Annexure A

KEETMANSHOOP MUNICIPALITY

KEETMANSHOOP ELECTRICITY BUSINESS UNIT (KEBU)

SPECIFICATION FOR OVERHEAD LINES (420 V, 11, 22, 33 KV) Part 3 – Overhead Line Materials & Accessories including ABC Conductor Lines

Reference: KEBU_SPEC_012

Revision: 1

August 18

CONTENTS

FOREWORD

This specification covers Keetmanshoop Electricity Business Unit (KEBU) requirements for overhead line material and accessories (420 V, 11 kV, 22 kV, 33 kV) and overhead line structures up to 33 kV standard.

Tenderers shall complete the technical schedules as detailed in Annexure B. 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.

Overhead line material and accessories shall be in accordance with the relevant SANS and/or IEC standards or similar approved.

1 SCOPE

This specification covers KEBU's requirements for overhead line material and accessories (420 V, 11 kV, 22 kV, 33 kV) and overhead line structures up to 33 kV standard.

2 NORMATIVE REFERENCES

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

2.1 WOODEN POLES

SANS 753, *Pine poles and cross-arms for power transmission, low-voltage reticulation and telephone systems*

SANS 754, *Eucalyptus poles and cross-arms for power transmission, low-voltage reticulation and telephone systems*

SANS 10005, *The preservative treatment of timber*

ISO 9001, *Quality Management systems – Requirements*

SANS 616, *Wood-preserving mixtures*

SANS 3575, *Continuous hot-dip zinc-coated carbon steel sheet*

2.2 STAYS AND ASSOCIATED COMPONENTS

NRS 022, *Stays and associated components*

2.3 CONDUCTOR

SANS 61089, *Round wire concentric lay overhead electric stranded conductors.*

SANS 182-1, *Conductors for overhead electrical transmission lines – Part 1 (Copper wires and stranded copper conductors).*

SANS 182-2, *Conductors for overhead electrical transmission lines – Part 2 (Stranded aluminium conductors).*

SANS 182-3, *Conductors for overhead electrical transmission lines – Part 3 (Aluminium conductors, steel reinforced).*

2.4 INSULATORS

NRS 066, *Medium voltage insulators*

2.5 AERIAL BUNDLED CONDUCTOR

SANS 1418, *Aerial Bundled Conductor Systems (Part 1 & 2)*

NRS 018-5, *Fittings and Connectors for Low-Voltage Overhead Power Lines Using Aerial Bundled Conductors - Part 5: Current-carrying connectors and joints*

NRS 063, *Split-Concentric Single-Phase Aerial Service Cable — For Domestic Service Connections with Separate Neutral and Earth Conductors*

NRS 020, *Cable ties for use with low voltage aerial bundled conductors*

NRS 018-2, *Fittings and Connectors for Low-Voltage Overhead Power Lines Using Aerial Bundled Conductors - Part 2: Strain and suspension fittings for insulated neutral supporting conductors*

3 DEFINITIONS AND ABBREVIATIONS

The definitions and abbreviations in the above documents shall apply to this specification.

4 MATERIAL

4.1 WOODEN POLES

All wooden poles and cross-arms shall be pine class A to SANS 753 and eucalyptus to SANS 754. The poles shall be of the 55 MPa quality.

All poles shall be subject to inspection in accordance with SANS 753 or SANS 754 to ensure compliance with the specification. Each pole and cross-arm shall bear a marked tag indicating such compliance.

All poles and cross-arms shall be securely bound at both ends.

All wooden poles and cross-arms shall be impregnated with a creosote mixture conforming to the requirements of SANS 616.

Unless otherwise approved, the average moisture content of poles and cross-arms at the time of treatment shall not exceed 250 g/kg.

Impregnation shall be carried out by means of either of the following methods:

a) Hot/cold open tank process

b) Full cell pressure process, or

c) Empty cell pressure process.

Where poles are drilled on site the wood shall be impregnated with high temperature creosote immediately after drilling. At all points where hardware is to be installed 150 mm to 200 mm bands are to be painted around the pole using conducting paint comprising of 10 kg plumbago to 18 l raw linseed oil.

Where holes are drilled into the wood a maximum clearance of 2 mm shall be allowed to avoid the exposure of thinly treated wood. No hole shall be drilled within 150 mm from the end of a pole.

Table 4-1: Wooden Pole Sizes

Pole length [m]	Pole top [mm]	Application	Planting depth [m]
5	80-99	Service connections	1.0
7	120-139	ABC	1.3
8	120-139	ABC	1.3
9	140-159	ABC	1.5
10	160-179	MV	1.7
11	160-179	MV	1.8
11	180-199	MV transformer structures	1.8
12	180-199	MV	2.0
13	180-199	Special MV application	2.2

Pole length [m]	Pole top [mm]	Application	Planting depth [m]
14	200-219	Special MV application	2.2
15	200-219	MV	2.2
16	200-219	Road crossings (Abnormal loads)	2.2

The poles shall be provided with identification tags bearing the following information:

a) the identification mark of the plant at which the pole was treated

b) the year and month during which the pole was treated (e.g. 2015/01)

c) length of pole and tip diameter (e.g. 11 m/140 mm)

d) specie of pole and strength class (e.g. E55 for eucalyptus 55 MPa poles, P55 for pine 55 MPa poles)

e) treater's registered certification body mark (e.g. SABS)

f) the class of wood preservative used, see SANS 10005 (e.g. A1)

g) the number of the charge in which the pole was treated (e.g. 137)

4.2 CONDUCTOR

The line conductors shall consist of Aluminium Conductor Steel Reinforced "ACSR" conductors to SANS 182, Part 3, or Bare stranded hard-drawn copper conductors to SANS 182, Part 1.

The following standard British size ACSR conductors shall be used having characteristics as indicated in the table below:

Code Name	Equivalent Cu area [mm²]	Stranding and wire diameter [mm]	Overall diameter [mm]	Aluminium area [mm²]	Breaking load [kg]	Current rating [A]
Gopher	16.3	6/1/2.36	7.08	26.25	990	150
Rabbit	32.26	6/1/3.35	10.05	52.88	1890	240
Hare	64.52	6/1/4.72	14.16	104.98	3670	360

The steel-core wires shall be preformed so that they remain inert and do not move relative to each other when cut. The aluminium used for the conductors shall be of the highest purity available. The stranding of each layer of the conductor shall be as close as possible with a right handed outer layer.

No joints shall be allowed in individual wires of a standard drum length.

The conductors shall be supplied wound onto drums constructed of approved material in accordance with BS 1559. The standard drum lengths for Gopher, Rabbit and Hare conductors shall be 3000 m, 1500 m and 1500 m respectively. The exact length of the conductor with an arrow indicating the correct direction of rolling must be marked on all conductor drums.

If specified in schedule A, the core and the inner layers of aluminium shall be greased with an approved grease complying with IEC 61394. Grease shall be uniformly applied by an approved method in accordance with IEC 61089. Only one type of grease shall be used on the steel core and all the aluminium layers on all conductors. All aspects of manufacture and delivery of greased conductors shall be completed in such a manner that grease is not displaced toward the outer surface of the conductors.

4.3 INSULATORS

Insulators together with their fittings shall comply with NRS 066, as specified and where specified shall offer a high resistance to damage, caused by malicious vandalism. Insulator material shall be high grade porcelain. As an alternative cycloalipohatic resin insulators shall be used where specified.

Pin type, Class B insulators shall be used on all cross-arms for the high voltage suspension structures. Pin type insulators shall be made in one piece and shall be manufactured from the finest grade wet process porcelain, by the hot-press method. Pure Portland cement, steam cured in saturated atmosphere ovens shall be utilized to cement the porcelain and metal to porcelain components.

Line post, Class A insulators shall be used as an alternative insulator to the pin insulator where specified. Line post insulators shall be of the capless, solid-core type. Line post insulators shall be puncture proof, radio interference free and shall display superior performance in polluted environments.

Long rod, Class A insulators shall be used in all cross-arms for the high voltage strain, terminal and pole-mounted transformer structures. The porcelain long rod insulator shall be absolutely puncture proof and of the type as specified in schedule A.

All insulators shall comply with the electrical and mechanical requirements as specified in table 2 of NRS 066 and as specified in schedule A.

The required specific creepage distance shall be specified in schedule A.

Table 4-2: General electrical and mechanical characteristics of insulators

1	2	3	4
Rated voltage		24 kV	36 kV
Rated lightning impulse withstand voltage		170 kV	200 kV
Rated short duration wet Power – frequency with stand voltage r.m.s, kV		50 kV	70 kV
Connecting length, mm (for long rods)		450 ± 12	570 ± 12
End fitting (Long rod)	Live end	Tongue	Ball
	Support end	Clevis	Socket
End fittings (Post)	Base	M20 insert or cap	M20 insert or cap
	Tie top	F-Neck	F-Neck

1	2	3	4
Mechanical failing load (Post), min kN		4	10
Specified mechanical load (Long rod), min kN		40	120
Creepage distance	Very heavy	31 mm/kV	31 mm/kV
Insulating material		Silicone rubber	Silicone rubber

4.4 JOINTS

The Contractor shall, where possible, order the conductor lengths so that there are no joints in any of the spans and that the jointing of conductors only takes place at termination structures.

Where joints are to be used the joints shall be of the compression type which shall have a mechanical strength of not less than 99 % of the ultimate strength of the conductor when tested in accordance with BS 3288 Part 1.

The electrical conductivity and current carrying capability of the joint shall not be less than that of the conductor.

During assembly of a joint, there must be no possibility of relative movement between individual layers of the conductor.

4.5 HARDWARE AND FITTINGS

All cast iron and steel fittings and hardware shall be manufactured in compliance with SANS 61284 where applicable and shall be hot-dip galvanised to SANS 121. No drilling, screw tapping or cutting of hardware and fittings shall be permitted after galvanising.

Eye bolts used for the strain and terminal structures shall be manufactured from mild steel and shall have a minimum failing load of 70 kN. The bolt size shall be of diameter indicated on the drawings with length to suit and the diameter of the eye and the eye material shall suit the dimensions of the shackle to be used.

The shackles shall be manufactured from forged steel and shall have a minimum failing load of 70 kN. The dimensions thereof shall suit the clevis of the insulators to be used.

The strain clamps shall be manufactured from malleable cast iron to BS 310 and shall have a minimum failing load of 70 kN. The dimensions of the clevis of the clamp shall be suitable for the tongue of the insulators to be used.

Intermediate pole conductor binding shall be effected by means of preformed wire ties. The ties shall be secured against unravelling by an approved stainless steel security band. Tension fittings shall be the preformed wire type together with suitable fittings for securing the tension insulators.

Tension insulator sets and fittings shall, unless otherwise approved, be ranged to give a minimum clearance of 150 mm between the jumper conductor and the rim of the live end insulator units. Tension sets shall be fitted with attachment plate to enable the load on the tension set to be relieved for maintenance purposes. Fittings made of steel or malleable iron shall be galvanised as specified to

prevent corrosion. All bolts and nuts shall be as specified and unless otherwise approved shall be locked by means of locknuts.

Split pins used on all insulator fittings shall be of stainless steel or other approved material and shall be backed by washers. Hump backed split pins shall not be used.

Two bolt parallel groove clamps of approved quality shall be used at jumper connections. The clamps not allow any slip or deterioration of the jumper connection at a load of less than 50 % of the ultimate strength of the conductor, and shall be designed so that loosening of the jumper connection is not possible in service.

4.6 STEEL CROSS-ARM

The steel cross-arms for the mounting of the expulsion fuses shall be manufactured from 1,6 metre 75 mm channel iron.

The steel cross-arms for the mounting of the transformer shall be manufactured from 100 mm steel channel iron as indicated on the detail thereof on the drawings.

4.7 POLE STAYS

Pole stays shall comply with the requirements of NRS 022 and shall comprise of the following:

a) preformed pole make-off

b) galvanised multi-strand steel wire, 7/4,0 mm

c) galvanised steel stay rod, M20 x 2,4 m, assembly including thimble

d) galvanised steel stay plate, 600 mm x 600 mm x 6 mm.

e) porcelain stay insulator, 136 mm x 85 mm type S22.

The type(s) of fitting(s) and the quantities of each type required will be specified in schedule A.

The central part of the 'make-off' shall be double-wrapped onto the pole top, after which the two legs shall be wrapped over the unformed wire to form a seven strand stay of similar strength and diameter to that of the normal staywire.

Stay rods, swivels, etc, shall comply with the relevant requirements of NRS 022 and the stay wire shall comply with the requirements of SANS 182-5.

Galvanising shall comply with the appropriate requirements of SANS 121.

Base-plates shall be provided with locking facilities to prevent turning of the stay rods.

Approved means for setting and re-adjusting the stay for stretch and settlement shall be provided.

The stays shall be erected so as to an angle of 45° to the pole and must be set for sufficient tension.

Porcelain stay insulators shall be used on all stays. They shall have a dry flashover of 35 kV. Cullinan SAG S22 or equivalent shall be used.

4.8 EXPULSION FUSES

The expulsion fuses shall comprise of three single pole spring loaded units suitable for mounting on a galvanised steel cross-arm. Each unit shall consist of:

a) Galvanized mounting brackets complete with fixing bolts

b) Insulator assembly manufactured from high quality glazed porcelain

c) Spring loaded contact assembly. Positive spring action shall cause the ejection of the fuse holder from its contact point under fault conditions.

d) Fuse holder consisting of an insulated cartridge and the fuse element.

The minimum fault clearance level of the fuse cutout shall be 200 kVA.

4.9 SURGE ARRESTORS

High voltage surge arrestors shall be of the metal-oxide type and shall have a nominal rating as specified. The arrestors shall include galvanised brackets for their mounting adjacent to the transformer's HV bushings.

4.10 ISOLATING LINKS

The links shall be of the outdoor, single phase, single break type suitable for vertical mounting on a channel iron support. All links shall be supplied complete with mounting base, retaining latch and large operating ring. The links shall be suitable for the connection of ACSR Hare conductors. All ferrous parts of the link shall be hot dipped galvanised and non-ferrous parts shall be plated to protect against corrosion. The links shall be insulated for the voltage specified and shall have a current rating of 400 amps and a short circuit capacity of up to 350 MVA for 3 seconds.

4.11 STRUCTURE EARTH

Galvanised steel wire, 3 x No 8 SWG 70 ton quality, shall be used for the earthing of the wood pole structures where specified.

The earthwire shall be stapled to the bottom end of the pole in a spiral form, using two metres of earthwire and must then be stapled along the length of the pole to 150 mm below the intersection of the two steel bracing straps.

The bracket securing the middle conductor to the upright shall have an earthwire connected between it and the bolt securing the cross-arm to the upright.

4.12 INDICATION AND DANGER PLATES

Conspicuous danger plates shall be fixed on all suspension and strain structures. The inscription and background of danger plates shall be vitreous enamel and the plate must be completely covered to prevent corrosion. Pressed aluminium plates shall be used for pole numbering.

4.13 ANTI-CLIMBING DEVICE

Each pole of a structure shall be fitted with six turns of galvanised barbed wire at a height of not less than 3 m above ground to prevent unauthorized persons coming into contact with live conductors by climbing such structures. Galvanised steel staples are to be used for securing these turns at approximately 150 mm intervals.

5 LINE CONFIGURATION AND STRUCTURES

5.1 GENERAL

Lines shall generally be configured as indicated in the drawings.

The line configuration and support structure shall be suitable for the proposed route.

Insulators shall be chosen to provide the mechanical strength and insulation level required by the line at every point.

Insulators shall be spaced to provide the conductor clearance required.

All steel or ironwork, i.e. fittings, cross-arms, bolts, nuts, washers, etc. shall be hot-dip galvanised to SANS 32 and 121.

The position of stays may or may not be indicated in the instructions for service, but it is the responsibility of the Contractor to provide staying adequate to maintain correct tension of the line and the verticality of every pole in the line.

5.2 A-FRAME

A-frames shall be manufactured from mild steel standard profiles as indicated in the detailed drawings. A-frames shall be bolted to the pole with 2 off M20 x 200 bolts threaded 80 mm, or threaded rod, complete with curved washers, spring washers and hexagonal nuts and locknuts. All holes drilled on A-frame to 22 mm diameter.

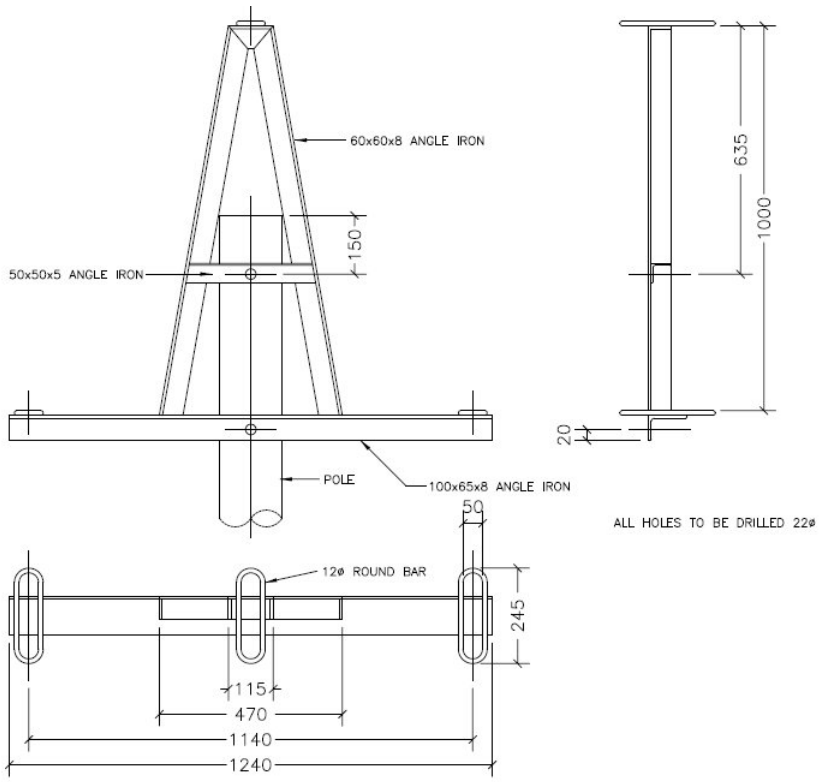

Figure 5-1: MV Bare Overhead Distribution Strain A-frame details

5.3 VERTICAL STAGGERED DELTA

Long rod insulators with thimble clevis shall be used and installed in accordance with approved detailed drawings. The minimum clearance between insulators shall be 800 mm. Insulators shall be bolted to the pole using M20 x 250 Eye Bolts, complete with curved washers, spring washers and hexagonal nuts and locknuts. All holes drilled on structure to be 22 mm.

6 AERIAL BUNDLE CONDUCTOR (ABC)

6.1 GENERAL

The cable shall be an ABC suspended on poles, and shall be constructed to form a bundle consisting of the following insulated conductors:

a) 3 phase conductors

b) 1 neutral conductor, and

c) 0, 1 or 2 Street Lighting / Earth Conductors (typically 1 is supplied).

The neutral conductor shall act as the carrier within the bundle and the phase conductors shall be laid around it. There shall be no overall sheath over the bundle and each conductor shall be easily extracted from the bundle.

The phase conductors shall have a core made from a stranded compacted three quarters hard drawn aluminium of 95,5 % purity having the properties laid down in SANS 1418.

The neutral conductor shall have a working stress not exceeding 33 % of its ultimate tensile strength. The bundle shall be supported by the neutral / carrier and no mechanical tension shall be put onto the phase or lighting conductors.

The bundle shall be laid up into the following configuration:

a) 3 x 120 mm² + 70 mm² + "Y" x 25 mm²

b) 3 x 95 mm² + 54,6 mm² + "Y" x 25 mm²

c) 3 x 70 mm² + 54,6 mm² + "Y" x 25 mm²

d) 3 x 50 mm² + 54,6 mm² + "Y" x 25 mm²

e) 3 x 35 mm² + 54,6 mm² + "Y" x 25 mm²

Where "Y" = 0,1 or 2 street lighting conductors.

6.2 CONSTRUCTION

The XLPE insulation shall be rated at 1 000 V nominal. During manufacture the cable shall be tested to be able to withstand 10 kV for at least 30 minutes continuously without breakdown of insulation, after being immersed in water for a period of 24 hours. The supplier shall state whether this test has been done for the cable they offer. The conductors of the bundle shall be twisted, with a right hand lay and the laying pitch shall be such as to allow the easy separation of conductors for making connection but also maintaining the bundle cohesion at angles. The cable shall be manufactured to comply with SANS 1418.

The cores shall be fully compressed so that no air-pocket in the cores are visible. These cores shall be of a circular cross section and shall be insulated with a single layer of cross linked polyethylene (XLPE) applied by an extrusion process. The XLPE layer shall be easily removed from the core. If a separator is used then it should be coloured to the extent that it is easily visible, to make its removal

easy. The XLPE insulation shall be black in colour and be Ultra Violet (UV) treated to have a high resistance to weather. The phase conductor shall be identified in the bundle by use of the numbers 1, 2, 3, denoting the individual phases. These numbers shall be both printed and embossed on each conductor. Conductors with no identification printing will not be acceptable. The Street Lighting / Earthing Conductor shall be made to the same standards and materials as that of the phase conductors described in the above paragraph, i.e. aluminium core with UV treated black XLPE insulation. The identification markings shall be "A1" or "A2" running longitudinally along the length of the cable. This marking shall be maximum 40 mm apart and the designation shall not be more than 30 mm long and less than 3 mm high. The marking shall only be printed on to each conductor. Conductors with no identification printing will not be acceptable. The Neutral Conductor shall be the carrier and shall be of circular cross section and made of aluminium alloy (Almelec) with approximately 0,5 % Magnesium, 0,5 % Silicon and traces of iron.

The electrical and physical properties and the dimensions of a supporting conductor shall comply with the appropriate requirements given in table 1 of SANS 1418, Part 1.

This core shall be insulated with a single layer of cross linked XLPE applied by an extrusion process. The XLPE layer shall be easily removed from the core and if a separator is used, then it should be coloured to the extent that it is easily visible to make its removal easy. The XLPE insulation shall be black in colour and be UV treated to have a high resistance to weather.

The Neutral Conductor / Carrier shall be of one size only (54,6 mm² nominal) irrespective of the size of the phase conductors used in the bundle from 25 to 95 mm². For a 120 mm² phase size, a 70 mm² neutral shall be used. The Neutral shall be identified only by longitudinal "rib" 1 mm wide x 1 mm high running down the entire length of the conductor in order to facilitate easy identification from the phase conductors particularly in the dark.

6.3 POLE MOUNTING HARDWARE

Pole fittings shall comply with the requirements of NRS 018 Parts 2 and 4.

6.3.1 Universal Brackets

Only two items of mounting hardware shall be required to install all sizes of aerial cables from 25 to 120 mm². The mounting hardware shall consist of a pole mounting bracket which is used for both the suspension and deadend clamp. The pole mounting brackets shall be made from aluminium alloy and shall be fixed to the pole by means of two stainless steel (grade 304) straps (0,7 x 20 mm) or one 16 mm diameter bolt. The design of the pole mounted bracket shall be such that it has a weak link so that when the load exceeds a predetermined value, the bracket breaks. Suppliers shall indicate the breaking load of the universal pole mounting bracket in the horizontal and vertical plane. The pole mounted universal bracket shall be delivered, packed separately from the suspension and deadend clamps such that any combination of deadends can be made up on site, i.e. single, double or triple deadends. The pole mounting bracket shall be of approved type.

6.3.2 Suspension Clamps

The suspension clamp shall be made from reinforced glass fibre plastic material to ensure double insulation of the carrier. The suspension clamp shall have a forged aluminium alloy link for attaching the clamp to the pole mounting bracket. The forged aluminium alloy link shall be so designed so that it has a weak point which will break before the conductor breaks in the event of a tree falling on the line. The link shall also be made so that once the suspension clamp is attached to the bracket, it cannot become detached once installed on the line. To install the conductor into the clamp, no tools shall be required.

The pressure exerted on the cable shall be independent of the person who installs the clamp and shall be factory set to a predetermined force. The bottom of the suspension clamp shall have a slot to allow a cable tie to be threaded through the clamp.

The suspension clamp must be able to be where the line is displaced up to 50 degrees on outside angles and 30 degrees on inside angles. The suspension clamp shall be of approved type.

6.3.3 Deadend Strain Clamps

The body of the strain clamp shall be made of a cast aluminium alloy and have conical wedged made from a polycarbonate material. Deadends making use of plastic bodies are not acceptable. The polycarbonate wedges shall ensure double insulation of the neutral carrier and avoid any damage to its sheath. The wedges shall run in guided rail grooves so designed such that when they are pulled completely open they do not fall closed under gravity when the clamp is held perpendicular to the ground. This is required in order to make installation easier. The strain clamp shall be attached to the bracket by means of a stainless steel flexible ball. The flexible ball shall be designed so that the deadend clamp can be easily attached to the universal pole mounting bracket without having to loosen any parts. Once the deadend is under tension, it must not be subject to any distortions. The breaking load of the deadend strain clamp shall not be less than 15 kN.

6.4 BUNDLE CONDUCTOR ELECTRICAL CONNECTORS

6.4.1 General

IPCs, crimped joints, lugs and end caps shall comply with NRS 018 Part 5.

The connectors shall be made of high conductivity aluminium alloy. The connector shall be insulation piercing on the main conductor. The insulation piercing teeth shall be machined to sharp points and be of sufficient depth to allow good contact on the aluminium conductor. Deep unmachined serration shall not be acceptable for insulation piercing. The connector shall make use of shear head bolts on the main conductors. The contact surfaces of the connector shall be prefilled with grease which improves the electrical connection. The tap off conductor for all house service connections and bulk supply tap off connections, shall enter the connector parallel to the main conductor. Tap off conductors shall not be allowed to enter a connector at right angles to the main conductor. Shear head bolts shall be used for all connections onto conductors greater than 25 mm^2 in cross sectional areas. These shear head bolts must shear in the range from 12 to 15 Nm. One size insulated spanner having dimensions of 8 mm across flats must be used on all connectors. All bolts tapped into aluminium must be able to take a torque of at least 20 Nm before the threads are stripped. After a

connector has been installed on the 54,6 mm² neutral conductor the breaking load of the neutral must not be less than 16,60 kN. All connectors shall be supplied with insulating shrouds installed on the connectors. The insulating shrouds shall be black in colour and be UV resistant. The insulating shroud shall clip around the connector end, forming a positive seal on both the main and tap off conductors. Insulating shrouds which have perforated slits to allow for conductor entry will not be acceptable. The connector must be designed to straddle the conductor so that it cannot open up when tightened or bolted skew in the conductor. All connectors must make use of separate bolts for the main and tap off conductors.

The components parts of the connectors shall be held together during installation so that no part can fall to the ground.

6.4.2 Bulk Supply Connector

The connector must be suitable for full line current and take conductors from 35 to 120 mm² on both the main and tap off conductors. The bolts tapped into the aluminium must be able to take a torque of 20 Nm before the threads are stripped. The connector must be insulation piercing on the main conductor.

6.4.3 Single Service Connector

The connector must be suitable for main conductor from 35 to 120 mm². The tap must be suitable for conductors from 1,5 to 25 mm². The connector shall be insulation piercing on the main conductors.

6.4.4 Double Service Connector

This connector must take 2 tap off conductors from a main between 35 to 120 mm² and be able to take 1 or 2 tap off conductors from 1,5 to 25 mm². The main connectors must be insulation piercing. The connector must have some form of identification on it so that it can easily be seen from the ground that it is a double service connector, e.g. coloured rivets on the shroud.

6.4.5 Streetlight Connector

This connector shall be suitable for taking conductors from a main between 10 to 25 mm² and tap off conductors from 1,5 to 25 mm².

6.5 MIDSPAN JOINTS

Midspan joints shall be allowed provided the correct pre-insulated joints are used which are recommended by the supplier of the ABC. The midspan joint shall make use of the same crimping die for all sizes from 25 to 95 mm². A different die size shall be used for the 120 mm². The crimping

die used for the 25 to 95 mm shall be the SIMEL 4E-173 and for the 120 sq mm the SIMEL 5E-215. The pre-insulated joints must be colour coded for the various different sizes of conductor. The strip length for the insulation and the no of crimps shall be marked on the joint. Pre-insulated joints shall be equal to the SIMEL type MJPT.

6.6 Bundle Conductor Terminations

Wherever the ABC is terminated onto a distribution board or a transformer use shall be made of friction welded AL/CU lugs to prevent bi-metallic corrosion.

6.7 ABC Cable End Caps

Where the ABC cable ends, each end shall be sealed with a push on moisture proof end cap. Caps shall be similar to the SIMEL flood seal end caps.

6.8 ABC Cable Ties

At each suspension clamp and dead-end at least one metal plastic coated cable tie to NRS 020 must be installed. PVC cable ties are not acceptable. Cable ties must be MALICO L-200 or equal cable tie.

6.9 Wooden Poles

Wooden poles from group strength A, shall be used conforming to SANS 753 specification. Poles shall be 9 m long and have a minimum diameter of 140 mm.

6.10 Stay Assemblies

Stays shall consist of a M20 x 2,4 stay rod, 450 x 450 x 6 mm base plate, SAG 522 stay insulator, 3 guy grip dead ends, 1 pole top make off and 10 m 7/4 mm 700 MPa galvanised stay wire.

6.11 Protective Pipes for ABC

Where bundle conductors or cables are taken down poles into the ground, the bundle conductor shall be protected by a suitably dimensioned galvanised pipe having a length of 3 m above the ground and 0,5 m below the ground. Pipes shall be clamped at a min of 1 m intervals with 20 mm x 0,7 mm stainless steel strapping.

6.12 TECHNICAL INFORMATION

Tenderers shall indicate the following information for each bundle size specified in the bill of quantities:

a) Maximum resistance at 20 °C (Ω/km)

b) Number of strands

c) Minimum diameter of strands (mm)

d) Thickness of insulation (mm)

e) Volt drop per meter at Cos Ø = 1 at 30 °C

f) Permissible current rating at 30 °C

7 TESTS

Tests as specified in the respective relevant standards shall apply to this specification.

8 MARKING, LABELLING AND PACKAGING

Marking, labelling and packaging shall comply with the requirements of the respective relevant standards.

9 DOCUMENTATION

Documentation that complies with the requirements of the respective relevant standards shall be submitted in a catalogue format. In addition, relevant test certificates confirming compliance with the requirements of these standards shall be submitted.

.

ANNEXURE B – TECHNICAL COMPLIANCE SCHEDULES A AND B