

Annexure A



KEETMANSHOOP MUNICIPALITY

KEETMANSHOOP ELECTRICITY BUSINESS UNIT (KEBU)

CABLE JOINTS, TERMINATIONS AND
ACCESSORIES UP TO 36 KV

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FOREWORD

This specification covers Keetmanshoop Electricity Business Unit (KEBU) minimum technical requirements for design, engineering, manufacture, testing, inspection and performance of indoor and outdoor cable joint / termination kits, and their accessories up to 36 kV.

Tenderers shall complete the technical schedules as detailed in Annexure B and C. All deviations from the requirements shall be stated in the tender documentation. In the absence of such a statement, it shall be understood that all requirements of this specification are fulfilled without exception.

Specifications are referenced in the normative references section; the list of standards may be used as a guide, but should not be regarded as a complete list. Tenderers shall be responsible for obtaining copies of NRS documents and any other relevant and current national and international standards.

Cable joints and terminations shall comply with the relevant SANS and/or IEC equivalent standards or similar approved.

1 SCOPE

This specification covers KEBU's requirements for the testing and supply of medium-voltage accessories for power cables used on a.c. systems with nominal voltages 11 kV up to and including 33 kV, as well as low-voltage joint and termination kits and accessories intended for use with 600/1000 V cables.

The medium-voltage accessories are intended for use on the following types of cable:

- a) Three-core, 35 mm² to 300 mm², general purpose impregnated paper-insulated cable with lead sheath and with double galvanised steel tape armour to SANS 97;
- b) Single-core, 630 mm², general purpose impregnated paper-insulated cable with no armour to SANS 97;
- c) Three-core, 35 mm² to 300 mm² x 3 core, Type A XLPE-insulated cable with polyethylene outer sheath to SANS 1339;
- d) Single-core, 95 mm², 185 mm² and 300 mm² Type B unarmoured XLPE-insulated cable with polyethylene outer sheath to SANS 1339.
- e) Single-core, 630 mm², Type A XLPE-insulated cable with polyethylene outer sheath to SANS 1339.

The accessories covered by this specification include:

- a) Indoor and outdoor terminations of all designs;
- b) Shrouded terminations for application in air-filled enclosures;
- c) Straight joints and transition joints of all designs, suitable for use underground or in air; and
- d) Fully-insulated separable connectors.

The test requirements for accessories for impregnated-paper and XLPE-insulated cables shall comply with this specification. The tests methods are based on SANS 61442.

All medium-voltage accessories shall comply with the requirements of NRS 053.

2 NORMATIVE REFERENCES

Parties using this specification shall apply the most recent edition of the documents listed below.

IEC 60055-1, *Paper-insulated metal-sheathed cables for rated voltages up to 18/30 kV (with copper or aluminium conductors and excluding gas pressure and oil filled cables) – Part 1: Tests on cables and their accessories.*

IEC 61442, *Test methods for accessories for power cables with rated voltages from 6 kV ($U_m = 7,2$ kV) up to 30 kV ($U_m = 36$ kV).*

CENELEC 629.1 S1, *Test requirements on accessories for use on power cables of rated voltage from 3,6/6(7,2) kV up to 20,8/36 (42) kV – Part 1: Cables with extruded insulation.*

CENELEC 629.2 S1, *Test requirements on accessories for use on power cables of rated voltage from 3,6/6(7,2) kV up to 20,8/36 (42) kV – Part 2: Cables with impregnated paper insulation.*

IEC 60502-4, *Power cables with extruded insulation and their accessories for rated voltages from 1 kV ($U_m = 1,2$ kV) up to 30 kV ($U_m = 36$ kV) – Part 4: Test requirements on accessories for cables with rated voltages from 6 kV ($U_m = 7,2$ kV) up to 30 kV ($U_m = 36$ kV).*

SANS 97, *Electric cables – Impregnated paper-insulated metal sheathed cables for rated voltages from 3,3/3,3 kV up to 19/33 kV.*

SANS 1339, *Electric cables – Cross-linked polyethylene (XLPE)-insulated cables for voltages from 3,8/6,6 kV up to 19/33 kV.*

NRS 053, *Accessories for medium voltage power cables (3,8/6,6 kV to 19/33 kV).*

SANS 876/NRS 012, *Cable terminations and live conductors within air insulated enclosures (insulation co-ordination) for rated a.c. voltages of 7,2 and up to and including 36 kV.*

BS EN 50393: *Test methods and requirements for accessories for use on distribution cables of rated voltage 0,6/1,0 kV (1.2).*

SANS 1507: *Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1900/3300 V).*

SANS 61238-1: *Compression and mechanical connectors for power cables for rated voltages up to 30 kV ($U_m = 36$ kV).*

3 DEFINITIONS AND ABBREVIATIONS

The definitions in NRS 053 and BS EN 50393 shall apply.

3.1 DEFINITIONS

Air-filled enclosure: A metallic enclosure designed to protect the ends of the cables and bushings, providing a weatherproof enclosure with a minimum rating of IP54.

armour clamp: A stainless steel clamp used to connect the main earthing conductor of an accessory to the armour wires of a cable.

bolted-type separable connector: A separable connector in which the electrical contact is made by a bolted device.

connector: A metallic device to connect cable conductors together. [IEV 461-17-03]

constant force spring (CFS): A strip of non-magnetic stainless steel that is wound to form a spring and intended to maintain a constant force on a circular object.

dead break connector: A separable connector designed to be connected and disconnected on de-energized circuits only.

indoor termination: A termination intended for use where it is not exposed to either solar radiation or weathering.

main earthing conductor: A conductor that maintains earth continuity throughout a cable joint, or connects the earth circuit of a cable to the metallic enclosure of terminal equipment and that is rated to carry the prospective earth fault current of the system.

outdoor termination: A termination intended for use where it is exposed to either solar radiation or weathering or both.

range-taking accessory: An accessory designed to accommodate more than one size of cable.

screened separable connector: A separable connector that has a fully screened external surface.

secondary earthing conductor: A conductor that for XLPE-insulated cable connects the copper screen of the cable to the main earthing conductor at a joint or termination.

separable connector: A fully insulated termination permitting the connection and the disconnection of a cable to other equipment.

shrouded termination: An indoor termination used in an air-filled enclosure that is insulated but unscreened at the terminal connection.

straight joint: An accessory making a connection between two cables to form a continuous circuit. [IEV 461-11-01]

termination: A device fitted to the end of a cable to ensure electrical connection with other parts of the system and to maintain the insulation up to the point of connection. [IEV 461-10-01]

termination tail: The part of a cable termination that for an impregnated paper-insulated cable extends from the end of the lead sheath to the end of the core insulation and in the case of an XLPE-insulated cable extends from the extruded bedding cut to the end of the core insulation.

transition joint: A straight joint making a connection between cables with different types of insulation and/or construction.

unscreened separable connector: A separable connector that does not have an external screen.

3.2 ABBREVIATIONS

AWA Aluminium wire armour

SWA Steel wire armour

DSTA Galvanized double steel-tape armour

MIND Mineral-impregnated non-draining

PI Paper-insulated

XLPE Cross-linked polyethylene

USC Unscreened Separable Connector

SSC Screened Separable Connector

4 REQUIREMENTS

4.1 STANDARD OPERATING CONDITIONS

All accessories shall be suitable for operation under the following conditions:

- a) altitude: up to 1500 m
- b) ambient air temperature: -5 °C to 45 °C
- c) relative humidity: 10 % to 95 %; and
- d) pollution conditions: very heavy.

4.2 GENERAL

Joint/termination kits and accessories shall meet or exceed the requirements of this specification in all respects.

Manufacturer's drawings shall show outline of joints, terminations and accessories together with all pertinent dimensions. Any variation in these dimensions due to manufacturing tolerances shall be indicated.

All lugs/ferrules included inside the kit shall be supplied from KEBU's approved manufacturers and in accordance to relevant specification.

4.2.1 Cable Accessories, Jointing and Terminating

Cable accessories shall comply with the requirements of NRS 053.

All three-core cable terminations shall be made using the "top-down" method in order to maximise the length of the screened tail to allow for core crossing in the screened section of the termination if necessary.

Each accessory shall be provided with a labelling system (identification tag) that indicates the manufacturer and part number and allows the date of installation to be indicated. The date of installation shall be indicated on the label and attached to the cable adjacent to the accessory.

4.2.2 Lugs and Ferrules

Lugs and ferrules shall comply with the requirements of SANS 1803-1.

Mechanical torque shear lugs and ferrules, that comply with the requirements of SANS 61238-1, shall be used for connecting conductors and be supplied and included with each cable accessory.

Compression lugs and ferrules shall comply with the requirements of SANS 61238-1.

4.3 STANDARD RANGES FOR ACCESSORIES

4.3.1 All accessories shall be range-taking in accordance with the following standard ranges:

Table 4-1: Standard ranges for terminations

Rated voltage U_0/U [kV]	Cable size [mm ²]			
	Accessory range			
	1	2	3	4
6,35/11	35 - 95	95 - 185	185 - 300	630
12,7/22	35 - 95	95 - 185	N/A	630
19/33	35 - 95	95 - 185	N/A	630

Table 4-2: Standard ranges for joints

Rated voltage U_0/U [kV]	Cable size [mm ²]			
	Accessory range			
	1	2	3	4
6,35/11	35 - 95	95 - 185	185 - 300	630
12,7/22	35 - 95	95 - 185	N/A	630
19/33	35 - 95	95 - 185	N/A	630

4.4 ACCESSORY EARTHING

4.4.1 General

The main earthing conductor of all joints and terminations shall be tinned copper braid with a cross-sectional area of 70 mm².

The main earthing conductor supplied with a termination shall be 700 mm long and shall be terminated with a tinned copper connector having an M12 fixing hole.

The cable termination main earthing conductor shall be water blocked to prevent ingress of moisture into the termination. The correct position of the water block shall be clearly indicated in the accessory installation instruction.

Constant force springs (CFS's) used to connect the main earthing conductor to the lead sheath or armour of a cable shall have a minimum width of 20 mm and shall be suitable for the relevant cable dimension.

Armour clamps shall be stainless steel with a nominal thickness of 1mm and nominal width of at least 20 mm. Fastening shall be possible by means of a socket or spanner.

Armour clamps and/or CFS's that form part of the main earthing connection shall not be used to secure any ferrous metal enclosures or components used for mechanical protection of a three-core cable joint.

The main earthing conductor of a joint shall be separated from the individual core insulation by a collective insulating inner sleeve that:

- a) for a paper-insulated cable extends from lead sheath to lead sheath;
- b) for an XLPE-insulated cable extends from bedding to bedding;
- c) for a transition joint extends from lead sheath to bedding; and
- d) is effectively sealed at each bedding or lead sheath interface.

The sharp edges of a CFS or armour clamp shall be smoothed using a suitable filler tape positioned around the CFS or clamp.

4.4.2 XLPE-Insulated Cables

- a) Secondary earthing conductors shall be tinned copper braid and shall have a cross-sectional area of at least 16 mm².
- b) The connection between the secondary earthing conductor and the copper screen of each cable core shall be made with a CFS.
- c) The main earthing conductor of a joint or termination shall be connected to the armour wires of the cable with a CFS or an armour clamp.
- d) The armour wires directly below the CFS or armour clamp of a three-core cable shall be supported with an adjustable support ring.

4.4.3 Paper-Insulated Cables

The main earthing conductor of a joint or termination shall be:

- a) Connected to the lead sheath of the cable by a CFS. A layer of tinned copper mesh shall be provided for application under the CFS; and
- b) connected to the armouring of the cable with a CFS.

4.5 CABLE TERMINATIONS

Terminations shall be classified as:

- a) Indoor terminations for use in air-filled enclosures; and

b) Outdoor terminations.

The design of the cable termination shall take into account changes to the electrical field distribution caused by pollution deposited on the surface of the termination in indoor and outdoor applications.

The specific creepage for indoor and outdoor terminations shall be 31 mm/kV. The actual creepage distance offered shall be stated in schedule B of the tender document.

Unless otherwise specified in schedule A, cable termination tail lengths shall be as specified in Table 4-3 and Table 4-4.

Table 4-3: Minimum tail length for three-core cable terminations

Rated voltage U_o/U [kV]	Tail length [mm]	
	Indoor	Outdoor
6,35/11	650	1600
12,7/22	750	1600
19/33	900	1600

Table 4-4: Maximum tail length for single-core cable terminations

Rated voltage U_o/U [kV]	Tail length (Indoor and Outdoor) [mm]
6,35/11	350
12,7/22	450
19/33	650

All cable termination instructions shall be based upon the "top down" principle of measurement and shall clearly indicate the minimum dimension "X" required from the bottom end of the lug barrel to the top of the stress control tube.

Outdoor cable terminations shall have:

- a) Tail lengths of 1600 mm;
- b) for impregnated paper-insulated cable, semi-conductive tubes that cover the metallic-paper core screen from the break-out boot to the end of the core screen; and
- c) the stress control tube positioned so that the top of the tube is at a dimension of "X + 600 mm" from the bottom of the lug barrel.

Three-core cable terminations shall be designed to accommodate crossing of cable cores within the screened section of the tri-furcated cores. The method of core crossing along with minimum clearances shall be indicated in the termination instruction.

The design of the cable termination shall ensure that no part of the armour or lead sheath of the cable is exposed once the termination is completed. In the case of a three-core termination this shall be

achieved by either ensuring that the length of the break-out boot is adequate or provision of a separate earthing/armour tube.

Outdoor cable terminations for paper-insulated cables shall be provided with crutch support to prevent damage to the cable crutch and core insulation from over tri-furcating.

Cable terminations shall be provided with a method of sealing the interface between the termination tail insulating tube and the lug barrel either by:

- a) allowing for at least 100 mm of additional length of termination tail insulating tube that covers the lug barrel; or
- b) providing lug insulating tubes of at least 150 mm.

The method used and application shall be clearly indicated in the termination instruction.

Cable terminations for single-core cable shall be supplied in sets of three i.e. allowing for the termination of three single-core cables.

An indoor cable termination referred to as an "extended screen termination" shall be supplied for the termination of 35 mm² to 185 mm² cable within an air-filled cable box that is fitted with low-voltage current transformers. The termination design shall allow for the core screen of the cable to extend through the current transformers by having a tail length of 800 mm.

4.6 CABLE JOINTS

All cable joints shall be of the filled type; heat shrink type joints shall be provided with a core separator and filler mastics.

Three-core cable joints shall be designed to accommodate crossing of cable cores within the joint. The method of core crossing shall be indicated in the jointing instruction.

Cable joints for single-core cable shall be supplied individually in order to allow for the jointing of one single-core cable.

Transition/tri-furcating joints shall be supplied individually for the purpose of jointing 3 single-core XLPE-insulated cables to a three core PILC cable.

4.7 FULLY-INSULATED UNSCREENED SEPARABLE CONNECTORS (USC)

The USC shall be a type 3 and comply to SANS 876/NRS 012 clearance requirements.

It shall be possible to connect cables in straight line or right angle configurations to respective switchgear.

The fully-insulated USC shall be supplied in sets of three in order to allow for the termination of one three-core cable or three single-core cables.

4.8 CABLE SEALING END CAPS

Cable sealing end caps shall be so designed to fit over the outer sheath of the largest cable that is specified in the range required.

Once applied to the cable end, an adequate amount of sealant shall ensure that no moisture enters into the cable.

4.9 TRIFURCATING TERMINATION KITS FOR SCREENED SEPARABLE CONNECTORS USED WITH THREE-CORE CABLE

Note: A trifurcating termination kit is used when a three-core XLPE-insulated cable is to be terminated with three screened separable connectors. The purpose of the kit is to:

- a) Separate the three screened cable cores;
- b) Provide an earth connection to the copper core screens and the armour wires of the three-core cable; and
- c) Provide a waterproof seal for the screened cores, cable crutch and earth connection.

A trifurcating termination kit shall be range-taking in accordance with the standard ranges specified in Table 4-1.

An earthing kit shall be provided for connecting to the copper core screens and armour wires and shall comply with the requirements of section 4.4.

A trifurcating termination kit shall include all components required for sealing the screened cable cores, cable crutch and earth connection.

4.10 EXTENSIBLE SCREENED SEPARABLE CONNECTORS (SSC)

Extensible SSC's shall be of the dead break, bolted type and shall be suitable for connecting to a type C bushing in accordance with EN 50180 and having an M16 x 2 thread.

The SSC's shall be range taking in accordance with the standard ranges specified in column 1 and column 2 of Table 4-1.

Each SSC shall be supplied with a stainless steel fixing stem and all associated components (e.g. end plug, test point cap etc.).

The SSC's shall be supplied with mechanical torque shear lugs with the relaxation that the lug profile shall be centered and be suitable for the cable sizes specified. The SSC shall have a fixed earth connection attached to the connector.

4.11 SCREENED XLPE TAILS

The screened XLPE tails shall be installed between the resin insulated compact switchgear and transformer of type 'B' miniature substations.

These tails shall be constructed from 70 mm² copper conductor, single core, XLPE insulated, copper tape screened, unarmoured and having a black PVC outer sheath.

4.12 STAND ALONE EARTHING KITS

The stand alone earthing kit shall be supplied in kit form.

4.13 MECHANICAL TORQUE SHEAR CONNECTORS AND CRIMPED FERRULES AND LUGS

All joint and terminations shall be supplied with three appropriately sized mechanical torque shear connectors, rated up to 42 kV.

The mechanical torque shear connectors shall comply with NRS 012. Proof of compliance is required.

All joint and terminations for single core 16 mm² to 630 mm² cables shall be supplied with three appropriately sized crimped tin copper ferrules and lugs.

The crimped ferrules and lugs shall comply with NRS 012. Proof of compliance is required.

All mechanical lugs shall have M16 fixing holes.

All installation instructions shall clearly indicate how to install the mechanical torque shear connectors and the crimped ferrules and lugs in the respective joints and terminations.

4.14 ADDITIONAL REQUIREMENTS

Where heat shrink materials are used for the purpose of electrical insulation they shall have a minimum wall thickness of at least 2 mm after application.

An installation instruction shall be provided with every accessory supplied.

The jointing and termination instructions for accessories used with XLPE-insulated cables shall clearly indicate the cable preparation required for cables having an outer sheath made of polyethylene.

The original manufacturer's written approval in respect of the electrical properties of any locally manufactured materials that are supplied shall be provided to ensure that the electrical properties of the material(s) are not changed in any way due to different manufacturing processes. Proof of this written approval shall be provided.

5 LOW VOLTAGE CABLE ACCESSORIES

5.1 JOINT KITS

The joints shall comply with BS EN 50393 and the requirements of this specification.

The joints shall use the resin system and shall be suitable for use with multi-core 600/1000 V PVC insulated, PVC bedded, steel wire armoured and PVC sheathed cable complying with SANS 1507 as described in Table 5-1.

Jointing kits shall be range-taking in accordance with the standard ranges given in Table 5-1.

The joint shell shall:

- a) have the minimum dimensions specified in Table 5-1 for the respective cable ranges;

Note: The minimum dimensions are specified to ensure adequate space for colour to colour jointing (i.e. crossed-cores) as well as maintaining electrical continuity of the armour wires of the cable.

- b) be transparent to allow for visual inspection of clearances, and
- c) be flame retardant.

Table 5-1: Standard ranges and minimum dimensions for LV joint kits

Item	Cable cross-sectional area [mm ²]	Minimum shell dimension [mm]		Number of cores	Number of resin packs
		Shell length	Shell diameter		
1	2,5 to 4	400	69	12 to 27	Not more than 2
2	4 to 10	275	49	2 to 4	Not more than 2
3	16 to 25	400	69	2 to 4	Not more than 2
4	35 to 70	435	95	4	Not more than 2
5	70 to 120	580	105	4	1 mixer container
6	120 to 185	700	140	4	1 mixer container
7	185 to 300	700	140	4	2 mixer containers

Ferrules are not required to be provided with the joint kit for items 1 – 2 of Table 5-1.

Mechanical torque shear connectors suitable for the range specified shall be provided with the joint kit for items 3 – 7 of Table 5-1.

Mechanical torque shear connectors shall be type A and tested in accordance with SANS 61238-1.

The resin shall be clear and have sufficient volume to fill the joint shell when empty.

Individual EPR tape strips shall be provided for insulating the ferrules and sealing both ends of the joint shell prior to the filling process.

A tinned copper braid of minimum cross-sectional area as given in Table 5-2 shall be provided with each joint kit. A method shall be provided and indicated in the jointing instruction to ensure that the copper braid is in contact with all of the armour wires.

Constant force springs or armour clamps shall be provided to connect the copper braid to the steel wire armour at both ends of the joint.

Table 5-2: Earthing conductor minimum cross-sectional areas

Cable cross-sectional area [mm ²]	Tinned copper braid minimum cross-sectional area [mm ²]
≤ 50	16
≤ 95	35
≤ 300	70

Note: The tinned copper braid minimum cross-sectional areas are based upon the equivalent cross-sectional area of the steel wire armour.

The chemical composition and classification of the components or resin shall be provided. The inhalation of fumes or vapours produced by any of the components or the curing resin shall have no adverse effects on the health of any person.

Each joint shall be supplied with two appropriately sized cable ties that shall be used to pull the cores together before placing the joint shell over the joined cables.

Each joint container/packaging shall be clearly marked with the expiry date of the resin.

5.2 TERMINATION KITS

Low voltage cable terminations shall be suitable for outdoor conditions. The termination kit shall:

- a) be constructed from polyolefin material
- b) be suitable for outdoor use
- c) be UV stable
- d) require no special tools or skills, and
- e) be resistant to abrasion, weathering, and atmospheric conditions.

The termination kit shall be capable of moisture sealing the crutches and cores of plastic, paper and rubber insulated cables.

The termination kit shall be capable of shrinking to fit several different sizes and types of cables as specified in Table 5-3.

Table 5-3: Standard range of low voltage power cables

Item	Compatible termination boot sizes	Cable cross-sectional area [mm ²]	Number of cores	Conductor
1	16 – 35	16	2	Copper / Aluminium
1	16 – 35	25	2	Copper / Aluminium
2	16 – 35	16	4	Copper / Aluminium
2	16 – 35	25	4	Copper / Aluminium
2	16 – 35	35	4	Copper / Aluminium
3	35 – 70	70	4	Copper / Aluminium
4	70 – 150	120	4	Copper / Aluminium
5	185 – 300	185	4	Copper / Aluminium
5	185 – 300	240	4	Copper / Aluminium

6 MARKING, PACKAGING AND STORAGE

6.1 MARKING

All accessories shall be clearly and durably marked as follows:

- a) the manufacturer's identification mark and part number (to be visible on the accessory packaging);
- b) the rated voltage and accessory description, e.g. 12 kV Outdoor termination (XLPE);
- c) the accessory range (to be visible on the accessory packaging)
- d) all components forming part of an accessory shall be marked with the manufacturer's identification mark as well as a part number. This part number shall be referenced in the bill of materials;
- e) all components or consumables that are subject to a shelf life limitation, shall be individually packed and have the expiry date prominently and permanently shown on the packaging;
- f) where an accessory contains components or consumables that have an expiry date it shall be clearly marked on the outside of the cardboard container; and
- g) the completed accessory shall be provided with an indelible label that indicates the manufacturer/supplier, accessory part number and allows the jointer to record their name and date of installation. The installation instruction shall show how the label is to be installed. This label shall be weather proof.

6.2 PACKAGING

Each accessory shall be packed in a cardboard container to protect it from mechanical damage. Individual parts shall be packed in sealed plastic bags. The package shall contain:

- a) an installation instruction;
- b) all necessary components and consumables required to complete the installation in accordance with the instruction i.e. accessory components, cleaning kit and earthing kit; and
- c) a bill of materials.

Plastic packing shall be such as to permit easy identification of the components without their removal from the packing.

Mastic fillers shall be packed in the required lengths for the various applications i.e. it shall not be left to the jointer to decide how much mastic should be used in each application.

Where accessories are bulk packed the mass of each container shall not exceed 30 kg. The container shall be marked with the following information:

- a) the name of the manufacturer;
- b) date of manufacture
- c) the accessory reference;
- d) the number of accessories per container; and
- e) KEBU's order number.

6.3 STORAGE

Components shall be capable of being stored without deterioration within the temperature range of -5 °C to + 45 °C for at least 24 months.

7 DOCUMENTATION, SAMPLES AND QUALITY MANAGEMENT

7.1 INSTALLATION INSTRUCTIONS

Installation instructions shall:

- a) be printed in colour, not only black and white.
- b) be unique to the rated voltage and the cable type for which the accessory has been designed;
- c) for terminations be unique for indoor and outdoor applications;
- d) be supported by legible illustrations, that clearly indicate the application and assembly of all components of the accessory;

- e) reference the bill of materials by utilising the short description and by quoting the relevant part number at least once when describing the components;
- f) indicate a date of issue and revision number.
- g) be provided with a cover page on which the jointer and KEBU's supervisor shall sign.

7.2 BILL OF MATERIALS

The bill of materials shall provide the following information for each component:

- a) a short description;
- b) the quantity;
- c) a part number.

7.3 TYPE TEST CERTIFICATES / REPORTS

All required type test certificates shall be submitted to KEBU. Single copies of all type test reports and certificates, in English, for the accessories offered shall be supplied to KEBU for approval at the bidding stage.

The type test reports shall include an installation instruction and bill of materials that form an integral part of the test report issued by the test authority.

Full routine test certificates shall be provided with the accessories supplied. Original manufacturer's test certificates/reports for bought out (out-sourced) equipment shall be provided with the equipment supplied.

If required, terminations shall be subjected to the 1000-hour salt fog test specified in IEC 60055-1 and SANS 60502-4. Proof of successful completion of the test shall be provided.

7.4 SAMPLES

If so required, samples of all accessories shall be supplied during the evaluation stage of the tender process.

7.5 QUALITY MANAGEMENT

A quality management plan shall be submitted in order to assure the proper quality management of the cable accessories during design, development, production, installation and servicing phases. Guidance on the requirements for a quality management plan may be found in the SANS ISO 9001. The details shall be subject to agreement between Keetmanshoop Municipality and the supplier.

8 TRAINING

If required, the supplier shall provide the following details with the tender regarding certified training offered:

- a) the available training courses;
- b) the duration of each course;
- c) the cost per delegate for training at a jointing school
- d) the minimum number of delegates required; and
- e) on-site training and back-up.

KEBU will only make use of accredited electricians; therefore, per new product must allow for accreditation of at least 5 – 10 electricians.

9 TESTS

All medium-voltage accessories shall be tested in accordance with NRS 053.

Type test certificates as per BS EN 50393 shall be submitted with a tender. All detailed tests performed during manufacturing shall be supplied by the manufacture.

ANNEXURE B – TECHNICAL COMPLIANCE SCHEDULES A AND B (JOINTS)

ANNEXURE C – TECHNICAL COMPLIANCE SCHEDULES A AND B (TERMINATIONS)