Transmission underground cables – continuous current rating

Document No. MDI 0046

Amendment No. 2

Endeavour Energy

POWER together

Revision History

This amendment replaces the following Standards:

MDI 0046 – Transmission underground cables – continuous current rating – Amendment No.1

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Document Control

Documentation content coordinator: Asset Engineering Manager

Contents

1 Purpose

The purpose of this Standard is to provide the ratings methodology, tabled continuous ratings, and derating factors for transmission cables (including 11kV and 22kV cables within zone substations) in Endeavour's network. The purpose of this revision is to provide updated ratings for cables supplied under new contract and to better align with current rating practice.

2 Scope

The continuous current ratings covered by this Standard are determined for a set of defined conditions. The 'as-installed' surrounding conditions of a cable must be like those described within this Standard before applying a rating.

Where an installation is outside the surrounding conditions described in this Standard, provisions are made for rating determination by cable ampacity software.

Cable ratings are provided for standard cable sizes, with cable constructions in accordance with current Endeavour Energy cable specifications. All cables are constructed with copper conductor and XLPE insulation.

The 11 kV and 22 kV cables referred in the document are single core transformer cables inside transmission/zone substations. This Standard does not apply to 11kV and 22kV distribution cables outside of transmission/zone substation environments.

3 References

External Regulations
Electricity Supply Act 1995 (NSW)
ENA National Electricity Network Safety Code (Doc 01-2019)

External Standards		
Standard No.	Year	Title
IEC 60287-1-1	2023	Electric cables - Calculation of the current rating

Company Policies and Procedures	
Company Policy (Network) 9.2.5	Network Asset Design
Company Policy (Network) 9.2.10	Network Asset Ratings
Company Policy (Network) 9.7.1	Network Asset Construction
Network Management Plan	December 2013 Review

Company Standards	
ETS 0054	6.35/11kV and 12.7/22kV polymeric insulated underground cables
ETS 0111	132kV Polymeric Insulated Underground Cables
ETS 0112	66kV Polymeric Insulated Underground Cables
ETS 0113	33kV Polymeric Insulated Underground Cables
MDI 0051	Underground transmission mains design
SDI 0531	Installation of Conduits in Transmission/Zone Substations and Switching Stations

4 Definitions and Abbreviations

Term	Definition
50°C Isotherm Model	A model where the region of backfill and/or native soil surrounding a cable or cables operating at rated load, is defined by a boundary at which the temperature is 50°C.
Backfill	Material used for filling trenches and excavations after conduits have been laid, usually placed on top of bedding material. Typical backfill material is selected excavated soil.
Bedding	A layer of material encasing conduits for the purpose of cable protection and/or reducing thermal resistance. Typical bedding materials are sand-cement mixes and TSBs.
Coastal Region	Refers to that part of the company's supply area that falls generally between the sea and the escarpment from Helensburgh to Ulladulla.
CSA	Cross-sectional area – typically refers to conductor size in mm^2.
Inland Region	Refers to the area within the company's supply area not otherwise described or covered by mountainous or coastal regions.
Mountainous Region	Mountains falling to the west of Hazelbrook Zone Substation and extending to the edge of the franchise area at Kandos. This region also applies to the network within the Southern Highlands area, which is confined to the east by the escarpment; to the north by Avon Dam Road, at Bargo; to the south by the township of Fitzroy Falls; and to the west by Marulan bulk supply point and the franchise area boundary.
Native Soil	Is the general mass of earth or soil surrounding a cable trench or underbore.
TR	Thermal resistivity of bedding, backfill and native soil. Practical TRs range from 0.8 ºC.m/W (TSB) to 1.3 ºC.m/W (backfill).
TSB	Thermally stabilized bedding – a manufactured material with low TR used as an alternative to sand-cement mixes to enable increased cable rating.
XLPE	Cross-linked polyethylene.

5 Actions

The electrical loadings applied to transmission underground cables must be in accordance with this Standard.

All transmission underground circuit designs must have an accompanying cable rating calculation. The design drawing must include a record of the cable rating for each underground cable section with suitable remarks to indicate the conditions of the rating assessment and any relevant criteria to qualify the final assessed rating. The record must be written with sufficient information to allow a third party to reproduce the assessed rating.

An example cable rating record is shown at Appendix 1.

For transmission underground cables installed in accordance with Section 5.2, the continuous current rating is obtained from the tables in Section 5.6, and the standard rating applied with any applicable rating factors from Section 5.7.

Where conditions vary from those set out in Section 5.2, a detailed ratings assessment must be conducted using cable ampacity software. Detailed ratings assessment by cable ampacity software is covered in Section 5.4.

5.1 Underground cable continuous rating

The continuous rating for an underground cable is the maximum current that can be carried indefinitely without causing damage to the cable material such as screening, insulation etc., or accelerating the ageing of such materials.

The continuous rating is calculated with the assumption of all adjacent heat sources and cables in service and carrying full load.

Soil dry-out and 50°C isotherm modelling shall be adopted for cable continuous rating calculations. The effect of dry out can be modelled, by assuming the native soil within the 50°C isotherm will completely dry out. The following thermal modelling approach is to be adopted:

1. For the region within 50°C isotherm, the thermal resistivity of the native soil at 0% moisture content shall apply.
2. For the region outside the 50°C isotherm, the TR of the native soil at 3% moisture shall apply.

The approach using the worst-case corrected TR from measured samples for the entire modelled area can be used, provided the selected cable size meets the cable rating requirement. This can be achieved either by using thermal resistivity values at 0% moisture content from geothermal investigation reports as the native soil thermal resistivity input in cable ampacity software, or by applying the continuous current ratings specified in Section 5.6.

Section 5.6 ratings are based on an assumed thermal resistivity of 1.2 (°C·m/W), and the ratings must be adjusted in accordance with Table 5.7.5 to determine the corresponding current rating.

For 66kV and 132kV cable projects, the continuous current ratings and rating factors in this Standard are for preliminary design phase only. A detailed ratings assessment using cable ampacity software is required at the detailed design phase.

For other projects, the cable ratings can be determined based on the continuous current ratings and derating factors provided in this Standard.

5.2 Cable installation and surrounding conditions

5.2.1 Native soil and backfill parameters

Parameter	Summer	Winter
Native soil temperature (°C)	25	18
Native soil thermal resistivity (°C.m/W)	1.2	
Backfill thermal resistivity (°C.m/W)	1.3	

5.2.2 Ambient air temperature

For cables installed in air, or ampacity calculations that otherwise require ambient air temperature (e.g. cable basements), a value of 40°C must be applied in Inland Regions and 30°C in Coastal and Mountainous Regions.

5.2.3 Intensity of solar radiation

For cable ampacity calculations requiring the intensity of solar radiation, a value of 1,000 W/m² must be applied.

5.2.4 Cable operating temperatures

Continuous ratings provided in Section 5.6 are calculated for continuous operation at 90°C (conductor temperature).

5.2.5 Cable construction

All cables are constructed with copper conductor, and XLPE insulation. The cable construction must be in accordance with Endeavour's cable specifications.

5.2.6 Cable conduit dimensions

Ratings are calculated for cables installed in air filled conduits, in the following sizes:

Cable	Nominal conduit size (mm)	Conduit internal diameter (mm)	Conduit external diameter (mm)
All single core 11kV - 66kV Cables (PVC conduits)	150	143	160
All single core 132kV Cables (PVC conduits)	200	203	225
All single core 11kV - 66kV Cables (PE conduits)	180	150	180
All single core 132kV Cables (PE conduits)	250	209	250

5.2.7 Construction: Standard formation

The continuous current ratings provided in Tables 5.6.2 and 5.6.3 are for cables in standard trefoil configuration at a range of depths in accordance with Endeavour Energy Drawing 290689 and provided in Figure 1.

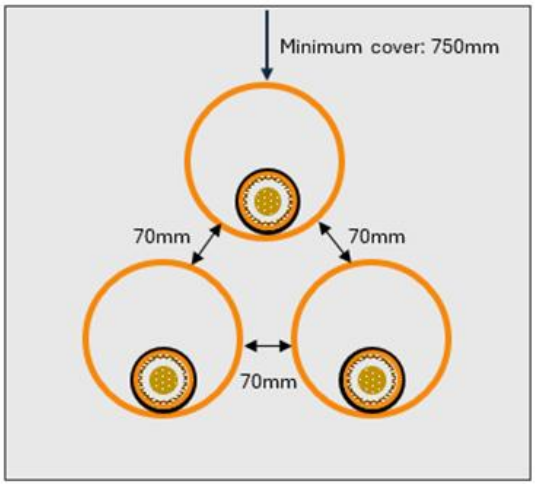

Figure 1 - Standard trefoil installation for transmission cables

Table 5.6.1 provides the continuous current ratings for transformer secondary cables in standard trefoil configuration for up to four cables per phase. The standard configuration for two cables per phase is provided in Figure 2.

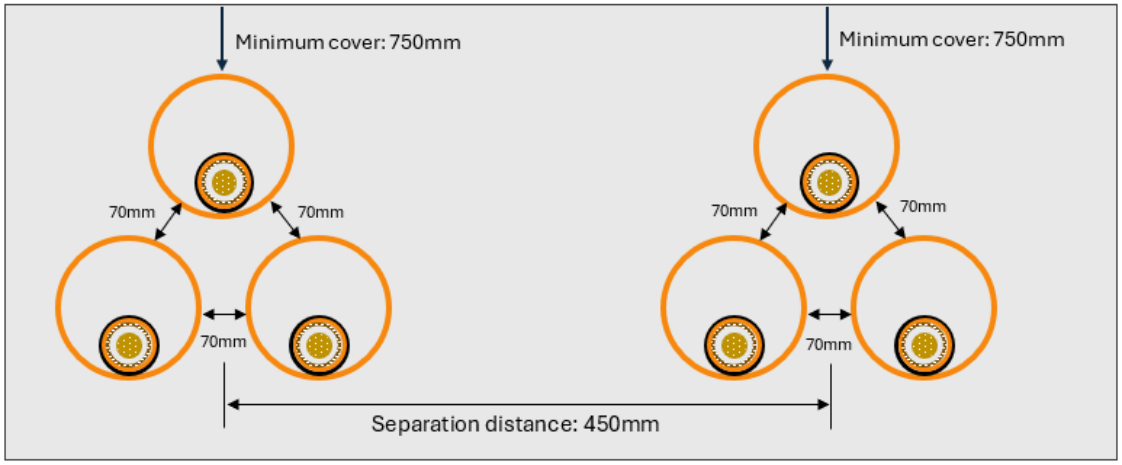

Figure 2 - Standard transformer secondary cable configuration for two cables per phase

5.2.8 Construction: Flat formation

Where cables are installed in flat formation, for example entering a joint pit or caterpillar pit, the rating factor for a flat construction will apply. An example of flat formation is provided in Figure 3.

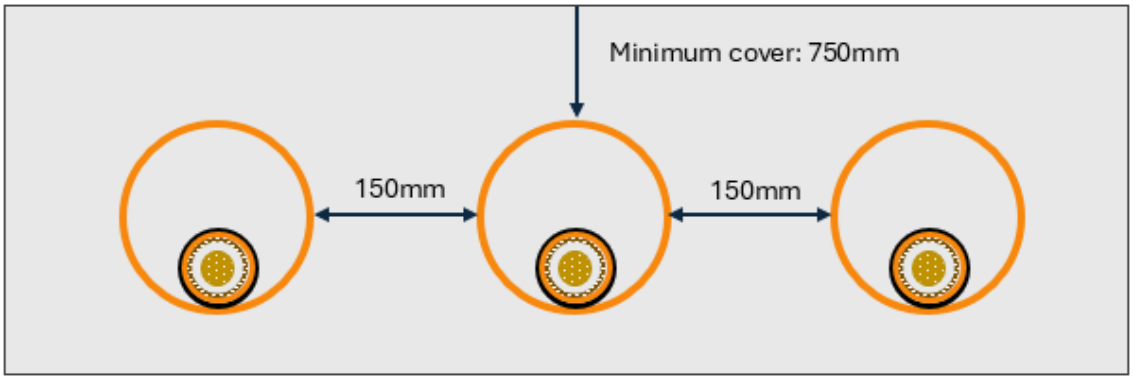

Figure 3 – Transmission cables in flat formation

5.2.9 11kV and 22kV single core cables within substations

Ratings for the single core 11 kV and 22 kV cables (used within substations) provided in this document are based on them being installed in the standard formation indicated in Figure 1 and a soil thermal resistivity of 1.2°C.m/W.

The following conditions have been applied when calculating the cable rating of the 11 kV and 22 kV transformer cables:

• all cable screens are single point bonded, and the route length is less than 200m.

• cables having same CSA are used in trefoil formation when multiple cables per phase option have been applied to connect the secondary side of the transformer to the switchgear.

• a 450 mm separation between the vertical centre lines of the trefoil conduit arrangement of each set of cables per phase, as indicated in Figure 2, is considered when multiple cables per phase are installed; and,

• the impedance of an individual cable among multiple cables that have same CSA, and when laid in the trefoil formation for short lengths, are approximately equal. Therefore, equal load sharing by each cable per phase has been applied.

5.2.10 Construction: Installed in air

Tables 5.6.2 and 5.6.3 also provide ratings for cables installed in air. The ratings are calculated for cables in a touching, trefoil arrangement, separated from the nearest surface (either wall or floor/ground) by a minimum 50mm.

Ratings are provided for both shaded and non-shaded cables. The intensity of solar radiation is taken to be 1,000 W/m², the air temperature is 40ºC, and the coefficient of surface absorptivity is 0.4.

5.2.11 Construction: Underbore

Tables 5.6.2 and 5.6.3 also provide cable ratings for underbore construction, covering both underbore without casing as per drawing 507646 and underbore with casing using the same bore/duct sizes. A grout thermal resistivity of 1.2 °C·m/W has been adopted in the calculations.

For underbore with casing, steel casing is used. If the casing material is different, cable rating calculations using cable ampacity software will be required.

5.2.12 Minimum cover (depth of burial)

The minimum cover is taken to be the distance between ground level and the top of the upper most conduit/s within the bank.

In determining the cable rating, the minimum cover to be selected for calculation must be the deepest depth of burial along the cable route. The value selected must be independent of the length of cable at that specified depth, and no provisions are made for short cable lengths at an increased burial depth.

5.2.13 Sheath bonding

Ratings are calculated for single core cables with cable sheaths bonded by one of the following methods: end-point, mid-point, or cross-bonded (with equal section lengths).

Single core cables with cable sheaths double point bonded are not covered by this Standard.

5.2.14 Presence of adjacent heat sources

Cable ratings in Section 5.6 are calculated with no adjacent heat sources.

5.3 Application and limitations of ratings factors

5.3.1 Rating factor: Proximity to adjacent circuits

Rating factors due to adjacent in-service circuits are provided in Table 5.7.2.

The rating factor must be selected based on the number of adjacent in-service circuits and the separation distance. The separation distance between circuits is taken as the distance between the centre lines of two conduit banks, as in Figure 4. The derating factor is applicable to three-core HV cables in the adjacent duct bank. Single core cables as the adjacent in-service circuits are not covered in this Standard.

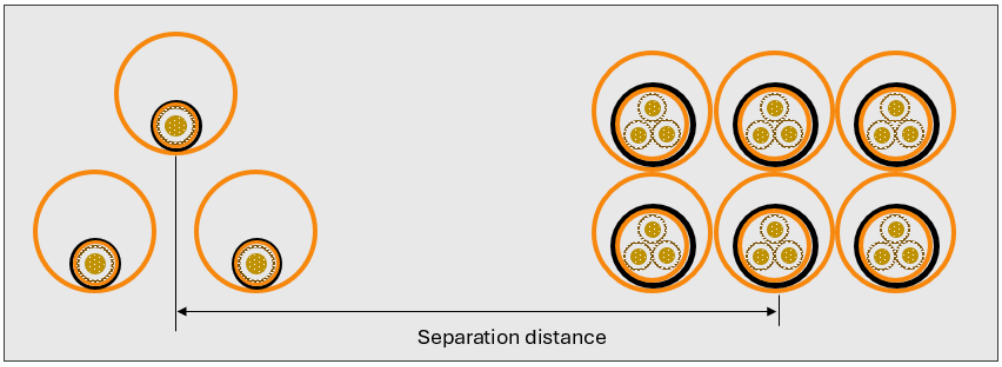

Figure 4 - Separation distance between adjacent in-service circuits.

5.3.2 Rating factor: Conduit separation

Cable ratings in Section 5.6 have been determined with conduit separation distances in accordance with the standard conduit configurations of Figures 1, 2, and 3. Where separation between cable conduits cannot be achieved, or conduits are touching, the conduits touching rating factor shall be applied.

5.3.3 Rating factor: Variation in underbore installation method

Rating factors for various under-bore installation methods have been accounted for in the underbore ratings provided in Tables 5.6.2 and 5.6.3.

An example of a typical underbore construction with conduits touching is provided in Figure 5.

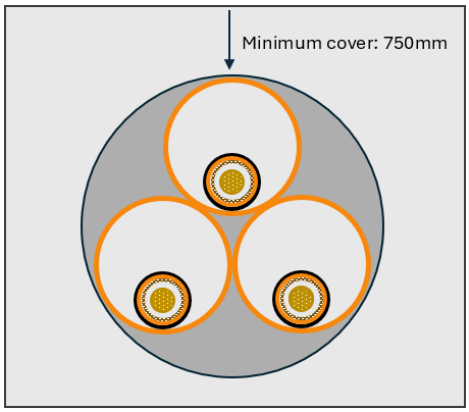

Figure 5 - Trefoil installation of transmission cables in underbore with touching conduits.

5.3.4 Rating factor: Variation in native soil thermal resistivity

The standard ratings provided within this Standard are determined using a native soil thermal resistivity value of 1.2°C.m/W. Where this is not consistent with the installation conditions, the relevant rating factor from Table 5.7.5 will apply.

5.3.5 Rating factor: Variation in backfill material thermal resistivity

The standard ratings in Section 5.6 are determined using a backfill material thermal resistivity value of 1.3°C.m/W. Where this is not consistent with the installation conditions the relevant rating factor from Table 5.7.6 will apply.

Rating factors for variation in backfill material thermal resistivity will only apply where the cross-section dimensions of the thermally rated backfill are at least 600mm in width and 750mm in height.

5.4 Ratings assessment by cable ampacity software

Where cable installation conditions are different to those covered by this Standard, a detailed ratings assessment must be completed using cable ampacity software. The cable ampacity software used must evaluate cable ratings in accordance with IEC 60287 and be capable of representing the ‘as installed’ conditions of the cable.

All rating assessments completed by cable ampacity software must be recorded in detailed rating reports and compiled into design packet and project documents.

5.5 Variations during construction

Variations in cable installation, such as an increased burial depth, will result in a reduced cable rating. It is important that the designer consider these variations to ensure specified circuit ratings are achieved.

Where the cable installation (e.g. depth of the cable / proximity to other cables) is varied from the project design drawing at the time of construction, all changes must be communicated and agreed upon with both the project designer and network planner. The project designer and network planner will determine if there is any change to the cable rating, endorse or reject the changes, and update the design drawing as appropriate.

5.6 Continuous current ratings

5.6.1 Transformer secondary cables (single core Cu conductor)

Voltage	CSA	Cable rating (A) per circuit			
		1 cable per phase	2 cables per phase	3 cables per phase	4 cables per phase
11kV	800mm^2	925	1555	2100	2605
	1200mm^2	1110	1825	2450	3040
22kV	630mm^2	840	1390	1875	2330
	800mm^2	940	1550	2090	2600

5.6.2 Feeder cables – copper wire screen (CWS) cables

Voltage	CSA	Cable Trench (A)										Underbore without casing (A)			Underbore with casing (A)			In air rating (A) See Note 2	
		0.75	0.9	1.0	1.25	1.5	1.75	2.0	2.5	3.0	3.5	4.0	5.0	6.0	4.0	5.0	6.0	Shaded	Un-shaded
		depth of burial (m)																	
33kV	300	561	553	548	538	529	523	517	507	500	494	485	477	471	469	461	454	711	581
	630	823	810	803	787	774	764	754	740	729	719	705	693	684	649	636	627	1091	888
	800	925	910	901	883	868	856	846	830	816	806	789	776	765	711	697	686	1242	1009
	1200	1125	1105	1095	1071	1053	1038	1025	1004	988	974	955	938	924	826	810	797	1600	1295
66kV	630	819	806	799	783	770	760	751	737	726	716	703	691	681	647	635	625	1084	879
132kV	300	560	552	548	538	530	524	518	509	502	495	490	482	475	466	457	450	698	562
	400	638	629	624	612	603	596	589	578	570	563	557	547	540	519	509	501	806	649
	630	824	812	804	789	777	767	758	744	732	723	714	702	692	635	622	612	1069	859
	800	926	912	904	887	872	861	851	834	821	810	801	786	775	691	677	666	1217	977
	1200	1127	1109	1098	1076	1058	1044	1031	1010	994	980	969	951	936	792	775	762	1550	1241
	1600	1270	1249	1237	1212	1191	1174	1160	1136	1117	1101	1088	1067	1051	856	837	822	1784	1425
	2000	1383	1359	1346	1318	1295	1276	1260	1233	1212	1195	1180	1158	1140	902	882	866	1974	1574
	2500	1491	1465	1450	1419	1394	1373	1356	1327	1304	1285	1269	1244	1224	944	923	906	2159	1720

Note 1: Cable ampacity software with finite element method module has been used for cable trench and underbore installations.

Note 2: The in-air ratings provided must not be used with any of the rating factors in Section 5.7. The ratings are calculated for the specific conditions set within Section 5.2.

Note 3: Tabled ratings for 66kV and 132kV cables are for preliminary planning purposes only (refer to clause 5.1)

5.6.3 Feeder cables – smooth aluminium sheath (SAS) cables

Voltage	CSA	Cable Trench (A)										Underbore without casing (A)			Underbore with casing (A)			In air rating (A) See Note 2	
		0.75	0.9	1.0	1.25	1.5	1.75	2.0	2.5	3.0	3.5	4.0	5.0	6.0	4.0	5.0	6.0	Shaded	Un-shaded
		depth of burial (m)																	
33kV	**300**	560	551	547	537	528	522	516	506	499	493	484	476	469	468	459	453	694	567
	630	818	805	798	782	769	759	750	735	724	715	699	687	680	642	630	621	1032	842
	800	917	902	893	875	861	849	839	822	809	799	780	767	756	701	688	677	1160	945
	1200	1106	1087	1077	1054	1036	1021	1008	988	972	959	935	918	905	808	792	779	1452	1179
66kV	**630**	813	800	793	777	765	754	746	731	720	711	696	684	675	640	628	618	1030	837
132kV	**300**	559	551	546	537	529	522	517	508	500	494	489	481	474	464	455	448	681	550
	400	636	627	621	610	601	593	587	576	568	561	554	545	537	517	507	499	783	631
	630	818	806	799	784	772	762	753	739	727	718	709	697	687	630	617	607	1019	822
	800	918	904	896	879	865	853	843	827	814	803	793	779	768	685	671	660	1149	925
	1200	1109	1091	1081	1059	1042	1027	1015	994	978	964	952	934	920	780	763	750	1425	1145
	1600	1242	1221	1209	1184	1164	1147	1133	1110	1091	1076	1060	1040	1024	838	820	805	1602	1286
	2000	1340	1317	1304	1277	1254	1236	1220	1194	1174	1157	1139	1117	1100	878	859	843	1737	1393
	2500	1430	1406	1391	1361	1337	1317	1300	1272	1250	1232	1211	1187	1168	914	893	877	1862	1490

Note 1: Cable ampacity software with finite element method module has been used for cable trench and underbore installations.

Note 2: The in-air ratings provided must not be used with any of the rating factors in Section 5.7. The ratings are calculated for the specific conditions set within Section 5.2.

Note 3: Tabled ratings for 66kV and 132kV cables are for preliminary planning purposes only (refer to clause 5.1)

5.7 Rating factors

5.7.1 Rating factor: Seasonal variations

Season	Summer	Winter
Rating factor	1.00	1.05

5.7.2 Rating factor: Proximity to adjacent circuits

Configuration	Distance to adjacent in-service cable (m)							
	1	2	4	6	8	10	12	>15
1 adjacent circuit	0.93	0.97	0.99	1.00	1.00	1.00	1.00	1.00
Bank of 2 conduits/circuits	0.90	0.95	0.98	1.00	1.00	1.00	1.00	1.00
Bank of 3 conduits/circuits	0.87	0.94	0.98	0.99	1.00	1.00	1.00	1.00
Bank of 4 conduits/circuits	0.86	0.93	0.98	0.99	1.00	1.00	1.00	1.00
Bank of 5 conduits/circuits	0.84	0.92	0.98	0.99	1.00	1.00	1.00	1.00
Bank of 6 conduits/circuits	0.83	0.92	0.97	0.99	1.00	1.00	1.00	1.00

5.7.3 Rating factor: Conduit separation

Construction	Rating factor
Standard conduit spacing	1.00
Conduits touching	0.96

5.7.4 Rating factor: Conduit arrangement

Construction	Rating factor
Trefoil construction	1.00
Flat construction	1.05

5.7.5 Rating factor: Variation in native soil thermal resistivity

Conductor CSA	Soil thermal resistivity (°C.m/W)						
	0.8	0.9	1.0	1.2	1.5	2.0	3.0
300mm^2	1.07	1.05	1.03	1.00	0.96	0.90	0.82
400mm^2	1.07	1.05	1.03	1.00	0.96	0.90	0.81
630mm^2	1.07	1.05	1.03	1.00	0.95	0.89	0.80
800mm^2	1.08	1.05	1.04	1.00	0.96	0.89	0.80
1200mm^2	1.08	1.06	1.04	1.00	0.95	0.89	0.80
1600mm^2	1.08	1.06	1.04	1.00	0.95	0.89	0.79
2000mm^2	1.08	1.06	1.04	1.00	0.95	0.88	0.79
2500mm^2	1.09	1.06	1.04	1.00	0.95	0.88	0.79

5.7.6 Rating factor: Variation in backfill material thermal resistivity

Backfill thermal resistivity (°C.m/W)	0.8	0.9	1.0	1.2	1.3	1.5	2.0	3.0
Rating factor	1.05	1.04	1.03	1.01	1.00	0.98	0.95	0.89

6 Authorities and Responsibilities

Listed below are the positions or groups of positions that have specific authorities and responsibilities associated with this policy/procedure.

General Manager Future Grid and Asset Management has the authority and responsibility for:

- approving major changes to this Standard in accordance with Table 4 of GAM 0001;
- making all decisions concerning compliance with this Standard;
- delegating any of these authorities and responsibilities to the Head of Asset Management and Digital.

Head of Asset Management and Digital has the authority and responsibility for:

- approving minor changes to this Standard in accordance with Table 4 of GAM 0001;
- making recommendations to the General Manager Future Grid & Asset Management for major changes in respect to this Standard.

Head of Future Energy Planning has the authority and responsibility for:

- the cable ratings of commissioned network assets being appropriately and accurately recorded in Network Characteristics.

Asset Engineering Manager has the authority and responsibility for:

- periodic review of and any required amendments to this Standard;
- managing dispensation requests for variations to requirements of this Standard.

Design Manager – Mains has the authority and responsibility for:

- provide advice to Asset Engineering in the review of ratings and associated parameters tabled in this Standard;
- reviewing and approving rating calculations for cables having installation conditions outside this Standard that are required for specific projects.

ADMS Manager has the authority and responsibility for:

- ensuring all continuous cable ratings recorded in Network Characteristics are implemented in ADMS.

Network Control Manager has the authority and responsibility for:

- ensuring all Network Control staff comply with the requirements of this Standard.

Customer Network Engineers are responsible for:

- reviewing designs from L3 ASPs and communicating with L3 ASPs to ensure compliance with this Standard;
- ensuring that rating assessments are collated and stored as part of respective project files.

Project Managers are responsible for

- providing WAE cable ratings to the Head of Future Energy Planning at the time of project commissioning for recording in Network Characteristics;
- communicating and obtaining mutual agreement on design variations encountered during construction with the project designer and network planner.

APPENDIX 1 - Sample cable rating evaluation

The following table is an example of the cable rating evaluation to be included on each project drawing. The format need not be exactly as example below, however, all information specified in column 1 of this table must be included as a minimum.

33kV CABLE RATING EVALUATION - 68G (@90°C OPERATING TEMPERATURE)						
ANTICIPATED CABLE TYPE		33kV 1200mm² Cu 1C XLPE/34kA CWS/HDPE UG CABLE	33kV 1200mm² Cu 1C XLPE/34kA CWS/HDPE UG CABLE	33kV 1200mm² Cu 1C XLPE/34kA CWS/HDPE UG CABLE	33kV 1200mm² Cu 1C XLPE/34kA CWS/HDPE UG CABLE	33kV 1200mm² Cu 1C XLPE/34kA CWS/HDPE UG CABLE
SECTION		DUCT NODE A - B	DUCT NODE B - C	DUCT NODE C - D	DUCT NODE D - E	DUCT NODE E - F
VOLTAGE (kV)		33	33	33	33	33
CABLE CSA (mm²)		1200	1200	1200	1200	1200
FINAL CONDUIT COVER (m)		2.2 (WORST CASE)	1.64 (WORST CASE)	1.1 (WORST CASE)	-	-
CABLE RATING UTILISING MDI0046		1001	1035	1081	1439	1439
DISTANCE TO ADJACENT DUCT BANK		8m	3m & 5m	1m	6x 33kV CABLES WITHIN 1-2m	6x 33kV CABLES WITHIN 1-2m
DUCT CONFIGURATION		FLAT	FLAT	DIRECTLY LAID IN SOIL	-	-
PROPOSED BACKFILL TR (°K.m/W)		1.0	1.0	1.0	1.0	1.0
RATING FACTORS	SEASONAL VARIATION SUMMER	1.0	1.0	1.0	1.0	1.0
	SEASONAL VARIATION WINTER	1.05	1.05	1.05	1.05	1.05
	PROXIMITY TO ADJACENT CIRCUIT	1.0	0.95	0.9	0.83	0.83
	DUCT ARRANGEMENT (TREFOIL/FLAT)	1.05	1.05	-	-	-
	DUCT SEPARATION (STANDARD/DUCTS TOUCHING)	1.0	1.0	-	-	-
	UNDERBORE VARIATION	-	-	-	-	-
	VARIATION IN BULK SOIL TR (1.527°K.m/W 0% MC)	0.93	0.93	0.93	-	-
	VARIATION IN BACKFILL TR (1.2°K.m/W OR LESS)	1.0	1.0	1.0	-	-
EVALUATED FEEDER RATING (A) CONTINUOUS RATING		977.48 (SUMMER) 1,026.35 (WINTER)	960.14 (SUMMER) 1,008.15 (WINTER)	904.8 (SUMMER) 950.04 (WINTER)	1194.37 (SUMMER) 1254.09 (WINTER)	1194.37 (SUMMER) 1254.09 (WINTER)
EVALUATED FEEDER RATING (MVA) CONTINUOUS RATING		55.9 (SUMMER) 58.6 (WINTER)	54.9 (SUMMER) 57.6 (WINTER)	51.7 (SUMMER) 54.3 (WINTER)	68.3 (SUMMER) 71.7 (WINTER)	68.3 (SUMMER) 71.7 (WINTER)

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