005: 2011

CEB

SPECIFICATION

PVC INSULATED ALUMINIUM SERVICE MAIN WIRE

CEYLON ELECTRICITY BOARD

SRI LANKA

Specification
for

PVC INSULATED ALUMINIUM SERVICE MAIN WIRE

CEB Standard 005:2011

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SPECIFICATION FOR P.V.C. INSULATED ALUMINIUM SERVICE MAIN WIRE

1.0 Scope

This specification covers design, manufacture and testing of the following PVC Insulated Aluminium Service Main Wires;

a) Twin Service Main Wire with one core insulated other core bare and both sheathed together.
b) Twin Service Main Wire with both cores insulated and sheathed.

2.0 System Parameters

a)	Nominal System Voltage	400/230V 3ph & Neutral
b)	System Highest Voltage	440/250V 3ph & Neutral
c)	System Frequency	50 Hz.
d)	Method of Earthing	Solidly earthed neutral at substations
e)	System Fault Level	16 kA

3.0 Service Conditions

a)	Annual average ambient temperature	30°C
b)	Maximum ambient temperature	40°C
c)	Maximum relative humidity	90%
d)	Environmental Condition	Humid tropical climate with polluted atmosphere
e)	Operational Altitude	From M.S.L. to 1900 meters above M.S.L.

4.0 Applicable Standards

The items and components supplied shall be in accordance with the latest edition of the standard specified below and amendments thereof. However CEB specification shall supersede these standards in the event there is a discrepancy.

BS 2627: 1970	Specification for Wrought Aluminium for Electrical Purposes Wire.
IEC 61089: 1991	Round wire concentric lay overhead electrical stranded conductors
BS 6004: 2000	Electric Cables PVC insulated non armoured cables for Voltages up to and including 450/750V, for electric power, lighting and Internal wiring.
BS 7655-3.1: 1997	Specification for insulating & sheathing materials for cables. PVC insulating compounds. Harmonized types
BS 7655-4.1:1997	Specification for insulating & sheathing materials for cables. PVC sheathing compounds. Harmonized type.
BS EN/IEC 608111.1: 1995	Insulating and sheathing materials of electric cables. Common test methods. General application. Measurement of thickness and overall dimensions. Test for determining the mechanical properties.

5.0 Basic Features

5.1 General

The Service Main Wires shall be of 300/350 V grade and shall comply with BS6004: 2000 in regard to thickness of the Insulation and the Sheath. The formation of insulations and overall sheathing shall be as per drawing No. DS&S/2007/005.

The core for the Service Main Wires stipulated under Clauses 5.2(a) and 5.2(b) shall be ¾ hard drawn aluminium (H6) wires as per BS 2627: 1970.

The Insulation shall be of extruded PVC type TI 1 complying with BS7655-3.1 : 1997.

The Sheath shall be of extruded PVC type TM 1 complying with BS7655-4.1 : 1997.It shall fit closely to avoid ingress of moisture while in service but shall not adhere to the Insulation or to the bare conductor so that it shall be possible to remove the Sheath easily without damage to the Insulation.

5.2 Manufacture

(a) Twin Service Main Wire one core Insulated, other core bare and both Sheathed.

The Service Main Wire shall be of twin type, one Core shall be insulated with **Brown** coloured PVC Insulation, the other core bare, both lay parallel and cores are sheathed with Black PVC sheath material.

The sheath shall separate the insulated conductors by a minimum thickness of 3.5 mm to provide additional Phase to Neutral Insulation. In addition to this a groove of width not less than 1mm shall be provided on the sheath between the phase and the neutral so that the both could be separated easily without bearing the Neutral as per drawing No DS&S/2007/005.

Cross sectional area of the cores shall be (10mm^2/16 mm^2) as indicated in the schedule of the prices.

(b) Twin Service Main Wire both cores Insulated and Sheathed.

The Service Main Wire shall be twin type, and the colours of the insulation shall be **Black, and Grey** and both lay in parallel and sheathed with Black colour PVC sheath material.

Cross sectional area of the cores shall be (10mm^2/16 mm^2) as indicated in the schedule of the prices.

6.0 Technical Requirements

(A) General

a)	Type of service main wire	As per clause 1.0
b)	Nominal cross sectional area	10 mm^2 and 16 mm^2
c)	No. of wires & nominal diameter for (10 mm^2) wire for (16 mm^2) wire	7/1.35mm 7/1.71mm
d)	Number of cores	Two cores
e)	Colour of Sheath	Black

(B) Conductor

a)	Conductor material	¾ Hard drawn Aluminium (H6)
b)	Conductor Diameter for (10 mm^2) for (16 mm^2)	4.05mm 5.12mm
c)	Conductor D.C. Resistance for (10 mm^2) for (16 mm^2)	2.8264 ohm/km 1.7665 ohm/km
d)	Tensile Strength of Conductor for (10 mm^2) for (16 mm^2)	1.25kN ~1.65kN 2.00kN ~ 2.64kN
e)	Wrapping Test of wire (only for 10mm^2)	No crack

(C) Insulation

a)	Insulation Type	Type TI 1 as per BS 7655-3.1: 1997
b)	Thickness	1 mm
c)	Smallest thickness	0.8mm
d)	Tensile Strength of as of manufactured	12.5 N/ mm^2
e)	Tensile Strength after ageing	12.5 N/ mm^2 with max. Variation ±20%
f)	Elongation at break as of manufactured	125 %
g)	Elongation at break after ageing	125 % with max. Variation ±20%
	Spark test- A.C. 10 kV r.m.s.	No breakdown

(D) Sheath

a)	Sheath type	Type TM – 1 as per BS 7655-4.1 : 1997
b)	Thickness for (10 mm^2) wire for (16 mm^2) wire	1.2mm 1.3mm
c)	Smallest Thickness for (10 mm^2) wire for (16 mm^2) wire	1mm 1mm
d)	Tensile Strength of as of manufactured	12.5 N/ mm^2
e)	Tensile Strength after ageing	12.5 N/ mm^2 with max. Variation ±20%
f)	Elongation at break as of manufactured	125 %
g)	Elongation at break after ageing	125 % with max. Variation ±20%

(E) Test on completed Cable

a)	Voltage test- A.C. (.r.m.s.)	2.0 kV

7.0 Quality Assurance

The Manufacturer shall possess ISO 9001: 2000 Quality Assurance Certification valid throughout the delivery period of this tender, for the plant where the Service Main Wire is being manufactured. The Bidder shall furnish a certified copy of the ISO Certificate along with the offer.

8.0 Additional Requirements

8.1 Supply of Raw Materials

The purchaser shall supply aluminium 1350 re-draw rods (temper H14) of 9.52 mm diameter coils to the Manufacturer. The gross weight of each coil of continuous re-draw rods shall be 1.5 MT to 2.0 MT.

The following are the quantities of aluminium re-draw rods shall be supplied for the manufacture of one kilometre of each Service Main Wire.

(a) 57 kg for the manufacture of each kilometre of finished 10mm^2 (7/1.35mm) twin Service Main Wire
(b) 91 kg for the manufacture of each kilometre of finished 16mm^2 (7/1.71mm) twin Service Main Wire

The manufacturer shall collect the Aluminium from the Purchaser's Stores. Other raw materials required for manufacture of the Service Main Wires shall be supplied by the manufacturer.

8.2 Marking

The outer sheath, of the Service Main Wire shall be embossed with letters "CEB" followed by the manufacturer's identification, rated voltage & conductor size according to clause 5.3 of BS 6004 at every 550mm or less along the length.

8.2 Packing

The Service main Wire shall be delivered in 100 Metre or 250 Metre Coils (as stipulated in the schedule of prices) and wrapped in polythene. Each coil shall bear a tag under the polythene wrappings showing the following particulars.

(c). Manufacturer's Name or Trade Mark,
(d). Type of cable
(e). Core size
(f). Length of cable
(g). Colour of Insulation /sheath.
(h). Net weight/Gross weight.

9.0 Information to be furnished with the Offer

9.1 The following shall be furnished with the offer in English Language

(a) Catalogues describing cables offered.
(b) Completed schedule of guaranteed technical particulars (Annex A).
(c) The manufacturer shall have at least 10 years of experience in the manufacturer of PVC cables and he shall furnish sufficient documentary evidence in the bid to prove his manufacturing experience.

(d). ISO 9001 quality assurance certificate as per clause 7.0

9.2 Type Test Certificates

The certified copies of the Type Tests Certificates for the following tests as per BS 6004 and IEC 61089 shall be furnished with the offer;

(a). Insulation material,
(b). Over sheath material
(c). Compatibility test for completed cables
(d). Voltage test on cores
(e). Flame propagation test
(f). Joints in aluminium wires
(g). Stress–strain curves
(h). Breaking strength of conductor

The type test certificates pertaining to recent manufacture of Aluminium Service Main Wire specified herein shall be from an independent testing authority acceptable to the purchaser.

10.0 Sample

The sample pieces of Aluminium Service Main Wire of length 1.0 Metre each for the conductor sizes indicated in the price schedule which are manufactured according to this specification shall be accompanying the offer. Bidder's identity shall be indelibly marked on the samples.

11.0 Inspection & Testing

11.1 Acceptance/Sample Test

The Manufacturer shall make necessary arrangements for inspection by an Engineer appointed by the CEB during Manufacture and before despatch and also to carry out in his presence the sample tests and routine tests (as per Clause 11.2 below) stated in BS 6004 and IEC 61089. These tests shall be witnessed by the Engineer on selected samples and the copies of the test certificates shall be supplied with the cable.

(a). Conductor material and construction
(b). Insulation thickness
(c). Over sheath thickness
(d). Conductor resistance
(e). Insulation resistance
(f). Mean overall dimensions
(g). Voltage test on completed cable

11.2 Routine Test

The following Routine test report of Service Main Wire shall be made available for the observation of the CEB inspector.

(a). Cable markings
(b). Absence of faults in the insulation

Annexure-A

SCHEDULE OF PARTICULARS

(To be filled by the manufacturer – Use separate sheet for each type of wire)

(A) General

a)	Name of Manufacturer	
b)	Type of service main wire	
c)	Nominal cross sectional area of the conductor (mm^2)	
d)	Number of strands & nominal diameter (mm)	
e)	Number of cores	
f)	Colour of insulation	
d)	Colour of sheath	

(B) Conductor

a)	Conductor material	
b)	Conductor overall diameter	
c)	Conductor Resistance at 20◦C	
d)	Tensile Strength- (N/ mm2)	
e)	Wrapping Test	

(C) Insulation

a)	Insulation Thickness (mm)	
b)	Smallest measure of Thickness (mm)	
c)	Tensile Strength of as of manufactured (N/ mm^2)	
d)	Tensile Strength after ageing (N/ mm^2)	
e)	Elongation at break as of manufactured (%)	
f)	Elongation at break after ageing (%)	
d)	Spark test at 10 kV (r.m.s.)	

(D) Sheath

a)	Thickness	
b)	Smallest measure of Thickness	
c)	Tensile Strength of as of manufactured (N/ mm^2)	
d)	Tensile Strength after ageing (N/ mm^2)	
e)	Elongation at break as of manufactured (%)	
f)	Elongation at break after ageing (%)	
d)	Whether the sheath is UV stabilized type (yes/No)	

(E) Test On Completed Cable

a)	Voltage test on completed cable	
b)	Flame propagation test	

I/We do hereby certify that the above particulars are true and correct.

Seal & Signature Of The Manufacturer And Date

Annexure - B

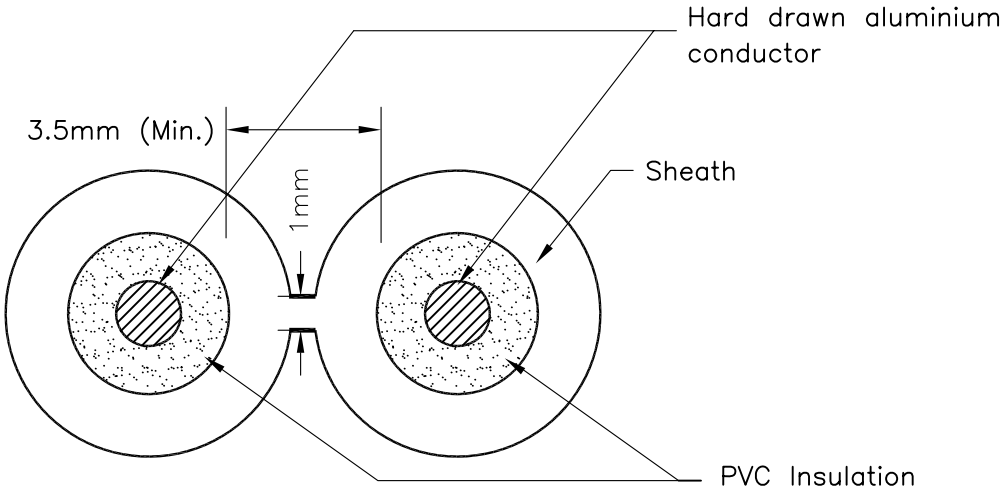
Non Compliance Schedule

On this schedule the bidder shall provide a list of non-compliances with this specification, documenting the effects that such noncompliance is likely to have on the equipment's life and operating characteristics. Each non- compliance shall be referred to the relevant specification clause.

Clause No.	Non Compliance

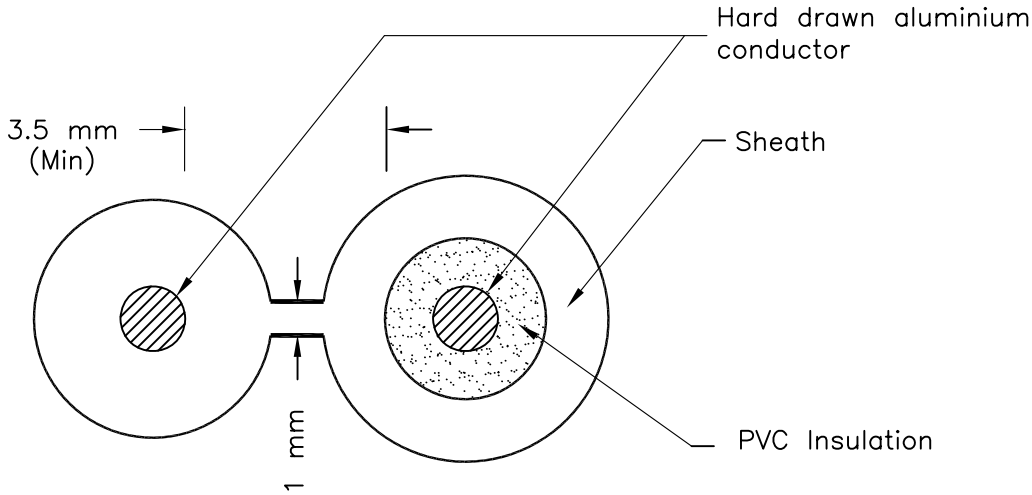
Seal & Signature of the Manufacturer/Bidder

Date:



(BOTH CORES INSULATED
AND SHEATHED)

FLAT TWIN SERVICE MAIN WIRE



(ONE CORE INSULATED,
OTHER CORE BARE AND
BOTH SHEATHED)

TWIN SERVICE MAIN WIRE

CEYLON ELECTRICITY BOARD	DISTRIBUTION STANDARDS & SPECIFICATION	SCALE : NOT TO SCALE
	PVC INSULATED ALUMINIUM SERVICE MAIN WIRE	DRAWN : LALANI
	DESIGNED BY / APPROVED BY	DATE : Feb., 2007
		DRG. NO : DS&S/2007/005
DIST. PLANNING BRANCH	E.E. (DS & S) / CHAIRMAN, SPECIFICATION COMMITTEE	CAD NO :