TABLE OF CONTENTS

0.1 Circulation List

COPY NO.	COPY HOLDER
1	Research & Development Manager
2	Procurement Manager
Electronic copy (pdf) on Kenya Power Server (currently :Network-\\stima-fprnt-001\techstd&specs	

0.2 Amendment Record

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)
1	2012-02-17	Revised dimensions for Non Tension Joints	S.Kimitei	G.Owuor

FOREWORD

This specification has been prepared by the Research and Development Department in collaboration with Operation & Maintenance Department all of The Kenya Power and Lighting Company Limited (Kenya Power) and it lays down requirements for Conductor joints for Overhead lines. It is intended for use by Kenya Power in purchasing conductor joints for All Aluminium Conductors (AAC), All Aluminium Alloy Conductors (AAAC) and Aluminium Conductors Steel Reinforced (ACSR).

It shall be the responsibility of the supplier to ensure adequacy of the design and good engineering practice in the manufacture of the conductor joints for Kenya Power. The supplier shall also submit information which confirms satisfactory service experience with products which fall within the scope of this specification.

1. SCOPE

1.1 This specification is for conductor joints for use on overhead power lines operating at nominal voltages of up to 66KV and frequency of 50Hz.

1.2 This specification covers the following:

a) Tension joints for Aluminium Conductors:

i. Type Reference no.T1AAC1&2, T1AAAC & T1ACSR1&2 compression type(without steel ferrule) for AAC, AAAC, & ACSR conductors respectively;

ii. Type Reference No.T2ACSR1&2 compression type with steel ferrule ACSR conductors;

iii. Type Reference No. T3AAC1&2 tongs twisted type for AAC conductors.

b) Non tension Joints Type Reference No. NT1AAC1&2, NT1AAAC & NT1ACSR 1&2 compression type(without steel ferrule) for AAC, AAAC & ACSR.

c) Helical Conductor Fittings;

d) Repair Sleeves (Aluminium);

e) Patch Sleeves (Aluminium);

Particular requirements for each type of conductor joint as may be relevant for a specific requisition are given in section 4.3.

2. REFERENCES

The following standards contain provisions which, through reference in this text, constitute provisions of this specification. Unless otherwise stated, the latest edition fo the referenced documents (including any amendments) applies.

BS 3288-1: Insulator and conductor fittings for overhead power lines- Part 1: Performance and general requirements.

ISO 1461: Hot dip galvanized coatings for fabricated iron and steel articles- Specifications and test methods.

ESI 43-92: Conductor terminations, joints and insulator bind for overhead lines up to and including 132Kv.

BS 1471: Wrought aluminium and aluminium alloys for general engineering purposes-drawn tube.

3. TERMS AND DEFINITIONS

For the purpose of this specification, the definitions given in the reference standards shall apply.

4. REQUIREMENTS

4.1 SERVICE CONDITIONS

The conductor joints shall be suitable for continuous operation outdoors in tropical areas at altitudes of up to 2200m above sea level, humidity of up to 90%, average ambient temperature of $+30^0$C with minimum of -1^0C and a maximum of $+40^0$C and heavy saline conditions along the coast.

4.2 GENERAL REQUIREMENTS

4.2.1 All the conductor joints shall comply with BS 3288-1 and requirements of this specification.

4.2.2 The joints shall not damage the conductor except for any deformation necessary to attach the joint.

4.2.3 The conductor joints shall be made of materials of sufficient ductility that the joints can withstand the dynamic mechanical loads to which they are likely to be subjected in service.

4.2.4 The conductor joints shall not give rise to the generation of visible or audible corona discharge at the specified test voltages.

4.2.5 All parts of conductor joints shall be either inherently resist to atmospheric corrosion or be suitably protected against corrosion, such as may occur in transit, storage and in service. All ferrous metal parts which will be exposed to the atmosphere in service, except those made of stainless steel, shall be protected by hot dip galvanized to ISO 1461.

4.2.6 All conductor joints shall be so designed that bi-metallic corrosion within or between joints or between a joint and the conductor does not occur.

4.3 PARTICULAR REQUIREMENTS

In addition to the requirements given elsewhere in this specification the following particular requirements specific to each type of joint shall be complied with.

Joint intended for Aluminium Conductors shall be suitable for All Aluminium Conductor (AAC) of sizes 50 & 100mm^2, All Aluminium Alloy Conductors (AAAC) of size 300mm^2 and Aluminium Conductor Steel Reinforced (ACSR) of sizes 75 & 150mm^2.

4.3.1 **Tension Joints for Aluminium Conductors-Compression type, without steel ferrule** (Type Reference No.T1AAC1&2, T1AAAC & T1ACSR1&2)

4.3.1.1 The joints shall be in accordance with Fig.1 and Table 1 of this specification and shall be manufactured from aluminium tube to BS 1471 designation T1B condition H4.

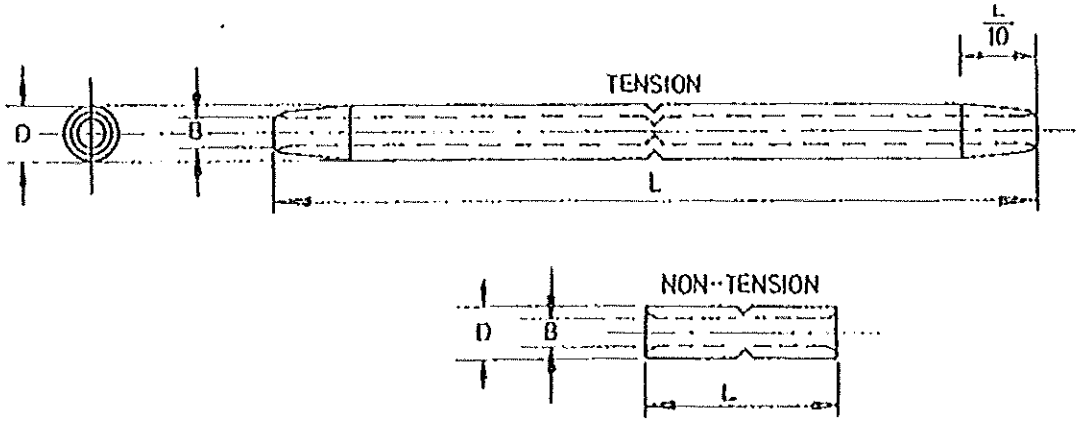

Fig 1: Aluminium Compression Joints

CONDUCTOR			LENGTH L (mm)				BORE B (mm)	DIAMETER D (mm)
Type	Size (mm)	Stranding (No/mm)	TENSION		NON-TENSION			
ACC	50	7/3.10	T1AAC1	200	NT1AAC1	120	10.72	15.88
	100	7/4.39	T1AAC2	300	NT1AAC2	120	15.09	25.40
AAAC	300	37/3.53	T1AAAC	700	NT1AAAC	180	25.7	40.0
ACSR	75	Al:6/4.09 St:1/4.09	T1ACSR1	500	NT1ACSR1	120	13.3	30.15
	150	Al:30/2.59 St:7/2.59	T1ACSR2	500	NT1ACSR2	150	19.05	30.15

4.3.1.2 The bore shall be tapered at end for a distance of 5mm and be chamfered off as shown leaving a minimum wall thickness at the ends of 2mm.

4.3.1.3 The tension joint shall be provided with indentations to form a conductor stop at the center of each joint. Care must be taken to ensure that the bore axis remain straight and is not deformed by this operation.

4.3.1.4 The joint shall be inserted between two lengths of a conductor to provide electrical and mechanical continuity of the conductor.

4.3.1.5 The barrel of each joint shall be packed with abrasive neutral high melting point soft grease and the ends sealed. The quantity of grease shall be approximately half the volume of the bore.

4.3.2 **Tension joints for Aluminium Conductors-Compression type, with steel ferrule** (Type Reference No. T2ACSR1&2)

4.3.2.1 The joints shall be in accordance with Fig.2 of this specification.

4.3.2.2 The aluminium sleeve shall be manufactured from aluminium tube to BS 1471 designation T1B condition H4.

4.3.2.3 Materials of construction for the steel ferrule shall be selected to be compatible with galvanized steel wires used in ACSR conductor to BS 215-2.

4.3.2.4 The set of aluminium tube and steel ferrule shall be dimensioned such as to comply with requirements of BS 3288 for tension joints and this specification. The set shall be in two sizes: T2ACSR1 for 75mm^2 ACSR conductors and T2ACSR2 for 150mm^2 ACSR conductors (conductor details as per Table 1).

4.3.2.5 The joint shall be inserted between two lengths of a conductor to provide electrical and mechanical continuity of the conductor. The steel core shall be joined by use of the steel ferrule, the aluminium sleeve shall then be compressed over the complete conductor.

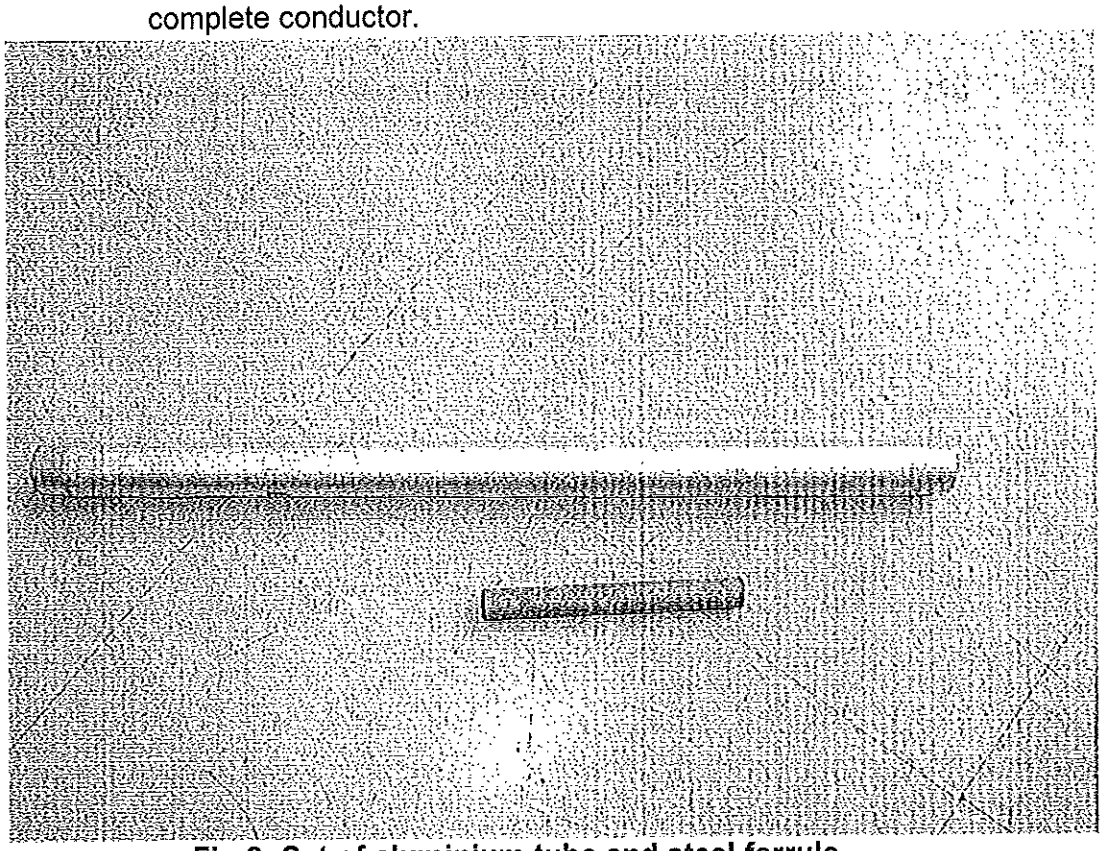

Fig 2: Set of aluminium tube and steel ferrule

4.3.3 Non-Tension Joints for Aluminium Conductors-Compression Type

4.3.3.1 The joints shall be in accordance with fig. 1 and Table 1 of this specification and shall be manufactured from aluminium tube to BS 1471 designation T1B condition H4.

4.3.3.2 The joint shall be suitable for connection of two consecutive pieces of conductor which are to be held, but not at line tension.

4.3.3.3 The bore shall be tapered at end for a distance of 5mm.

4.3.3.4 The non-tension joint shall be provided with indentations to form a conductor stop at the centre of each joint. Care must be taken to ensure that the bore axis remains straight and is not deformed by this operation.

4.3.3.5 The barrel of each joint shall be packed with an abrasive neutral high melting point soft grease and the ends sealed. The quantity of grease shall be approximately half the volume of the bore.

4.3.4 Tension joint for All Aluminium Conductors- Tongs Twisted Type (Type Reference No. T3AAC1&2)

4.3.4.1 The joint shall be in accordance with Fig. 3 of this specification and shall be suitable for installation by use of tongs twister.

4.3.4.2 The barrel for each joint shall be packed with an abrasive neutral high melting point soft grease and the ends sealed. The quantity of grease shall be approximately half the volume of the bore.

4.3.4.3 The bore shall be elliptical in cross-section and shall be suitable for AAC conductor sizes $50mm^2$ and $100mm^2$ as per table 1.

4.3.4.4 The total length for the tongs twisted type joint for $50mm^2$ AAC and $100mm^2$ AAC conductors shall be 400mm and 600mm respectively.

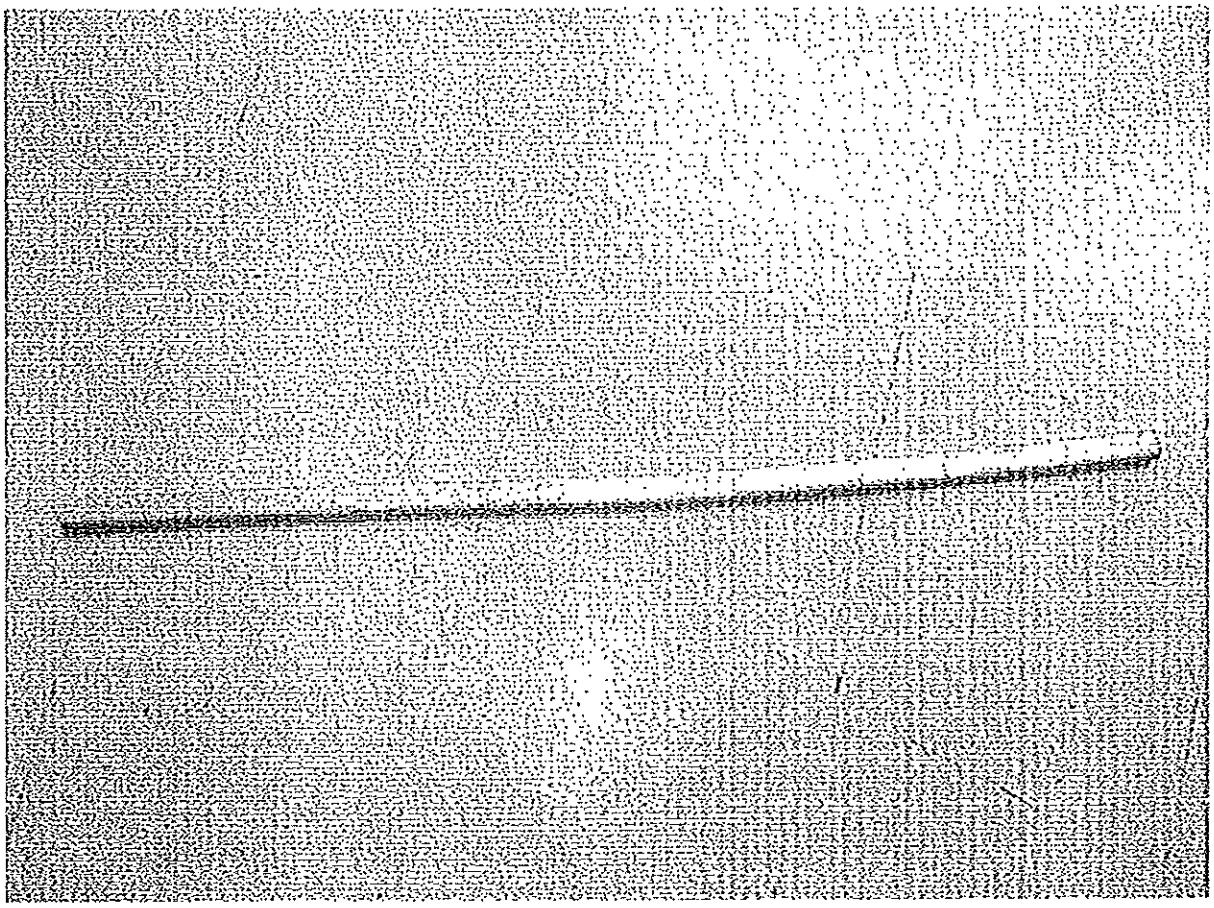

Fig 3: Tension Joints for All Aluminium Conductors- Tongs Twisted Type

4.3.5 Helical Conductor Fittings

4.3.5.1 The fittings shall be factory formed.

4.3.5.2 The fittings shall be designed and constructed such that the force necessary to grip the conductor is provided by helical wires which are self tightening on the conductor.

4.3.6 Repair sleeves

4.3.6.1 The fittings shall be suitable for aluminium conductors.

4.3.6.2 The fittings shall be suitable for installing over a damaged conductor in order to restore its electrical and mechanical properties.

4.3.6.3 The repair sleeves shall be suitable for aluminium conductors whose details are given in table 1.

4.3.7 Patch sleeves

4.3.7.1 The fittings shall be suitable for aluminium conductors.

4.3.7.2 The fittings shall be suitable for installing over a damaged conductor in order to restore its electrical properties.

4.3.7.3 The patch sleeves shall be suitable for aluminium conductors whose details are given in Table1.

5. TESTS AND INSPECTION

5.1 The conductor joints shall be tested in accordance with the relevant requirements of BS 3288-1 and this specification. It shall be the responsibility of the manufacturer to perform or to have performed all the tests specified.

5.2 Copies of previous Test Certificate and Reports certified by the relevant International or National Testing/Standards Authority of the country of manufacture or ISO/IEC 17025/ILAC accredited testing laboratory shall be submitted with the tender (including certificate of accreditation for laboratory) for the purpose of technical evaluation, all in English Language.

Copies of Test Certificates to be submitted shall include the result of the appropriate type test made on not less than three joint identical in all essential details with those to be supplied. The test report shall include mechanical, electrical (resistance and electrical heating cycle test), and verification of dimensions.

5.3 Routine and sample test reports for the conductor joints to be supplied shall be submitted to KPLC for approval before shipment/delivery of the goods.

Kenya Power Engineers (2) will witness acceptance tests at the factory.

5.4 On receipt of the conductor joints, Kenya Power will inspect them for acceptance at stores and may perform tests or have tests performed in order to verify compliance of the joints with this specification.

The supplier shall replace without charge to Kenya Power, any conductor joints which upon examination, test or use fail to meet any or all for the requirements in this specification.

6.0 MARKING AND INSTRUCTION

6.1 Instruction for installation and details on applicable tools shall be included in each package, all in English language.

6.2 The following information shall be marked legibly, indelibly and permanently on each joint:

(i) Name or trade mark of the manufacturer
(ii) Type reference number
(iii) Conductor sizes applicable
(iv) Crimping positions (for compression type)

ANNEX A: Guaranteed Technical Particulars *(to be filled and signed by the Supplier and submitted together with copies of manufacturer's catalogues, brochures, drawings, technical data, sales records and copies of certificates/test reports for tender evaluation)*

Tender No. .....

Clause number	**Bidder's offer** (indicate full details of the offered equipment for each requirement of the specification)
1. Scope	
1.1-1.2	
4. Requirements	
4.1	
4.2 General Requirements	
.4.2.1	
4.2.2	
4.2.3	
4.2.4	
4.2.5	
4.2.6	
4.3 Particular Requirements	
4.3.1	
4.3.1.1	
4.3.1.2	
4.3.1.3	
4.3.1.4	
4.3.1.5	
4.3.2	
4.3.2.1	
4.3.2.2	
4.3.2.3	
4.3.2.4	
4.3.2.5	
4.3.3	
4.3.3.1	
4.3.3.2	
4.3.3.3	
4.3.3.4	
4.3.4	
4.3.4.1	
4.3.4.2	
4.3.4.3	
4.3.4.4	

4.3.5	
4.3.5.1	
4.3.5.2	
4.3.6	
4.3.6.1	
4.3.6.2	
4.3.6.3	
4.3.7	
4.3.7.1	
4.3.7.2	
4.3.7.3	
Test & Inspection	
5.1-5.4	
5.2	
5.3	
5.4	
Marking & Instructions	
6.1	
6.2	

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Supplier's Name, Signature, Stamp and Date