.788	2.788	2.788	2.960	2.960	2.960	2.960	2.960	2.960
2500	3.077	3.077	3.077	3.077	3.077	3.077	3.338	3.338	3.338	3.338	3.338	3.338

Table 3b (SMIF) : Variation factor for Aluminium in Corr Al construction (AIFs)												
Nominal Cross Sectional Area (in Sq. mm)	127/220 kV						160/275 kV					
SC Current in KA	31.5			40			31.5			40		
Duration in sec	1	2	3	1	2	3	1	2	3	1	2	3
400	2.096	2.049	2.149	2.096	2.198	2.502	2.445	2.527	2.476	2.445	2.527	2.502
500	2.206	2.124	2.206	2.206	2.219	2.551	2.472	2.523	2.472	2.472	2.523	2.472
630	2.268	2.185	2.268	2.268	2.282	2.537	2.568	2.619	2.568	2.568	2.651	2.620
800	2.357	2.270	2.326	2.357	2.371	2.574	2.818	2.873	2.818	2.818	2.873	2.818
1000	2.619	2.497	2.546	2.619	2.634	2.679	2.906	2.940	2.906	2.906	2.940	2.906
1200	2.845	2.826	2.779	2.845	2.869	2.923	3.068	3.102	3.068	3.068	3.102	3.068
1400	2.983	2.929	2.872	2.983	2.999	3.018	3.101	3.135	3.101	3.101	3.135	3.101
1600	3.156	3.101	3.008	3.156	3.183	3.156	3.352	3.412	3.352	3.352	3.412	3.352
1800	3.241	3.263	3.241	3.241	3.263	3.191	3.489	3.549	3.489	3.489	3.549	3.489
2000	3.517	3.545	3.517	3.517	3.545	3.517	3.562	3.622	3.562	3.562	3.622	3.562
2500	3.796	3.836	3.796	3.796	3.836	3.796	3.926	3.964	3.926	3.926	3.964	3.926

IEEMA (PVC)/EHV CABLE/2019 (R-1)

Effective from: 1st September 2019

Table 3b (SMIF) : Variation factor for Aluminium in Corr Al construction (AIFs)												
Nominal Cross Sectional Area (in Sq. mm)	190/330 kV						220/400 kV					
SC Current in KA	31.5			40			31.5			40		
Duration in sec	1	2	3	1	2	3	1	2	3	1	2	3
500	2.618	2.650	2.618	2.618	2.650	2.618	-	-	-	-	-	-
630	2.716	2.748	2.716	2.716	2.800	2.748	2.823	2.844	2.823	2.823	2.879	2.845
800	2.904	2.938	2.904	2.904	2.938	2.904	2.955	2.991	2.955	2.955	2.991	2.955
1000	2.978	3.034	2.978	2.978	3.034	2.978	3.031	3.053	3.031	3.031	3.053	3.031
1200	3.145	3.200	3.145	3.145	3.200	3.145	3.217	3.240	3.217	3.217	3.240	3.217
1400	3.179	3.234	3.179	3.179	3.234	3.179	3.486	3.511	3.486	3.486	3.511	3.486
1600	3.532	3.593	3.532	3.532	3.593	3.532	3.589	3.614	3.589	3.589	3.614	3.589
1800	3.638	3.676	3.638	3.638	3.676	3.638	3.693	3.719	3.693	3.693	3.719	3.693
2000	3.748	3.786	3.748	3.748	3.786	3.748	3.998	4.041	3.998	3.998	4.041	3.998
2500	4.014	4.076	4.014	4.014	4.076	4.014	4.229	4.273	4.229	4.229	4.273	4.229

Table 3b (SMIF) : Variation factor for Aluminium in Corr Al construction (AIFs)						
Nominal Cross Sectional Area (in Sq. mm)	290/500 kV					
SC Current in KA	31.5			40		
Duration in sec	1	2	3	1	2	3
800	3.671	3.728	3.671	3.671	3.728	3.671
1000	3.671	3.728	3.671	3.671	3.728	3.671
1200	3.742	3.798	3.742	3.742	3.798	3.742
1400	3.776	3.833	3.776	3.776	3.833	3.776
1600	3.848	3.883	3.848	3.848	3.883	3.848
1800	3.857	3.913	3.857	3.857	3.913	3.857
2000	4.050	4.111	4.050	4.050	4.111	4.050
2500	4.352	4.391	4.352	4.352	4.391	4.352

IEEMA (PVC)/EHV CABLE/2019 (R-1)

Effective from: 1st September 2019

Table 3c (SMIF) : Variation factor for Lead in Lead +Cu wire construction (PbF)

Nominal Cross Sectional Area (in Sq. mm)	38/66 KV						64/110 kV					
	31.5			40			31.5			40		
SC Current in KA												
Duration in sec	1	2	3	1	2	3	1	2	3	1	2	3
185	3.101	3.101	3.101	3.101	3.101	3.101	4.279	4.279	4.279	4.279	4.279	4.279
240	3.544	3.268	3.268	3.268	3.268	3.268	4.770	4.463	4.463	4.463	4.463	4.463
300	3.784	3.600	3.600	3.790	3.600	3.600	5.045	4.850	4.850	5.045	4.850	4.850
400	4.120	4.120	4.120	4.120	4.120	3.838	5.423	5.423	5.423	5.423	5.423	5.112
500	4.592	4.592	4.592	4.592	4.592	4.592	5.749	5.749	5.749	5.749	5.749	5.749
630	4.881	4.881	4.881	4.881	4.881	4.881	6.184	6.184	6.184	6.184	6.184	6.184
800	5.494	5.494	5.494	5.494	5.494	5.494	6.853	6.853	6.853	6.853	6.853	6.853
1000	6.100	6.100	6.100	6.100	6.100	6.100	7.381	7.381	7.381	7.381	7.381	7.381
1200	7.516	7.516	7.516	7.516	7.516	7.516	8.069	8.069	8.069	8.069	8.069	8.069
1400	7.950	7.950	7.950	7.950	7.950	7.950	8.746	8.746	8.746	8.746	8.746	8.746
1600	8.584	8.584	8.584	8.584	8.584	8.584	9.602	9.602	9.602	9.602	9.602	9.602
1800	9.096	9.096	9.096	9.096	9.096	9.096	9.930	9.930	9.930	9.930	9.930	9.930
2000	9.550	9.550	9.550	9.550	9.550	9.550	10.443	10.443	10.443	10.443	10.443	10.443
2500	10.976	10.976	10.976	10.976	10.976	10.976	11.379	11.379	11.379	11.379	11.379	11.379

IEEMA (PVC)/EHV CABLE/2019 (R-1)

Effective from: 1st September 2019

Table 3c (SMIF) : Variation factor for Lead in Lead +Cu wire construction (PbF)												
Nominal Cross Sectional Area (in Sq. mm)	76/132 kV						87/150 kV					
SC Current in KA	31.5			40			31.5			40		
Duration in sec	1	2	3	1	2	3	1	2	3	1	2	3
185	5.001	5.001	5.001	5.001	5.001	5.001	-	-	-	-	-	-
240	5.440	5.193	5.193	5.193	5.193	5.193	6.290	6.011	6.011	6.011	6.011	6.011
300	5.525	5.194	5.194	5.525	5.194	5.194	6.382	6.002	6.002	6.382	6.002	6.002
400	6.042	6.042	6.042	6.042	6.042	5.706	6.710	6.710	6.710	6.710	6.710	6.109
500	6.470	6.470	6.470	6.470	6.470	6.470	7.019	7.019	7.019	7.019	7.019	7.019
630	6.933	6.933	6.933	6.933	6.933	6.933	7.653	7.653	7.653	7.653	7.653	7.653
800	7.638	7.638	7.638	7.638	7.638	7.638	8.185	8.185	8.185	8.185	8.185	8.185
1000	8.186	8.186	8.186	8.186	8.186	8.186	8.772	8.772	8.772	8.772	8.772	8.772
1200	8.910	8.910	8.910	8.910	8.910	8.910	9.801	9.801	9.801	9.801	9.801	9.801
1400	9.710	9.710	9.710	9.710	9.710	9.710	10.336	10.336	10.336	10.336	10.336	10.336
1600	10.225	10.225	10.225	10.225	10.225	10.225	10.693	10.693	10.693	10.693	10.693	10.693
1800	10.630	10.630	10.630	10.630	10.630	10.630	11.233	11.233	11.233	11.233	11.233	11.233
2000	10.895	10.895	10.895	10.895	10.895	10.895	11.567	11.567	11.567	11.567	11.567	11.567
2500	12.260	12.260	12.260	12.260	12.260	12.260	12.952	12.952	12.952	12.952	12.952	12.952

IEEMA (PVC)/EHV CABLE/2019 (R-1)

Effective from: 1st September 2019

Table 3c (SMIF) : Variation factor for Lead in Lead +Cu wire construction (PbF)												
Nominal Cross Sectional Area (in Sq. mm)	127/220 kV						160/275 kV					
SC Current in KA	31.5			40			31.5			40		
Duration in sec	1	2	3	1	2	3	1	2	3	1	2	3
400	9.088	9.088	9.088	9.088	9.088	9.078	9.905	9.905	9.905	9.905	9.905	9.266
500	9.862	9.862	9.862	9.862	9.862	9.862	10.022	10.022	10.022	10.022	10.022	10.022
630	10.130	10.130	10.130	10.130	10.130	10.130	10.442	10.442	10.442	10.442	10.442	10.442
800	10.454	10.454	10.454	10.454	10.454	10.454	10.832	10.832	10.832	10.832	10.832	10.832
1000	11.081	11.081	11.081	11.081	11.081	11.081	11.455	11.455	11.455	11.455	11.455	11.455
1200	12.074	12.074	12.074	12.074	12.074	12.074	11.977	11.977	11.977	11.977	11.977	11.977
1400	12.368	12.368	12.368	12.368	12.368	12.368	12.527	12.527	12.527	12.527	12.527	12.527
1600	13.154	13.154	13.154	13.154	13.154	13.154	12.895	12.895	12.895	12.895	12.895	12.895
1800	13.514	13.514	13.514	13.514	13.514	13.514	13.655	13.655	13.655	13.655	13.655	13.655
2000	14.337	14.337	14.337	14.337	14.337	14.337	14.017	14.017	14.017	14.017	14.017	14.017
2500	15.640	15.640	15.640	15.640	15.640	15.640	15.307	15.307	15.307	15.307	15.307	15.307

IEEMA (PVC)/EHV CABLE/2019 (R-1)

Effective from: 1st September 2019

Table 3c (SMIF) : Variation factor for Lead in Lead +Cu wire construction (PbF)												
Nominal Cross Sectional Area (in Sq. mm)	190/330 kV						220/400 kV					
SC Current in KA	31.5			40			31.5			40		
Duration in sec	1	2	3	1	2	3	1	2	3	1	2	3
500	10.481	10.481	10.481	10.481	10.481	10.481						
630	10.870	10.870	10.870	10.870	10.870	10.870	11.596	11.596	11.596	11.596	11.596	11.596
800	11.426	11.426	11.426	11.426	11.426	11.426	11.784	11.784	11.784	11.784	11.784	11.784
1000	11.671	11.671	11.671	11.671	11.671	11.671	12.016	12.016	12.016	12.016	12.016	12.016
1200	12.615	12.615	12.615	12.615	12.615	12.615	12.794	12.794	12.794	12.794	12.794	12.794
1400	12.773	12.773	12.773	12.773	12.773	12.773	13.196	13.196	13.196	13.196	13.196	13.196
1600	13.570	13.570	13.570	13.570	13.570	13.570	14.011	14.011	14.011	14.011	14.011	14.011
1800	13.909	13.909	13.909	13.909	13.909	13.909	14.372	14.010	14.010	14.010	14.010	14.010
2000	14.722	14.722	14.722	14.722	14.722	14.722	15.189	15.189	15.189	15.189	15.189	15.189
2500	16.047	16.047	16.047	16.047	16.047	16.047	16.551	16.551	16.551	16.551	16.715	16.551

Table 3c (SMIF) : Variation factor for Lead in Lead +Cu wire construction (PbF)						
Nominal Cross Sectional Area (in Sq. mm)	290/500 kV					
SC Current in KA	31.5			40		
Duration in sec	1	2	3	1	2	3
800	15.618	15.618	15.618	15.618	15.618	15.618
1000	15.624	15.624	15.624	15.624	15.624	15.624
1200	15.971	15.971	15.971	15.971	15.971	15.971
1400	16.144	16.144	16.144	16.144	16.144	16.144
1600	16.278	16.278	16.278	16.278	16.278	16.525
1800	16.381	16.381	16.381	16.381	16.381	16.381
2000	17.000	17.000	17.000	17.000	17.000	17.000
2500	18.401	18.401	18.401	18.401	18.401	18.401

Table 3d (SMIF) : Variation factor for Copper in Lead +Cu wire construction (CuFpb)												
Nominal Cross Sectional Area (in Sq. mm)	38/66 KV						64/110 kV					
	31.5			40			31.5			40		
	1	2	3	1	2	3	1	2	3	1	2	3
185	1.762	2.531	3.196	2.235	3.325	4.163	1.637	2.383	3.048	2.087	3.177	4.015
240	1.719	2.509	3.174	2.213	3.304	4.141	1.565	2.359	3.024	2.063	3.153	3.991
300	1.692	2.555	1.566	2.258	3.262	4.100	1.538	2.428	1.488	2.111	3.104	3.942
400	1.646	2.525	3.211	2.215	3.347	4.068	1.484	2.360	3.044	2.059	3.183	3.907
500	1.584	2.463	3.147	2.154	3.281	4.135	1.438	2.324	3.011	2.022	3.140	3.993
630	1.551	2.432	3.111	2.122	3.239	4.118	1.390	2.281	2.956	1.962	3.087	3.949
800	1.475	2.363	3.035	2.057	3.179	4.035	1.308	2.188	2.868	1.883	3.015	3.869
1000	1.400	2.282	2.961	1.975	3.095	3.960	1.240	2.125	2.800	1.817	2.937	3.796
1200	1.228	2.109	2.786	1.800	2.928	3.782	1.160	2.050	2.729	1.740	2.861	3.724
1400	1.216	2.056	2.730	1.745	2.869	3.726	1.082	1.973	2.642	1.660	2.779	3.627
1600	1.095	1.975	2.652	1.669	2.784	3.662	0.988	1.873	2.542	1.563	2.678	3.541
1800	1.106	2.017	2.709	1.699	2.841	3.720	1.037	1.938	2.631	1.630	2.773	3.655
2000	0.976	1.861	2.535	1.549	2.670	3.539	0.909	1.769	2.450	1.466	2.585	3.451
2500	0.896	1.796	2.490	1.489	2.632	3.514	0.913	1.768	2.460	1.457	2.598	3.490

IEEMA (PVC)/EHV CABLE/2019 (R-1)

Effective from: 1st September 2019

Table 3d (SMIF) : Variation factor for Copper in Lead +Cu wire construction (CuFpb)												
Nominal Cross Sectional Area (in Sq. mm)	76/132 kV						87/150 kV					
SC Current in KA	31.5			40			31.5			40		
Duration in sec	1	2	3	1	2	3	1	2	3	1	2	3
185	1.562	2.290	2.955	1.994	3.085	3.922						
240	1.488	2.265	2.930	1.969	3.059	3.897	1.370	2.131	2.796	1.835	2.925	3.763
300	1.472	2.395	1.466	2.049	3.061	3.898	1.360	2.132	2.797	1.971	2.926	3.764
400	1.414	2.292	2.977	1.983	3.110	3.970	1.310	2.245	2.963	1.919	3.094	3.750
500	1.364	2.238	2.918	1.941	3.055	3.938	1.268	2.204	2.922	1.878	3.052	3.965
630	1.299	2.187	2.860	1.875	2.996	3.866	1.178	2.108	2.818	1.787	2.970	3.881
800	1.215	2.104	2.776	1.797	2.924	3.783	1.106	2.036	2.756	1.708	2.906	3.794
1000	1.152	2.036	2.716	1.729	2.849	3.712	1.025	1.956	2.668	1.634	2.816	3.711
1200	1.062	1.945	2.627	1.641	2.761	3.622	0.911	1.829	2.554	1.511	2.680	3.587
1400	0.975	1.854	2.539	1.555	2.676	3.549	0.856	1.757	2.471	1.431	2.615	3.524
1600	0.924	1.797	2.479	1.491	2.612	3.468	0.815	1.711	2.427	1.388	2.573	3.475
1800	0.977	1.857	2.554	1.546	2.695	3.572	0.749	1.631	2.348	1.302	2.494	3.411
2000	0.853	1.717	2.395	1.414	2.536	3.385	0.712	1.585	2.310	1.262	2.451	3.364
2500	0.809	1.664	2.359	1.351	2.505	3.379	0.521	1.383	2.114	1.068	2.240	3.152

IEEMA (PVC)/EHV CABLE/2019 (R-1)

Effective from: 1st September 2019

Table 3d (SMIF) : Variation factor for Copper in Lead +Cu wire construction (CuFpb)												
Nominal Cross Sectional Area (in Sq. mm)	127/220 kV						160/275 kV					
SC Current in KA	31.5			40			31.5			40		
Duration in sec	1	2	3	1	2	3	1	2	3	1	2	3
400	1.053	1.937	2.613	1.623	2.751	3.621	0.887	1.822	2.542	1.490	2.669	3.330
500	0.973	1.849	2.536	1.543	2.662	3.512	0.874	1.803	2.516	1.474	2.665	3.577
630	0.942	1.820	2.495	1.506	2.632	3.482	0.828	1.738	2.468	1.422	2.594	3.503
800	0.909	1.775	2.460	1.465	2.596	3.458	0.793	1.691	2.404	1.366	2.551	3.453
1000	0.828	1.702	2.377	1.387	2.506	3.373	0.734	1.603	2.328	1.284	2.471	3.369
1200	0.717	1.577	2.251	1.266	2.382	3.258	0.660	1.535	2.256	1.210	2.380	3.312
1400	0.686	1.536	2.211	1.232	2.357	3.203	0.572	1.453	2.164	1.125	2.304	3.207
1600	0.680	1.457	2.117	1.140	2.267	3.124	0.531	1.396	2.106	1.080	2.262	3.158
1800	0.724	1.540	2.205	1.270	2.347	3.227	0.544	1.313	2.004	0.984	2.157	3.066
2000	0.529	1.317	1.996	1.049	2.109	2.968	0.475	1.265	1.959	0.975	2.100	3.000
2500	0.373	1.337	2.020	1.036	2.140	2.977	0.253	1.150	1.814	0.889	1.973	2.831

IEEMA (PVC)/EHV CABLE/2019 (R-1)

Effective from: 1st September 2019

Table 3d (SMIF) : Variation factor for Copper in Lead +Cu wire construction (CuFpb)												
Nominal Cross Sectional Area (in Sq. mm)	190/330 kV						220/400 kV					
SC Current in KA	31.5			40			31.5			40		
Duration in sec	1	2	3	1	2	3	1	2	3	1	2	3
500	0.826	1.736	2.447	1.409	2.593	3.501						
630	0.790	1.688	2.401	1.363	2.548	3.450	0.870	1.756	2.455	1.443	2.581	3.465
800	0.735	1.604	2.329	1.286	2.473	3.371	0.862	1.734	2.425	1.414	2.566	3.448
1000	0.700	1.566	2.292	1.248	2.420	3.330	0.833	1.701	2.396	1.385	2.516	3.422
1200	0.571	1.436	2.159	1.114	2.299	3.202	0.750	1.611	2.312	1.299	2.447	3.326
1400	0.566	1.415	2.133	1.097	2.271	3.192	0.711	1.566	2.252	1.270	2.399	3.274
1600	0.550	1.309	2.026	1.022	2.163	3.072	0.697	1.472	2.165	1.178	2.302	3.176
1800	0.478	1.273	1.982	0.975	2.125	3.028	0.642	1.457	2.123	1.183	2.265	3.139
2000	0.330	1.196	1.861	0.937	1.995	2.910	0.488	1.360	2.048	1.089	2.158	3.042
2500	0.034	1.039	1.741	0.747	1.846	2.721	0.283	1.245	1.927	0.948	2.019	2.877

Table 3d (SMIF) : Variation factor for Copper in Lead +Cu wire construction (CuFpb)						
Nominal Cross Sectional Area (in Sq. mm)	290/500 kV					
SC Current in KA	31.5			40		
Duration in sec	1	2	3	1	2	3
800	0.233	1.088	1.782	0.830	1.901	2.770
1000	0.233	1.088	1.782	0.830	1.901	2.770
1200	0.041	1.039	1.735	0.788	1.893	2.728
1400	0.030	1.036	1.737	0.744	1.857	2.717
1600	0.021	1.033	1.740	0.740	1.847	2.645
1800	0.014	1.063	1.733	0.701	1.854	2.701
2000	0.000	0.994	1.612	0.633	1.772	2.638
2500	0.000	0.779	1.473	0.528	1.635	2.499