WESTERN POWER DISTRIBUTION

Serving the South West and Wales
Gwasanaethu'r De Orllewin a Chymru

Company Directive

STANDARD TECHNIQUE: SD8B/3 (Part 6)

Relating to 275kV Underground Cable Ratings

Policy Summary

This document contains 275kV cable ratings of the various types of 275kV cables used within Western Power Distribution South West and South Wales areas. It assumes that the cables will be subjected to the cyclic load as given by the load curve shown in figure one. If other load curves are required contact the Company Cable Engineer.

This Standard Technique should be used when designing any 275kV electricity distribution network that has underground cables in it.

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Approved by PJ Wen

Policy Manager

Date: 30-03-09

1.0 INTRODUCTION

This Standard Technique replaces Standard Technique ST: SD 8B/2.

This Part 6 document of ST: SD 8B sets out the all the WPD, 275kV underground cable Sustained ratings and Cyclic ratings for winter, spring, summer and autumn which are to be applied. These ratings are based on Crater for EHV polymeric Cables, Crater for Oil filled Cables.

2.0 UNDERGROUND CABLES

The main factors governing the rating of underground cables are: -

Maximum depth of lay;

Soil thermal resistivity Tr (g);

Ground ambient temperature (^{O}C);

Air ambient temperature (^{O}C);

Cyclic loading conditions;

Maximum permissible conductor temperature;

Proximity to other cables;

Whether the cable is laid direct in the ground, in ducts or in air.

Duct dimensions and duct type

3.0 CRITERIA

3.1 General criteria for 275kV cables (applies to Oil filled, and XLPE cables)

A winter soil resistivity of 0.9^{O}Cm/W and a summer soil resistivity of 1.2^{o}Cm/W are considered realistic for the South West and South Wales, although the possibility of localised higher values may need to be taken into account. To control the thermal resistivity of the surrounding medium then the best example would be to use cement bound sand (CBS) backfill for a cable route, but this is expensive. Generally crushed Limestone dust or crushed Granite dust 3mm to dust is suitable as this gives a Tr of 1.2^{o}Cm/W.

Ground ambient temperatures across the South West and South Wales vary between 7^{O}C in the winter and 15^{O}C in the summer. These values apply in most locations, but winter ground temperatures in the city centres such as Bristol, Cardiff, Exeter, Plymouth and Swansea will be about 2^{O}C higher.

3.2 The current ratings quoted in this document are maximum values based on balanced loads.

3.3 The current ratings quoted apply to cables supplying loads, during the requisite season.

3.4 The current ratings specified are to be adjusted where the conditions are known to vary from those quoted in this instruction i.e. high summer loads or grouping.

3.5 The maximum conductor temperature for oil filled cable is 85^{o}C. The maximum conductor temperature for XLPE cables is 90^{o}C.

3.6 When two or more cables or trefoil groups are laid in the same trench then a derating factor needs to be applied to both circuits. The amount of derating is dependant upon the spacing of the circuits. All spacing distances quoted in this document are **centre-to-centre** spacing's of the cables or trefoil groups.

3.7 Only 275kV Ratings are now included in this document.

3.8 The ratings are detailed as **Sustained** - Winter, Spring, Summer and Autumn; **Cyclic** - Winter, Spring, Summer and Autumn; for each of the cable types included in this document.

3.9 Each cable type for which ratings have been generated the typical assumed installation conditions are given in the formation shown below: -

Depth of lay 1m;

Soil resistivity of 0.9^{O}Cm/W;

Ground ambient temperature of 10^{O}C;

Maximum conductor temperature of 85^{O}C for 275kV single core oil filled cables. All polymeric cables e.g. XLPE have a maximum conductor temperature of 90°C.

No allowance made for grouping of cable circuits.

4.0 DEFINITIONS

All 275kV EPR single core circuits, for the purpose of this document, have been assumed to be three single-core polymeric or oil filled cables laid in flat space with a spacing of 2D throughout their length. That the copper wire screens and or the lead sheaths of the cables have been cross bonded together to form major and minor sections within the length of the circuit.

For any other type of configuration then contact the Company Cable Engineer at Avonbank.

4.1 Sustained, Continuous or Steady-State rating

The sustained rating is the maximum current that can be carried, in defined conditions, without the assumed maximum conductor temperature being exceeded.

4.2 Cyclic rating

A cyclic rating is the maximum current that maybe carried during the prolonged application of a succession of identical 24-hour load cycles, without the assumed maximum conductor temperature being exceeded.

4.3 Utilisation factor

This is not applicable at 275kV.

4.4 Load Factor

The ratio of the number of units supplied during a given period, to the number of units that would be supplied, had the maximum demand been maintained throughout that period. This is usually expressed as a percentage.

4.5 Soil thermal conductivity

The soil thermal conductivity is the thermal transmission in unit time through unit area of homogeneous soil of unit thickness, when unit difference of temperature is established between its surfaces.

4.6 Soil thermal resistivity

The ratings given are calculated for a damp thermal resistivity, which is suitable for rating cables for winter-peak loads.

4.7 Ground ambient temperature

Where a cable circuit carries a sustained load and does not have a seasonal variation it should be rated for the maximum summer value of ground temperature.

4.8 Ducts

A duct up to 15m in length can be used without derating the cable. Two or more duct lengths can be used on a section, provided that there is no more than 30m of duct in a particular 250m cable section and that there is a minimum of 10m separation between each duct length. See the example given below.

Example of two 15m-duct lengths in a 250m-cable section.

The correct duct rating shall be used if 15m or more of continuous duct is installed on a particular 250m-cable section. This rating is dependant upon the type of ducting used, for this reason the ratings given in the tables contain values for both smooth walled “PVC” and “Rigiduct” (Rigiduct is a twin walled duct) type ducting.

The rating of the cable section can be restored if the ducts are bentonited after the cables have been installed. To ensure the thermal equivalence to the direct buried parts of the route, the ducts shall be completely filled with a bentonite-sand-cement mixture.

The filling medium shall be prepared by adding 20 parts of sand and 8 parts of cements, by weight, to 100 parts of a 10:1 water/bentonite mixture.

Note: - Provided the bentonite is sealed into the duct with duct seals, and then the bentonite forms a gel, which is stabilized by the cement, and the addition of sand increases the load-bearing properties of the mixture. Should it be necessary to remove this mixture, it may be flushed out of the ducts by using high-pressure water jets.
Ducts, which are filled with a bentonite mixture, shall be installed wherever possible in a concrete surround but if not, any joints in the duct run must be effectively sealed. At the duct ends, the gap around the cable must be effectively sealed to prevent migration of the bentonite mixture and preserve its moisture content under service conditions.

In general duct lengths of up to 100m can be filled where a standard 150mm nominal bore duct is installed.

4.9 Cables exposed to the sun

To reduce the effect of solar radiation it is recommended that cables should be shielded from direct rays of the sun without restriction of ventilation.

4.10 Effects of grouping of cables

No allowance has been made for grouping in the ratings listed in the tables. Use the correction factors given in Table 1 for various grouping arrangements.

When two or more circuits of the same voltage are laid in close proximity the ratings of the cables must be reduced by multiply the group-rating factor given in Table 1 with the relevant cable rating selected from this document. It should be noted that if thermally independence of both the circuits is required, then the circuits need a centre-to-centre spacing of 2.5m.

All spacing quoted in Table 1, are a centre-to-centre spacing for the relevant circuits.

4.11 Loading Conditions

All the ratings listed in this document are calculated for a particular typical domestic/commercial daily load curve, having a loss load factor of 0.5. See Figure 1 for the load curve.

Ratings given for cables installed in air and clipped direct to a wall are the steady-state ratings. Cables installed in this manner do NOT have a Cyclic rating just their sustained or steady state rating.

5.0 FURTHER GUIDANCE

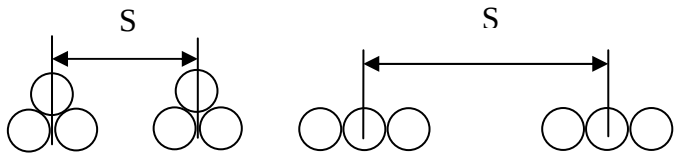
If required, further guidance should be sought from the Company Cable Engineer, Policy Section, Avonbank, Feeder Road, Bristol where necessary.

5.1 INDEX

TABLE	DESCRIPTION
Table 1	Group Derating Factors for Circuits.
Figure 1	Typical Load Curve G.
A1 win	275kV XLPE Lead Sheath and MDPE oversheath - **WINTER** – Sustained and Cyclic Current Ratings.
A2 spr	275kV XLPE Lead Sheath and MDPE oversheath - **SPRING –** Sustained and Cyclic Current Ratings.
A3 sum	275kV XLPE Lead Sheath and MDPE oversheath - **SUMMER –** Sustained and Cyclic Current Ratings.
A4 aut	275kV XLPE Lead Sheath and MDPE oversheath - **AUTUMN –** Sustained and Cyclic Current Ratings.
B1 win	275kV Single core, oil filled corrugated Al sheath cable - **WINTER –** Sustained and Cyclic Current Ratings.
B2 spr	275kV Single core, oil filled corrugated Al sheath cable - **SPRING –** Sustained and Cyclic Current Ratings.
B3 sum	275kV Single core, oil filled corrugated Al sheath cable - **SUMMER –** Sustained and Cyclic Current Ratings.
B4 aut	275kV Single core, oil filled corrugated Al sheath cable - **AUTUMN –** Sustained and Cyclic Current Ratings.
C1 win	275kV Single core, oil filled lead sheath cable - **WINTER –** Sustained and Cyclic Current Ratings.
C2spr	275kV Single core, oil filled lead sheath cable - **SPRING –** Sustained and Cyclic Current Ratings.
C3 sum	275kV Single core, oil filled lead sheath cable - **SUMMER –** Sustained and Cyclic Current Ratings.
C4 aut	275kV Single core, oil filled lead sheath cable - **AUTUMN –** Sustained and Cyclic Current Ratings.

TABLE 1

GROUP DERATING FACTORS FOR CIRCUITS OF THREE SINGLE-CORE CABLES, IN TREFOIL or LAID FLAT, HORIZONTAL FORMATION, LAID DIRECT.



Type of Cable	No. of Circuits	Spacing of Circuits – Metre (S).				
		Touching				
		Trefoil	Laid Flat			
275kV Cables	Contact Company Cable Engineer in Avonbank for information.					

Figure 1

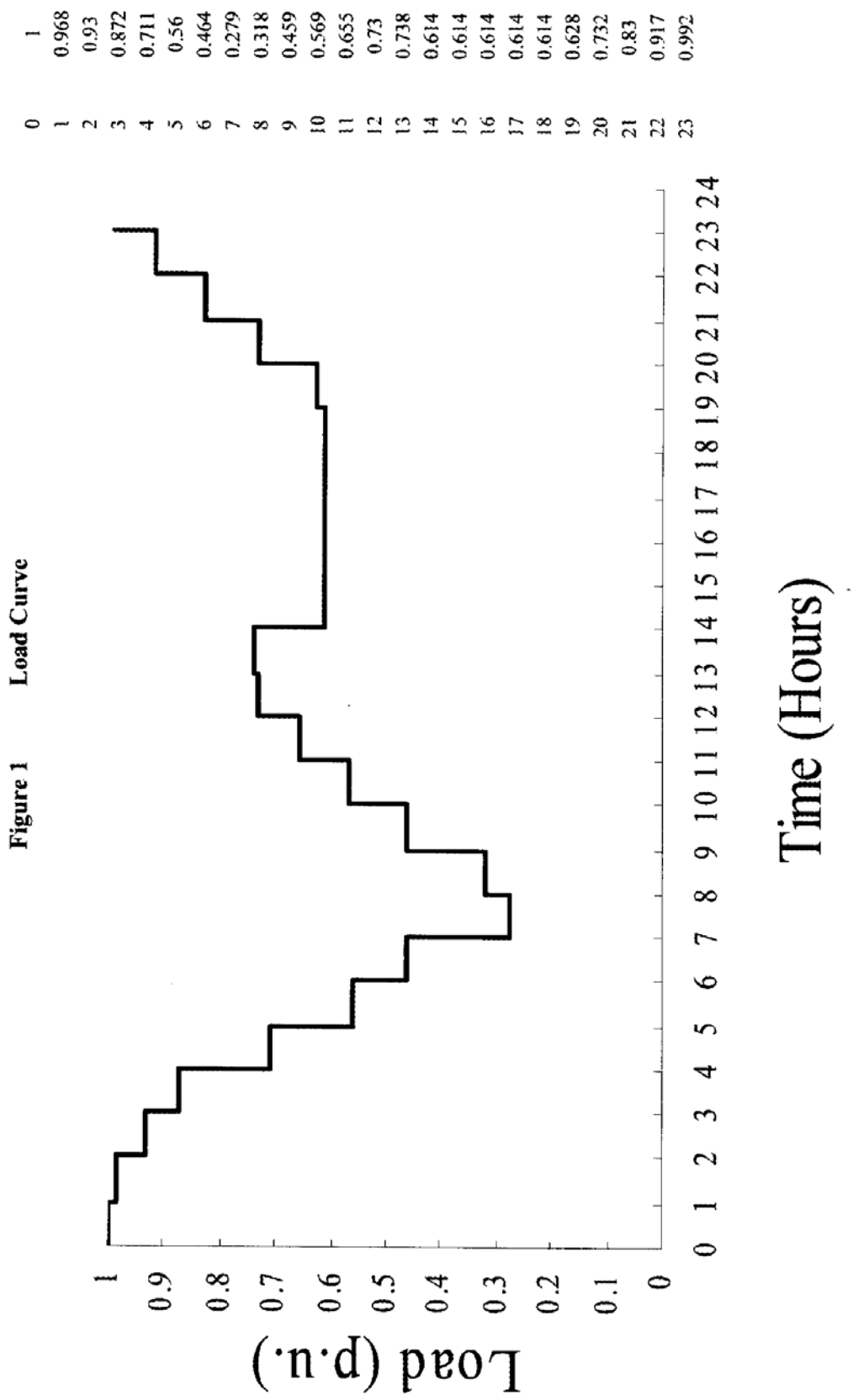


Figure 1 Load Curve
0 1
1 0.968
2 0.93
3 0.872
4 0.711
5 0.56
6 0.464
7 0.279
8 0.318
9 0.459
10 0.569
11 0.655
12 0.73
13 0.738
14 0.614
15 0.614
16 0.614
17 0.614
18 0.614
19 0.628
20 0.732
21 0.83
22 0.917
23 0.992
Load (p.u.)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Time (Hours)

TABLE A1 – Win

275kV SINGLE CORE X.L.P.E. INSULATED LEAD SHEATH & M.D.P.E. OUTER SHEATH CABLES, LAID IN TREFOIL. (Dry design)

Winter *SUSTAINED* Current Ratings

SIZE AND TYPE OF CABLE CONDUCTOR	SUSTAINED CURRENT RATINGS-AMPS			
	CABLE IN GROUND	CABLE IN DUCTS		CABLE IN AIR
		PVC	Rigiduct	
Metric sizes				
Copper conductors				
1000mm² Copper	1045	882	826	1390
1200Smm² Copper	1080	907	849	1504
1600Smm² Copper	1165	979	911	1677
2000Smm² Copper	1237	1048	970	1839
2500Smm² Copper	1421	1177	1072	2148

Note: - S = segmental conductor stranding.

Parameters

Maximum depth of lay	1m
Soil Thermal Resistivity (g)	0.9°C m/W
Ground Ambient Temperature	10°C
Air Ambient Temperature	10°C
Maximum Conductor Temperature	90°C

Ratings based on Crater for EHV polymeric cables.

TABLE A1 – Win

275kV SINGLE CORE X.L.P.E. INSULATED LEAD SHEATH & M.D.P.E. OUTER SHEATH CABLES, LAID IN TREFOIL. (Dry design)

Winter *CYCLIC* Current Ratings

SIZE AND TYPE OF CABLE CONDUCTOR	CYCLIC CURRENT RATINGS-AMPS			
	CABLE IN GROUND	CABLE IN DUCTS		CABLE IN AIR
		PVC	Rigiduct	
Metric sizes				
Copper conductors				
1000mm² Copper	1261	1092	1036	1390
1200Smm² Copper	1313	1130	1072	1504
1600Smm² Copper	1438	1260	1190	1677
2000Smm² Copper	1541	1360	1279	1839
2500Smm² Copper	1782	1540	1426	2148

Note: - S = segmental conductor stranding.

Parameters

Maximum depth of lay	1m
Soil Thermal Resistivity (g)	0.9°C m/W
Ground Ambient Temperature	10°C
Air Ambient Temperature	10°C
Maximum Conductor Temperature	90°C

Ratings based on Crater for HV polymeric cables.

TABLE A2 – Spr

275kV SINGLE CORE X.L.P.E. INSULATED LEAD SHEATH & M.D.P.E. OUTER SHEATH CABLES, LAID IN TREFOIL. (Dry design)

Spring ***SUSTAINED*** Current Ratings

SIZE AND TYPE OF CABLE CONDUCTOR	SUSTAINED CURRENT RATINGS-AMPS			
	CABLE IN GROUND	CABLE IN DUCTS		CABLE IN AIR
		PVC	Rigiduct	
Metric sizes				
Copper conductors				
1000mm^2 Copper	968	824	774	1390
1200Smm^2 Copper	997	847	796	1504
1600Smm^2 Copper	1075	913	854	1677
2000Smm^2 Copper	1139	975	908	1839
2500Smm^2 Copper	1307	1039	1002	2148

Note: - S = segmental conductor stranding.

Parameters

Maximum depth of lay	1m
Soil Thermal Resistivity (g)	1.05^{o}C m/W
Ground Ambient Temperature	12^{o}C
Air Ambient Temperature	12^{o}C
Maximum Conductor Temperature	90^{o}C

Ratings based on Crater for EHV polymeric cables.

275kV SINGLE CORE X.L.P.E. INSULATED LEAD SHEATH & M.D.P.E. OUTER SHEATH CABLES, LAID IN TREFOIL. (Dry design)

Spring ***CYCLIC*** Current Ratings

SIZE AND TYPE OF CABLE CONDUCTOR	CYCLIC CURRENT RATINGS-AMPS			
	CABLE IN GROUND	CABLE IN DUCTS		CABLE IN AIR
		PVC	Rigiduct	
Metric sizes				
Copper conductors				
1000mm² Copper	1179	1029	980	1390
1200Smm² Copper	1224	1063	1013	1504
1600Smm² Copper	1337	1182	1121	1677
2000Smm² Copper	1430	1273	1202	1839
2500Smm² Copper	1652	1439	1338	2148

Note: - S = segmental conductor stranding.

Parameters

Maximum depth of lay	1m
Soil Thermal Resistivity (g)	1.05^{o}C m/W
Ground Ambient Temperature	12^{o}C
Air Ambient Temperature	12^{o}C
Maximum Conductor Temperature	90^{o}C

Ratings based on Crater for EHV polymeric cables.

275kV SINGLE CORE X.L.P.E. INSULATED LEAD SHEATH & M.D.P.E. OUTER SHEATH CABLES, LAID IN TREFOIL. (Dry design)

Summer ***SUSTAINED*** Current Ratings

SIZE AND TYPE OF CABLE CONDUCTOR	SUSTAINED CURRENT RATINGS-AMPS			
	CABLE IN GROUND	CABLE IN DUCTS		CABLE IN AIR
		PVC	Rigiduct	
Metric sizes				
Copper conductors				
1000mm² Copper	896	767	724	1390
1200Smm² Copper	921	788	744	1504
1600Smm² Copper	991	849	797	1677
2000Smm² Copper	1049	905	847	1839
2500Smm² Copper	1203	1015	934	2148

Note: - S = segmental conductor stranding.

Parameters

Maximum depth of lay 1m

Soil Thermal Resistivity (g) 1.2 C m/W

Ground Ambient Temperature 15^{o}C

Air Ambient Temperature 15^{o}C

Maximum Conductor Temperature 90^{o}C

Ratings based on Crater for EHV polymeric cables.

TABLE A3 - Sum

275kV SINGLE CORE X.L.P.E. INSULATED LEAD SHEATH & M.D.P.E. OUTER SHEATH CABLES, LAID IN TREFOIL. (Dry design)

Summer ***CYCLIC*** Current Ratings

SIZE AND TYPE OF CABLE CONDUCTOR	CYCLIC CURRENT RATINGS-AMPS			
	CABLE IN GROUND	CABLE IN DUCTS		CABLE IN AIR
		PVC	Rigiduct	
Metric sizes				
Copper conductors				
1000mm² Copper	1100	966	923	1390
1200Smm² Copper	1139	998	953	1504
1600Smm² Copper	1242	1105	1052	1677
2000Smm² Copper	1326	1188	1126	1839
2500Smm² Copper	1530	1341	1251	2148

Note: - S = segmental conductor stranding.

Parameters

Maximum depth of lay	1m
Soil Thermal Resistivity (g)	1.2 ^{o}C m/W
Ground Ambient Temperature	15^{o}C
Air Ambient Temperature	15^{o}C
Maximum Conductor Temperature	90^{o}C

Ratings based on Crater for HV polymeric cables.

275kV SINGLE CORE X.L.P.E. INSULATED LEAD SHEATH & M.D.P.E. OUTER SHEATH CABLES, LAID IN TREFOIL. (Dry design)

Autumn ***SUSTAINED*** Current Ratings

SIZE AND TYPE OF CABLE CONDUCTOR	SUSTAINED CURRENT RATINGS-AMPS			
	CABLE IN GROUND	CABLE IN DUCTS		CABLE IN AIR
		PVC	Rigiduct	
Metric sizes				
Copper conductors				
1000mm² Copper	950	809	762	1390
1200Smm² Copper	977	832	783	1504
1600Smm² Copper	1052	896	840	1677
2000Smm² Copper	1115	957	893	1839
2500Smm² Copper	1279	1074	985	2148

Note: - S = segmental conductor stranding.

Parameters

Maximum depth of lay	1m
Soil Thermal Resistivity (g)	1.1 C m/W
Ground Ambient Temperature	12°C
Air Ambient Temperature	12°C
Maximum Conductor Temperature	90°C

Ratings based on Crater for EHV polymeric cables.

275kV SINGLE CORE X.L.P.E. INSULATED LEAD SHEATH & M.D.P.E. OUTER SHEATH CABLES, LAID IN TREFOIL. (Dry design)

Autumn ***CYCLIC*** Current Ratings

SIZE AND TYPE OF CABLE CONDUCTOR	CYCLIC CURRENT RATINGS-AMPS			
	CABLE IN GROUND	CABLE IN DUCTS		CABLE IN AIR
		PVC	Rigiduct	
Metric sizes				
Copper conductors				
1000mm² Copper	1160	1014	967	1390
1200Smm² Copper	1202	1048	999	1504
1600Smm² Copper	1313	1163	1104	1677
2000Smm² Copper	1403	1252	1184	1839
2500Smm² Copper	1620	1415	1317	2148

Note: - S = segmental conductor stranding.

Parameters

Maximum depth of lay	1m
Soil Thermal Resistivity (g)	1.1 ^{o}C m/W
Ground Ambient Temperature	12^{o}C
Air Ambient Temperature	12^{o}C
Maximum Conductor Temperature	90^{o}C

Ratings based on Crater for EHV polymeric cables.

TABLE B1 – win

275kV SINGLE CORE, OIL FILLED, DUCTLESS, CORRUGATED ALUMINIUM SHEATH, CABLE.

Winter ***SUSTAINED*** Current Ratings

SIZE AND TYPE OF CABLE CONDUCTOR	SUSTAINED CURRENT RATINGS - AMPS			
	CABLE IN GROUND	CABLE IN DUCTS		CABLE IN AIR
		PVC	Rigiduct	
Metric sizes				
Copper conductors				
2500mm^2 Copper	957	843	790	1550

Parameters

Maximum depth of lay	1m
Soil Thermal Resistivity (g)	0.9^{o}C m/W
Ground Ambient Temperature	10^{o}C
Air Ambient Temperature	10^{o}C
Maximum Conductor Temperature	85^{o}C

Ratings based on Crater for Oil filled cables.

TABLE B1 – win

275kV SINGLE CORE, OIL FILLED, DUCTLESS, CORRUGATED ALUMINIUM SHEATH, CABLE.

Winter ***CYCLIC*** Current Ratings

SIZE AND TYPE OF CABLE CONDUCTOR	CYCLIC CURRENT RATINGS - AMPS			
	CABLE IN GROUND	CABLE IN DUCTS		CABLE IN AIR
		PVC	Rigiduct	
Metric sizes				
Copper conductors				
2500mm^2 Copper	1204	1107	1049	1550

Parameters

Maximum depth of lay	1m
Soil Thermal Resistivity (g)	0.9^{o}C m/W
Ground Ambient Temperature	10^{o}C
Air Ambient Temperature	10^{o}C
Maximum Conductor Temperature	85^{o}C

Ratings based on Crater for Oil filled cables.

TABLE B2 - spr

275kV SINGLE CORE, OIL FILLED, DUCTLESS, CORRUGATED ALUMINIUM SHEATH, CABLE.

Spring ***SUSTAINED*** Current Ratings

SIZE AND TYPE OF CABLE CONDUCTOR	SUSTAINED CURRENT RATINGS - AMPS			
	CABLE IN GROUND	CABLE IN DUCTS		CABLE IN AIR
		PVC	Rigiduct	
Metric sizes				
Copper conductors				
2500mm^2 Copper	877	783	737	1550

Parameters

Maximum depth of lay	1m
Soil Thermal Resistivity (g)	1.05^{O}C m/W
Ground Ambient Temperature	12^{O}C
Air Ambient Temperature	12^{O}C
Maximum Conductor Temperature	85^{O}C

Ratings based on Crater for Oil filled cables.

TABLE B2 – spr

275kV SINGLE CORE, OIL FILLED, DUCTLESS, CORRUGATED ALUMINIUM SHEATH, CABLE.

Spring ***CYCLIC*** Current Ratings

SIZE AND TYPE OF CABLE CONDUCTOR	CYCLIC CURRENT RATINGS - AMPS			
	CABLE IN GROUND	CABLE IN DUCTS		CABLE IN AIR
		PVC	Rigiduct	
Metric sizes				
Copper conductors				
2500mm^2 Copper	1111	1032	983	1550

Parameters

Maximum depth of lay	1m
Soil Thermal Resistivity (g)	1.05^{o}C m/W
Ground Ambient Temperature	12^{o}C
Air Ambient Temperature	12^{o}C
Maximum Conductor Temperature	85^{o}C

Ratings based on Crater for Oil filled cables.

TABLE B3 – sum

275kV SINGLE CORE, OIL FILLED, DUCTLESS, CORRUGATED ALUMINIUM SHEATH, CABLE.

Summer ***SUSTAINED*** Current Ratings

SIZE AND TYPE OF CABLE CONDUCTOR	SUSTAINED CURRENT RATINGS - AMPS			
	CABLE IN GROUND	CABLE IN DUCTS		CABLE IN AIR
		PVC	Rigiduct	
Metric sizes				
Copper conductors				
2500mm^2 Copper	772	695	657	1550

Parameters

Maximum depth of lay	1m
Soil Thermal Resistivity (g)	1.2^{o}C m/W
Ground Ambient Temperature	15^{o}C
Air Ambient Temperature	15^{o}C
Maximum Conductor Temperature	85^{o}C

Ratings based on Crater for Oil filled cables.

TABLE B3 – sum

275kV SINGLE CORE, OIL FILLED, DUCTLESS, CORRUGATED ALUMINIUM SHEATH, CABLE.

Summer ***CYCLIC*** Current Ratings

SIZE AND TYPE OF CABLE CONDUCTOR	CYCLIC CURRENT RATINGS - AMPS			
	CABLE IN GROUND	CABLE IN DUCTS		CABLE IN AIR
		PVC	Rigiduct	
Metric sizes				
Copper conductors				
2500mm^2 Copper	984	921	879	1550

Parameters

Maximum depth of lay	1m
Soil Thermal Resistivity (g)	1.2^{o}C m/W
Ground Ambient Temperature	15^{o}C
Air Ambient Temperature	15^{o}C
Maximum Conductor Temperature	85^{o}C

Ratings based on Crater for Oil filled cables.

275kV SINGLE CORE, OIL FILLED, DUCTLESS, CORRUGATED ALUMINIUM SHEATH, CABLE.

Autumn ***SUSTAINED*** Current Ratings

SIZE AND TYPE OF CABLE CONDUCTOR	SUSTAINED CURRENT RATINGS - AMPS			
	CABLE IN GROUND	CABLE IN DUCTS		CABLE IN AIR
		PVC	Rigiduct	
Metric sizes				
Copper conductors				
2500mm^2 Copper	838	750	707	1550

Parameters

Maximum depth of lay	1m
Soil Thermal Resistivity (g)	1.1^{O}C m/W
Ground Ambient Temperature	12^{O}C
Air Ambient Temperature	12^{O}C
Maximum Conductor Temperature	85^{O}C

Ratings based on Crater for Oil filled cables.

275kV SINGLE CORE, OIL FILLED, DUCTLESS, CORRUGATED ALUMINIUM SHEATH, CABLE.

Autumn ***CYCLIC*** Current Ratings

SIZE AND TYPE OF CABLE CONDUCTOR	CYCLIC CURRENT RATINGS - AMPS			
	CABLE IN GROUND	CABLE IN DUCTS		CABLE IN AIR
		PVC	Rigiduct	
Metric sizes				
Copper conductors				
2500mm^2 Copper	1064	991	945	1550

Parameters

Maximum depth of lay	1m
Soil Thermal Resistivity (g)	1.1^{o}C m/W
Ground Ambient Temperature	12^{o}C
Air Ambient Temperature	12^{o}C
Maximum Conductor Temperature	85^{o}C

Ratings based on Crater for Oil filled cables.

TABLE C1 - Win

275kV SINGLE CORE, OIL FILLED, DUCTED, LEAD SHEATH, CABLE.

Winter ***SUSTAINED*** Current Ratings

SIZE AND TYPE OF CABLE CONDUCTOR	SUSTAINED CURRENT RATINGS-AMPS			
	CABLE IN GROUND	CABLE IN DUCTS		CABLE IN AIR
		PVC	Rigiduct	
Metric sizes				
Copper conductors				
2500mm² Copper	1245	973	880	1931
Imperial sizes				
Copper conductors				
1. 5in² Copper	955	797	745	1246

Parameters

Maximum depth of lay	1m
Soil Thermal Resistivity (g)	0.9°C m/W
Ground Ambient Temperature	10°C
Air Ambient Temperature	10°C
Maximum Conductor Temperature	85°C

Ratings based on Crater for Oil filled cables.

275kV SINGLE CORE, OIL FILLED, DUCTED, LEAD SHEATH, CABLE.

Winter ***CYCLIC*** Current Ratings

SIZE AND TYPE OF CABLE CONDUCTOR	CYCLIC CURRENT RATINGS-AMPS			
	CABLE IN GROUND	CABLE IN DUCTS		CABLE IN AIR
		PVC	Rigiduct	
Metric sizes				
Copper conductors				
2500mm^2 Copper	1538	1218	1112	1931
Imperial sizes				
Copper conductors				
1. 5in^2 Copper	1135	965	908	1246

Parameters

Maximum depth of lay	1m
Soil Thermal Resistivity (g)	0.9^{o}C m/W
Ground Ambient Temperature	10^{o}C
Air Ambient Temperature	10^{o}C
Maximum Conductor Temperature	90^{o}C

Ratings based on Crater for Oil filled cables.

TABLE C2 - Spr

275kV SINGLE CORE, OIL FILLED, DUCTED, LEAD SHEATH, CABLE.

Spring ***SUSTAINED*** Current Ratings

SIZE AND TYPE OF CABLE CONDUCTOR	SUSTAINED CURRENT RATINGS-AMPS			
	CABLE IN GROUND	CABLE IN DUCTS		CABLE IN AIR
		PVC	Rigiduct	
Metric sizes				
Copper conductors				
2500mm^2 Copper	1142	903	821	1931
Imperial sizes				
Copper conductors				
1. 5in^2 Copper	892	752	706	1246

Parameters

Maximum depth of lay	1m
Soil Thermal Resistivity (g)	1.05^{o}C m/W
Ground Ambient Temperature	12^{o}C
Air Ambient Temperature	12^{o}C
Maximum Conductor Temperature	85^{o}C

Ratings based on Crater for Oil filled cables.

275kV SINGLE CORE, OIL FILLED, DUCTED, LEAD SHEATH, CABLE.

Spring ***CYCLIC*** Current Ratings

SIZE AND TYPE OF CABLE CONDUCTOR	CYCLIC CURRENT RATINGS-AMPS			
	CABLE IN GROUND	CABLE IN DUCTS		CABLE IN AIR
		PVC	Rigiduct	
Metric sizes				
Copper conductors				
2500mm² Copper	1423	1141	1043	1931
Imperial sizes				
Copper conductors				
1. 5in² Copper	1070	919	868	1246

Parameters

Maximum depth of lay	1m
Soil Thermal Resistivity (g)	1.05^{o}C m/W
Ground Ambient Temperature	12^{o}C
Air Ambient Temperature	12^{o}C
Maximum Conductor Temperature	85^{o}C

Ratings based on Crater for Oil filled cables.

275kV SINGLE CORE, OIL FILLED, DUCTED, LEAD SHEATH, CABLE.

Summer ***SUSTAINED*** Current Ratings

SIZE AND TYPE OF CABLE CONDUCTOR	SUSTAINED CURRENT RATINGS-AMPS			
	CABLE IN GROUND	CABLE IN DUCTS		CABLE IN AIR
		PVC	Rigiduct	
Metric sizes				
Copper conductors				
2500mm² Copper	1006	803	731	1931
Imperial sizes				
Copper conductors				
1.05in² Copper	802	682	642	1246

Parameters

Maximum depth of lay	1m
Soil Thermal Resistivity (g)	1.2°C m/W
Ground Ambient Temperature	15°C
Air Ambient Temperature	15°C
Maximum Conductor Temperature	85°C

Ratings based on Crater for Oil filled cables.

275kV SINGLE CORE, OIL FILLED, DUCTED, LEAD SHEATH, CABLE.

Summer ***CYCLIC*** Current Ratings

SIZE AND TYPE OF CABLE CONDUCTOR	CYCLIC CURRENT RATINGS-AMPS			
	CABLE IN GROUND	CABLE IN DUCTS		CABLE IN AIR
		PVC	Rigiduct	
Metric sizes				
Copper conductors				
2500mm² Copper	1262	1021	938	1931
Imperial sizes				
Copper conductors				
1. 5in² Copper	971	842	796	1246

Parameters

Maximum depth of lay	1m
Soil Thermal Resistivity (g)	1.2°C m/W
Ground Ambient Temperature	15°C
Air Ambient Temperature	15°C
Maximum Conductor Temperature	85°C

Ratings based on Crater for Oil filled cables.

275kV SINGLE CORE, OIL FILLED, DUCTED, LEAD SHEATH, CABLE.

Autumn ***SUSTAINED*** Current Ratings

SIZE AND TYPE OF CABLE CONDUCTOR	SUSTSAINED CURRENT RATINGS-AMPS			
	CABLE IN GROUND	CABLE IN DUCTS		CABLE IN AIR
		PVC	Rigiduct	
Metric sizes				
Copper conductors				
2500mm² Copper	1092	866	788	1931
Imperial sizes				
Copper conductors				
1. 5in² Copper	858	726	682	1246

Parameters

Maximum depth of lay	1m
Soil Thermal Resistivity (g)	1.1°C m/W
Ground Ambient Temperature	12°C
Air Ambient Temperature	12°C
Maximum Conductor Temperature	85°C

Ratings based on Crater for Oil filled cables.

TABLE C4 - aut

275kV SINGLE CORE, OIL FILLED, DUCTED, LEAD SHEATH, CABLE.

Autumn ***CYCLIC*** Current Ratings

SIZE AND TYPE OF CABLE CONDUCTOR	CYCLIC CURRENT RATINGS-AMPS			
	CABLE IN GROUND	CABLE IN DUCTS		CABLE IN AIR
		PVC	Rigiduct	
Metric sizes				
Copper conductors				
2500mm^2 Copper	1363	1097	1006	1931
Imperial sizes				
Copper conductors				
1. 5in^2 Copper	1034	891	841	1246

Parameters

Maximum depth of lay	1m
Soil Thermal Resistivity (g)	1.1^{o}C m/W
Ground Ambient Temperature	12^{o}C
Air Ambient Temperature	12^{o}C
Maximum Conductor Temperature	85^{o}C

Ratings based on Crater for Oil filled cables.

APPENDIX A

SUPERSEDED DOCUMENTATION

This document supersedes ST:SD8B/2 dated September 2003 which should now be withdrawn.

APPENDIX B

ASSOCIATED DOCUMENTATION

ST: CA6A/2 - Relating to the Installation of Underground Cables

APPENDIX C

IMPACT ON COMPANY POLICY

This Standard Technique has been updated to add all four seasons to the cable rating document instead of just having one season as given in the previous document. In addition the document has been broken up into manageable parts, with each part being for a particular voltage level.

APPENDIX D

IMPLEMENTATION OF POLICY

This Standard Technique shall be communicated to all relevant WPD Planning and Control staff at the next Team Briefing by the relevant Team Manager.

APPENDIX E

KEY WORDS

275kV Group Derating, Sustained Rating, Cyclic Rating, Laid Direct Rating, Duct Rating, Air Rating.