 Eskom	Standard	Technology
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Title: SPECIFICATION FOR OIL-FILLED POWER CABLES AND ACCESSORIES FOR SYSTEMS WITH NOMINAL VOLTAGES OF 44kV TO 132kV

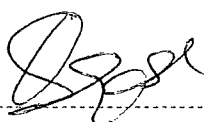
Unique Identifier: 240-56030399

Alternative Reference Number: 34-1903

Area of Applicability: Engineering

Next Review Date: STABILISED

COE Acceptance



Bheki Ntshangase

HV Plant - Senior Manager

DBOUS Acceptance



Amelia Mtshali

DBOUS – Senior Manager

Date: 20/06/2017

Date: 21 June 2017

This document is STABILISED. The technical content in this document is not expected to change because the document covers: *(Tick applicable motivation)*

1	A specific plant, project or solution	
2	A mature and stable technical area/technology	X
3	Established and accepted practices.	

PCM Reference: <xxxxxx>

SCOT Study Committee Number/Name: <Number or name>

 Eskom	Specification	Group Technology
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Title: **SPECIFICATION FOR OIL-FILLED
POWER CABLES AND
ACCESSORIES FOR SYSTEMS
WITH NOMINAL VOLTAGES OF
44 KV TO 132 KV**

Unique Identifier: **34-1903**

Part: **22 - Cables**

Area of Applicability: **Distribution Engineering**

Documentation Type: **Specification**

Revision: **1**

Total Pages: **18**

Next Review Date: **April 2017**

Disclosure Classification: **Controlled Disclosure**

Compiled by



Brighton Mwarehwa
Senior Engineer

Date: 22/03/2012

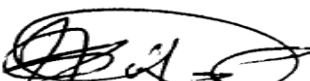
Approved by



Rhett Kelly
Chief Engineer

Date: 22/03/2012

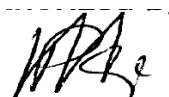
Functional Responsibility



Vinod Singh
Power Plant Manager

Date: 22/03/2012

Authorized by



Prince Moyo
Power Delivery Engineering GM (Acting)

Date: 13/04/2012

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Foreword

Eskom Distribution maintains a significant installed base of high-voltage, low-pressure, oil-filled, single-core and three-core cable systems. This specification is therefore based on [1] IEC 60141-1.

Note: New high-voltage cable systems in Eskom Distribution are comprised of single-core Cross-linked Polyethylene (XLPE) insulated cable and accessories.

Revision history

This revision cancels and replaces revision number 0 of document number DSP 34-1903.A

Date	Rev.	Compiled By	Paragraph	Remarks
April 2012	1	B Mwarehwa	General	Document revised according to revision cycle and latest SCOWT document template. Specification revised and updated following the inclusion of Eskom's requirements in NRS 0077 Edition 2.
			2	Normative references updated.
				All Eskom requirements which were incorporated in NRS 077 Edition 2 have now been removed from this document.
			4.3.4	The core screen shall comprise carbon black paper or a combination of carbon black paper and non-magnetic conducting foil, tape or metallized paper tape.
			4.3.5	The cores of three-core cables shall be laid up together with an appropriate right-hand lay.
			4.3.6.1	The laid-up cores of three-core cables shall be bound together with a helically applied, copper-woven or aluminium-woven fabric tape that effectively bonds the individual conducting core screens together, and bonds each screen to the metallic sheath.
			4.3.6.2	The core of a single-core cable shall have a helically applied, copper-woven or aluminium-woven fabric tape.
			4.4.1.7	Where pre-chamfered paper rolls are supplied, each roll shall be marked correctly and be stored in a sealed oil tin.
			4.4.3.2	Transition cable joints shall be sheath interrupting (i.e. shall be supplied with an insulating flange) and shall comply with the requirements of NRS 077.
			6.1	Marking of outer sheath requirements added.
			4.4.4.4	The diameter of the tinned copper vertical stem changed from 26 mm to 38 mm.
Jul 2008		T P du Plessis	0	First issue. Document created for Eskom requirements on all oil-filled insulated HV cables and accessories.

Acceptance

This document has been seen and accepted by:

Name	Designation
P Moyo	Power Delivery Engineering GM (Acting)
V Singh	Power Plant Technologies Manager
R A Kelly	Underground Distribution Systems Study Committee Chairperson

This document shall apply throughout Eskom Holdings Distribution Division.

Development team

Rhett Kelly	IARC
Thinus du Plessis	T&Q Gauteng Operating Unit
Brighton Mwarehwa	IARC
Lourenco Gonsalves	Gauteng Operating Unit

Introduction

The failure of any component of a high-voltage cable installation generally results in significant repair cost and disruption to the power system. In order to minimize the risk of this occurring, the Distribution Division has undertaken to purchase only high-voltage oil-filled cable and accessories that have been type tested in accordance with [1] IEC 60141-1

Keywords

Underground cable; underground distribution system; accessories; joints; terminations; HV; high voltage; specifications; oil-filled; fluid-filled; self-contained; static; low pressure; paper-insulated; CSA; aluminium sheath; metallic sheath, metal-sheathed.

1. Scope

This specification covers Distribution Division's requirements for single-core and three-core oil-filled cables and accessories for systems with nominal voltages of 44 kV, 66 kV, 88 kV and 132 kV. The test methods and requirements specified are in accordance with [1] IEC 60141-1.

2. References

Parties using this document shall apply the most recent edition of the following documents:

2.1 Normative references

2.1.1 International document(s)

Document Number	Document Title	Preparer/Author	Revision or Date of Issue
[1] IEC 60141-1	Tests on oil-filled and gas pressure cables and their accessories - Oil-filled, paper-insulated, metal-sheathed cables and accessories for alternating voltages up to and including 400kV	IEC	1993
[2] IEC 60228	Conductors of insulated cables	IEC	Latest

2.1.2 South African national document(s)

Document Number	Document Title	Preparer/Author	Revision or Date of Issue
[3] NRS 077	XLPE-insulated cables and accessories for systems with nominal voltages of 44 kV, 66 kV, 88 kV and 132 kV	ESLC	Latest
[4] DST 34-1625	[Distribution Standard – Part 22] Specification for XLPE-insulated power cables and accessories for systems with nominal voltages of 44 kV to 132 kV	Eskom	Latest

2.1.3 Eskom divisional document(s)

Document Number	Document Title	Preparer/Author	Revision or Date of Issue
Eskom Documents:			
[5] DSP 34-1495	Distribution Standard – Part 22: Specification for new cable oil	Eskom	Latest
[6] DST 34-1625	Distribution Standard – Part 22: Specification for XLPE-insulated power cables and accessories for systems with nominal voltages of 44 kV to 132 kV	Eskom	Latest
Eskom Assembly Drawings:			
[7] D-DT-5030	[Sheet 1 of 3] HV cable termination - support structure foundation	Eskom	Latest
	[Sheet 2 of 3] HV cable termination - support structure details		

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Document Number	Document Title	Preparer/Author	Revision or Date of Issue
	[Sheet 3 of 3] HV cable termination - support cap details		
[8] D-DT-5031	[Sheet 1 of 3] HV cable end support (non self-supporting) steelwork assembly details	Eskom	Latest
	[Sheet 2 of 3] HV cable end support (non self-supporting) steelwork surge arrester mounting plate		
	[Sheet 3 of 3] HV cable end support (non self-supporting) foundation details		
[9] D-DT-0881	HV cable used in Eskom Distribution	Eskom	Latest
[10] D-DT-0890	[Sheet 1 of 4] HV XLPE cable termination with surge arrester conductor assembly (also applicable on oil-filled HV cable)	Eskom	Latest
	[Sheet 2 of 4] HV XLPE cable termination with surge arrester overhead line assembly (also applicable on oil-filled HV cable)		
[11] D-DT-0891	[Sheet 2 of 4] HV oil-filled single circuit direct buried joint bay layout	Eskom	Latest
	[Sheet 4 of 4] HV single circuit direct buried joint bay protective weather cover		
[12] D-DT-0892	[Sheet 2 of 3] HV power cable trench details (tre-foil formation)	Eskom	Latest
[13] D-DT-0893	[Sheet 1 of 5] HV cable bonding and earthing arrangement end-point bonded system	Eskom	Latest
	[Sheet 2 of 5] HV cable bonding and earthing arrangement double end-point bonded system		
	[Sheet 3 of 5] HV cable bonding and earthing arrangement multiple end-point bonded system		
	[Sheet 4 of 5] HV cable bonding and earthing arrangement cross-bonded system		
	[Sheet 5 of 5] HV cable outdoor termination bonding and earthing arrangement		
[14] D-DT-0894	HV cable link disconnecting box manhole details	Eskom	Latest
Eskom Buyer's Guide Drawings:			
[15] D-DT-2882	HV cable oil and absorbent oil and chemical	Eskom	Latest
[16] D-DT-2879	CAP, HV oil-filled cable end seal	Eskom	Latest
[17] D-DT-2877	HV oil-filled cable repair sleeve	Eskom	Latest
[18] D-DT-2874	Box, Link disconnecting box 1L Earth Kiosk	Eskom	Latest
[19] D-DT-2872	Termination Kit/Sealing end HV single core paper insulated/oil-filled	Eskom	Latest
[20] D-DT-2871	Joint Kit HV single core and 3 core oil-filled and transition	Eskom	Latest
[21] D-DT-2870	Cable HV single core and 3 core oil-filled	Eskom	Latest
[22] D-DT-8073	HV cable termination supports	Eskom	Latest
[23] D-DT-8074	HV cable link disconnecting boxes	Eskom	Latest

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Document Number	Document Title	Preparer/Author	Revision or Date of Issue
[24] D-DT-8075	Bonding leads for HV cables	Eskom	Latest

2.2 Informative references

Document Number	Document Title	Preparer/Author	Revision or Date of Issue
[25] 32-9	Definition of Eskom Documents	Eskom Document Centre	Latest
[26] 32-644	Eskom Documentation Management Standard	Eskom Document Centre	Latest
[27] 474-65	Operating Manual of the Steering Committee of Wires Technologies (SCOWT)	Vinod Singh	Latest

3. Definitions and abbreviations

3.1 Definitions

The definitions in [1] IEC 60141-1, [3] NRS 077 and the following shall apply:

Definition	Explanation
Low pressure oil-filled cable	A self-contained (static), fluid-filled, paper-insulated, metal-sheathed cable which operates with a minimum static pressure of between 20 kPa (0,2 bar) and 300 kPa (3,0 bar) inclusive, a maximum static pressure of not more than 800 kPa (8,0 bar) and a minimum transient pressure of not less than 20 kPa (0,2 bar). (The quoted pressures are above atmospheric pressure.)
Self-supporting termination	A cable termination having an outer housing that is rigid and requiring no additional mechanical support.

3.2 Abbreviations

The abbreviations in [1] IEC 60141-1, [3] NRS 077 and the following shall apply

Abbreviation	Explanation
CAP	Committee for Accepted Products
GM	General Manager
HV	High Voltage
IARC	Industry Association Resource Centre (formerly 'Distribution Technology')
LAP	List of Accepted Products
MDPE	Medium-density Polyethylene
MIG	Metal Inert Gas
n/a	not applicable

Abbreviation	Explanation
SCOWT	Operating Manual of the Steering Committee of Wires Technologies
T&Q	Technology and Quality
T&Q	Technology and Quality
XLPE	Cross-linked Polyethylene

4. Requirements

Oil-filled high voltage cable and accessories shall comply with the requirements of [1] IEC 60141-1, this specification and, where indicated, the requirements of [3] NRS 077. Where conflicting requirements arise, the requirements of this specification shall take precedence.

Note: Cable, accessories and ancillary equipment for use on high-voltage oil-filled systems in Eskom Distribution are given in the Buyer's Guide drawings listed in paragraph 2.1.3.

4.1 Standard installation conditions

- a) The standard installation conditions given in [3] NRS 077 shall apply. In addition, the cable depth of burial and configuration installation conditions shall be in accordance with [10] D-DT-0890, [11] D-DT-0891 and [12] D-DT-0892.

Notes:

- 1) Although [10] D-DT-0890 and D-DT-0892 are intended for single-core XLPE-insulated cables, their requirements are also be applicable to all oil-filled cables.
 - 2) In general, for single-core high-voltage cables, the bonding and earthing arrangement (special bonding) is in accordance with [13] D-DT-0893.
- b) Cables and accessories shall be designed to operate in a 'Category A' system in accordance with [1] IEC 60141-1.

4.2 Cable and accessory operating voltages

The standard operating voltages given in [3] NRS 077 shall apply.

4.3 Cable materials and construction

The cable construction shall be in accordance with the relevant sheet of [9] D-DT-0881 (refer to [21] D-DT-2870).

4.3.1 Conductor

- a) The cable conductor material shall be stranded and compacted aluminium or copper in accordance with [2] IEC 60228.

Note: Single-core cables require a hollow-core to accommodate an oil duct.

- b) The conductor cross-sectional area shall be 400 mm², 500 mm², 630 mm² or 1 000 mm² and shall be specified in the enquiry document.

Note: The most common sizes of high-voltage oil-filled cable installed in Eskom Distribution networks are 400 mm², 500 mm² and 10 00 mm².

4.3.2 Conductor screen

The conductor screen shall comprise carbon black paper or a combination of carbon black paper and non-magnetic conducting foil, tape or metallized paper tape.

4.3.3 Insulation

The insulation shall consist of helically applied paper tape layers.

4.3.4 Core screen

The core screen shall comprise carbon black paper or a combination of carbon black paper and non-magnetic conducting foil, tape or metallized paper tape.

4.3.5 Laying up of three core cables

The cores of three-core cables shall be laid up together with an appropriate right-hand lay.

4.3.6 Metallic woven fabric tape

- a) The laid-up cores of three-core cables shall be bound together with a helically applied, copper-woven or aluminium-woven fabric tape that effectively bonds together the individual conducting core screens and bonds each screen to the metallic sheath.
- b) The core of a single core cable shall have a helically applied, copper-woven or aluminium-woven fabric tape.

4.3.7 Cable oil, ducts and filler materials

- a) Cable oil shall comply with the requirements of [5] DSP 34-1495.
- b) Where applicable, stainless steel helical oil ducts shall be provided in accordance with [9] D-DT-0881.
- c) For three-core cables, appropriate filler materials shall be provided.

4.3.8 Metal sheath

The metal sheath shall be a helically corrugated aluminium sheath. All other requirements for the corrugated aluminium sheath shall comply with the requirements of [3] NRS 077.

Note: A helically corrugated metal sheath allows for the longitudinal flow of oil within the cable.

4.3.9 Outer sheath

The outer sheath shall comply with the requirements of [3] NRS 077.

4.4 Cable accessories

4.4.1 Cable joints

- a) Straight-through joints (refer to [20] D-DT-2871) shall allow for the flow of oil through the joint.
- b) Stop joints (refer to [20] D-DT-2871) shall provide an oil barrier suitable for creating hydraulic sections in the cable system.
- c) Trifurcating joints (refer to [20] D-DT-2871) shall be designed to join a three-core cable to three single-core cables.

Note: Trifurcating joints that consist of a three-core cable splitter box (refer to paragraph 4.4.2) and three single-core joints will be considered.

- d) Cable joints shall be sheath interrupting (i.e. shall be supplied with an insulating flange) and shall comply with the requirements of [3] NRS 077.

Note: Sheath interrupting joints are required in order to accommodate the particular special bonding applicable to the cable system being maintained. Sheath interrupting joints may also be used as non-sheath interrupting joints. This decision has been made in order to limit strategic stockholding requirements.

- e) Unless otherwise specified by Eskom in the enquiry document, each cable joint shall be supplied with a suitable means to join the relevant conductor(s). Acceptable conductor joining methods include:
 - 1) conductor welding (Metal Inert Gas (MIG)), in which case the joint shall be supplied with the appropriate welding jig(s); or
 - 2) sweating, in which case the joint shall be supplied with appropriate ferrule(s) to allow for soldered contact of the conductor in the ferrule(s); or
 - 3) torque shear mechanical compression, in which case the joint shall be supplied with appropriate torque-shear mechanical connector(s); or
 - 4) suitable alternative methods approved by Eskom.
- f) Cable joints shall be supplied with sets of paper rolls and crêpe paper tapes. Where applicable, preference shall be given to pre-chamfered paper rolls.
- g) Where pre-chamfered paper rolls are supplied, each roll shall be marked correctly and be stored in a sealed oil tin.

4.4.2 Splitter boxes

- a) Splitter boxes (refer to [20] D-DT-2871) shall be designed to trifurcate and seal the individual cores of a three-core cable and shall be provided with 3 × 15 m lengths of single-core outer protection sheaths for the three individual cores of the three-core cable.
- b) The single-core outer protection sheaths shall comprise a Medium-density Polyethylene (MDPE) outer sheath bonded to a corrugated aluminium sheath.

4.4.3 Transition joints

- a) Transition joints (refer to [20] D-DT-2871) shall be designed to join oil-filled cable to XLPE-insulated cable in accordance with [6] DST 34-1625.

Notes:

- 1) Transition joints are required either to join a single-core oil-filled cable to a single-core XLPE-insulated cable or to join a three-core oil-filled cable to three single-core XLPE-insulated cables. The latter constitutes a trifurcating transition joint.
 - 2) Trifurcating transition joints that consist of a three-core cable splitter box (refer to paragraph 4.4.2) with three single-core transition joints will be considered.
- b) Transition cable joints shall be sheath interrupting (i.e. shall be supplied with an insulating flange) and shall comply with the requirements of [3] NRS 077.

4.4.4 Outdoor cable sealing ends

- a) Outdoor cable sealing ends (refer to [19] D-DT-2872) shall be self-supporting and shall comply with the requirements of [3] NRS 077.
- b) Outdoor sealing ends shall be suitable for mounting on the medium equipment support and cap shown in [7] D-DT-5030 (sheets 2 and 3) and [10] D-DT-0890 (sheets 1 and 2).
- c) Outdoor sealing ends shall have a specific creepage of 31 mm/kV.
- d) In the case of self-supporting type terminations, unless otherwise specified in Schedule A (refer to Annex B), the diameter of the tinned copper vertical stem shall be 38 mm.

5. Tests

Cable and accessories shall be tested in accordance with [1] IEC 60141-1. Minimum test voltages shall comply with the requirements of [3] NRS 077.

6. Marking, labelling and packaging

6.1 General requirements

Marking, labelling and packaging shall comply with the requirements of [3] NRS 077 and oil-filled cable shall be packaged on steel drums with the associated oil pressure tank fitted on the inside.

6.2 Marking of outer sheath

Cables shall be legibly marked in accordance with the requirements of [3] NRS 077, but the marking shall include the specification number to which the cable has been manufactured and the word 'ESKOM'. A typical legend would be:

XXXXXXXXX CABLES 2011 76/132 kV IEC 60840 500 mm² Cu ESKOM

7. Documentation

- a) Documentation shall comply with the requirements of [3] NRS 077.
- b) The cable parameters shall be stated for the rated conductor operating temperature for both normal and emergency operation.

Note: Where applicable, circuit parameters shall be given for the standard installation conditions given in paragraph 4.1.

8. Spares

The length of cable and number and type of accessories to be supplied shall be stated in the enquiry document.

Note: Oil-filled high-voltage cables and accessories are classified as strategic spares in the Eskom Distribution Division.

9. Inspection

Prior to the delivery of cable and/or accessories to Eskom, the relevant Eskom personnel from the regional TSG Cables Section, Technology and Quality Department and Industry Association Resource Centre (IARC) shall be contacted to carry out an inspection of the cable and/or accessories.

Annex A – Impact Assessment

(Normative – for Eskom internal use only)

A.1 Guidelines

- All comments must be completed.
- Motivate why items are not applicable (n/a).
- Indicate actions to be taken, persons or organizations responsible for actions and deadline for action.
- Change control committees to discuss the impact assessment and, if necessary, give feedback to the compiler regarding any omissions or errors.

A.2 Critical Points

A.2.1 Importance of this document, e.g. is implementation required due to safety deficiencies, statutory requirements, technology changes, document revisions, improved service quality, improved service performance, optimized costs.

Comment: Document created according to revision cycle and latest SCOWT document template

A.2.2 If the document to be released impacts on statutory or legal compliance, this needs to be very clearly stated and so highlighted.

Comment: n/a.

A.2.3 Impact on stock holding and depletion of existing stock prior to switch over.

Comment: Not applicable – no new stock items have been added.

A.2.4 When will new stock be available?

Comment: Not applicable – no new stock items have been added.

A.2.5 Has the interchangeability of the product or item been verified, i.e. when it fails, is a straight swap possible with a competitor's product?

Comment: Not applicable – no new stock items have been added.

A.2.6 Identify and provide details of other critical (items required for the successful implementation of this document) points to be considered in the implementation of this document.

Comment: None.

A.2.7 Provide details of any comments made by the Regions regarding the implementation of this document.

Comment: (n/a during commenting phase).

A.3 Implementation Time Frame

A.3.1 Time period for implementation of requirements.

Comment: Immediate.

A.3.2 Deadline for changeover to new item and personnel to be informed of DX wide changeover.

Comment: Not applicable – no new stock items have been added

A.4 Buyer's Guide and Power Office

A.4.1 Does the Buyer's Guide or Buyer's List need updating?

Comment: n/a

A.4.2 What Buyer's Guides or items have been created?

Comment: None.

A.4.3 List all assembly drawing changes that have been revised in conjunction with this document.

Comment: None.

A.4.4 If the implementation of this document requires assessment by CAP, provide details under paragraph A.5.

A.4.5 Which Power Office packages have been created, modified or removed?

Comment: None.

A.5 CAP/LAP Pre-qualification Process-related Impacts

A.5.1 Is an ad hoc re-evaluation of all currently accepted suppliers required as a result of implementation of this document?

Comment: No.

A.5.2 If NO, provide motivation for issuing this specification before Acceptance Cycle Expiry date.

Comment: No LAP evaluation has ever been carried out for HV Oil-filled cable and accessories.

A.5.3 Are ALL suppliers (currently accepted per LAP) aware of the nature of changes contained in this document?

Comment: Not applicable. This is a non-standard item and non-capital item that is required only for maintenance.

A.5.4 Is implementation of the provisions of this document required during the current supplier qualification period?

Comment: n/a

A.5.5 If Yes to paragraph A.5.4, what date has been set for all currently accepted suppliers to comply fully?

Comment: n/a

A.5.6 If Yes to paragraph A.5.4, have all currently accepted suppliers been sent a prior formal notification informing them of Eskom's expectations, including the implementation date deadline?

Comment: n/a

A.5.7 Can the changes made, potentially impact upon the purchase price of the material/equipment?

Comment: No.

A.5.8 Material group(s) affected by specification (refer to Pre-qualification invitation schedule for list of material groups).

Comment: HV Oil-filled cable, accessories and ancillary equipment.

A.6 Training or Communication

A.6.1 Is training required?

Comment: Awareness training required for planners and project engineers on the requirements.

A.6.2 State the level of training required to implement this document (e.g. awareness training, practical/on job, module).

Comment: IARC or T&Q responsible for training.

A.6.3 State designations of personnel that will require training.

Comment: Technology engineering investigators, T&Q Network services, planners, projects engineers.

A.6.4 Is the training material available? Identify person responsible for the development of training material.

Comment: No training material available. IARC or T&Q responsible.

A.6.5 If applicable, provide details of training that will take place (e.g. sponsor, costs, trainer, schedule of training, course material availability, training in erection/use of new equipment, maintenance training).

Comment: Requirements will be incorporated into IARC training material.

A.6.6 Was Technical Training Section consulted regarding module development process?

Comment: No.

A.6.7 State communications channels to be used to inform target audience.

Comment: Email.

A.7 Special Tools, Equipment, Software

A.7.1 What special tools, equipment, software, etc. will need to be purchased by the Region to effectively implement?

Comment: None.

A.7.2 Are stock numbers available for the new equipment?

Comment: Not applicable – no new equipment has been specified.

A.7.3 What will be the cost of these special tools, equipment, software?

Comment: n/a

A.8 Finances

A.8.1 What total costs would the Regions be required to incur in implementing this document? Identify all cost activities associated with implementation, e.g. labour, training, tooling, stock, obsolescence.

Comment: None.

Impact assessment completed by:

Name: Brighton Mwarehwa

Designation: Senior Engineer

Annex B – Technical schedules**B.1 Technical schedules A and B: 44 kV, 66 kV, 88 kV or 132 kV oil-filled cable****Schedule A:** Purchaser's specific requirements**Schedule B:** Guarantees and technical particulars of equipment offered

Item	Subclause	Description	Units of Measure	Schedule A	Schedule B
1.	7	Cable mass	kg/m	xxxxxxx	_____
2.	7	Oil volume per metre	l/m	xxxxxxx	_____
3.	7	DC resistance of conductor at 20 °C	Ω/km	xxxxxxx	_____
4.	7	AC resistance of conductor at operating temperature	Ω/km	xxxxxxx	_____
5.	7	AC resistance of sheath with conductor at operating temperature	Ω/km	xxxxxxx	_____
6.	7	Reactance per phase	Ω/km	xxxxxxx	_____
7.	7	Capacitance per phase	nF/km	xxxxxxx	_____
8.	7	Zero sequence resistance	Ω/km	xxxxxxx	_____
9.	7	Zero sequence reactance	Ω/km	xxxxxxx	_____
10.	7	Zero sequence capacitance	nF/km	xxxxxxx	_____
11.	7	Rated continuous current	A	xxxxxxx	_____
12.	7	Rated symmetrical fault withstand	kA – s	xxxxxxx	_____
13.	7	Rated earth fault withstand	kA – s	xxxxxxx	_____
14.	7	Conductor temperature at rated load	°C	xxxxxxx	_____
15.	7	Conductor temperature after symmetrical fault (1 s) assuming operation at specified load prior to fault	°C	xxxxxxx	_____
16.	7	Sheath temperature after earth fault (1 s) assuming operation at specified load prior to fault	°C	xxxxxxx	_____
17.	7	Conductor losses at maximum conductor operating temperature	kW/km	xxxxxxx	_____
18.	7	Type test report number for the cable offered or similar cable previously tested (report to be provided)		xxxxxxx	_____
19.	7	Dimensioned drawing number for the cable cross-section (drawing to be supplied)		xxxxxxx	_____
20.	7	Minimum installation bending radius	m	xxxxxxx	_____
21.	7	Emergency current rating	A	xxxxxxx	_____
22.	7	Emergency current conductor operating temperature	°C		

B.2 Technical schedules A and B: 44 kV, 66 kV, 88 kV or 132 kV oil-filled cable joints

Schedule A: Purchaser's specific requirements.

Schedule B: Guarantees and technical particulars of equipment offered.

Item	Subclause	Description	Schedule A	Schedule B
1.	4.4.1 (e)	Conductor joining method	xxxxxxx	_____
23.	7	Type test report number for the cable joint offered or similar cable joint previously tested (report to be provided)	xxxxxxx	_____
24.	7	Dimensioned drawing number for the cable joint (drawing to be supplied)	xxxxxxx	_____
25.	7	Installation instruction drawing number for the cable joint (instruction to be supplied)	xxxxxxx	_____
26.	7	Details of training offered on cable joint	xxxxxxx	_____

B.3 Technical schedules A and B: 44 kV, 66 kV, 88 kV or 132 kV oil-filled cable sealing ends

Schedule A: Purchaser's specific requirements

Schedule B: Guarantees and technical particulars of equipment offered

Item	Subclause	Description	Units of Measure	Schedule A	Schedule B
1.		Insulator material (porcelain/silicone)		xxxxxxx	_____
27.		Measured creepage	mm	xxxxxxx	_____
28.	7	Type test report number for the cable sealing end offered or similar sealing end previously tested (report to be provided)		xxxxxxx	_____
29.	7	Dimensioned drawing number for the cable sealing end (drawing to be supplied)		xxxxxxx	_____
30.	7	Installation instruction drawing number for the cable sealing end (instruction to be supplied)		xxxxxxx	_____
31.	7	Details of training offered on cable sealing end		xxxxxxx	_____