TECHNICAL SPECIFICATION FOR TENSION HARDWARE FITTINGS COMPRISING OF CROSS-ARM STRAP, BALL CLEVIS & SOCKET TONGUE AND DEAD END CLAMP (COMPRESSION TYPE) TO BE USED IN 33 KV LINE WITH 70 KN B&S TYPE DISC INSULATOR .

1.0	**SCOPE :**
i)	The Specification covers the design, manufacture, testing (preferably at manufacturer's works before supply) and delivery of the combined Unit of Cross Arm Strap, Ball Clevis & Socket Clevis and compression type dead end Clamp including loading, unloading anywhere in West Bengal.
ii)	The combined units offered shall be complete with all components which are necessary (excepting disc insulator) or usual for their effective performance and easy maintenance and inter changeability at site. Such parts shall be deemed to be within the scope of contract.
iii)	**The set is to be used in 33 KV line with 70 KN B&S type Disc Insulator for ACSR Wolf Conductor. The set is also be used in 33 KV Sub-Station with 70 KN Disc Insulator for ACSR Panther Conductor.**
2.0	**GENERAL REQUIREMENTS**
i)	Ball diameter should be 16 mm.
ii)	The Fittings shall be free from defects, corrosion protected and shall meet the requirements of Galvanizing Test etc as per IS.
iii)	All forging and casting shall be of good finish and free from flaws and other defects. The edges of the fittings such as the **Eye, Clevis and holes** shall be rounded.
iv)	All parts of different fittings which provide the interconnection shall be made such that sufficient clearance is provided at the connection point to ensure free movement. All **Eye and clevis connection** shall be free in this manner but care shall be taken that too much clearance between Eye and the tongues of the Clevis is avoided.
v)	**Spring washer should be electro galvanized- Coating thickness as per IS: 1573-1986.** **U bolt, Hexagonal Bolt, Nut, Plain Washer and all** other ferrous parts shall be Hot dip Galvanized. In case of Hot Dip Galvanization, minimum Value of Mass of zinc coating should be 610 g/m2. The split pin to be used shall be of **Humpback type** & shall be **made of Stainless Steel conforming to IS: 5522-1992** with a minimum hardness of 160 HV. Locking devices (R Type) for ball and socket lockers shall be of **Stainless Steel conforming to IS: 6603-1972** with minimum hardness of 160 HV. The dimension shall conform to IS 2486 (Part 3) : 1974.
3.0	**STANDARD** The materials covered under this specification shall comply with the requirements of the latest version of the following standards as amended upto date, except where specified otherwise.

i)	IS 2486 (Part 1) : 1993		Specification for metal fittings of insulators for overhead power lines with nominal voltage greater than 1000 V
ii)	IS 2486 (Part 2) : 1989 IS : 2486 (Part III) - 1974		Specification for Insulator fittings for overhead power lines with nominal voltage greater than 1000 V
iii)	IS 4759 : 1996		Specification for hot-dip zinc coatings on structural steel and other allied products
iv)	IS : 6745 - 1972		Method for determination of mass of zinc coating on zinc coated iron and steel articles
v)	IS:1573 - 1986		Specification for electroplated coatings of zinc on iron and steel
vi)	IS: 2629-1985		Recommended Practice for hot dip galvanizing of iron & Steel
vii)	IS : 2633 - 1986		Method for testing uniformity of coating on zinc coated articles

4.0	**MATERIALS AND OTHER REQUIREMENTS** :
4.1	**CROSS-ARM STRAPS (fig-1) (For Tender Purpose)** Cross-arm straps shall be manufactured from MS Flat hot dip galvanized and to connect the cross-arm/bracket of the structure at one end and the Ball Clevis at the other end. It should be complete with hexagonal bolts, nuts, spring washers and cotter pin at the threaded end to lock the unit. Minimum Threaded portion of the bolt shall be **30mm**. **Minimum Ultimate strength (Tensile strength) shall be 70 KN.** Dimensions shall be in accordance with IS: 2486 (Part-2) unless otherwise specified.
4.2	**BALL CLEVIS (fig-2) & SOCKET TONGUE (fig-3)** **(For Tender Purpose):** All forgings shall be of good finish and free from any flaws and any other defects which may cause decrement of efficiency while in operation. Connection/attachment with other component of the unit shall provide reasonable clearance/ensure free movement at the connecting/attaching point. **Care should be taken to avoid too much clearance while used with insulators.** Materials for Ball Clevis & Socket tongue should be as stated below:- Ball Clevis - Forged Steel and hot dipped galvanised. Socket tongue - Forged Steel and hot dipped galvanised. **Minimum Ultimate strength (Tensile strength) shall be 70 KN**. All dimensions of Ball Clevis & Socket tongue shall be in accordance with IS:2486 (Part-2) unless otherwise specified.
4.3	**DEAD END CLAMP (COMPRESSION TYPE) & JUMPER CONE** **(fig. 4 for ACSR Wolf conductor & Fig 5 for ACSR Panther Conductor) (For Tender Purpose) :** The dead end clamps shall be suitable for supporting ACSR Conductor. The Clamp comprises of outer sleeve and inner sleeve. Outer Sleeve & Jumper Cone shall be made of EC grade Aluminium. The inner Sleeve is Steel Sleeve & shall be made by Forged Steel. The steel sleeve of dead end clamp shall be single piece obtained by process of drop forging and shall not be made by joining, welding, shrink fitting or any other process for more than one piece of material. The steel sleeve shall be hot dip galvanized**.** The part for main conductor to be tension joint at rated tension and for jumper part it is to be non-tension type. The dead end clamp for ACSR Wolf conductor shall be compression type with provision for compressing jumper terminal at one end. A tensile load of about 50% of the breaking load of the conductor shall be applied and the conductor shall be marked in such a way that movement relative to the clamp can be detected. Without subsequent adjustment of the clamp, the load shall be steadily increased to 95% then reduced to 90% of the breaking load of the conductor and maintained for one minute. There shall be no movement of the conductor relative to the clamp during this one minute period and no failure of the Clamp. The conductivity of the clamp shall not be less than that of conductor. Non-Compression zone shall be clearly marked on each dead end clamp. The dead end clamp for ACSR Panther conductor shall be compression type with provision for compressing jumper terminal at one end. A tensile load of about 50% **of 70 KN** shall be applied and the conductor shall be marked in such a way that movement relative to the clamp can be detected. Without subsequent adjustment of the clamp, the load shall be steadily increased to 95% then reduced to 90% **of 70 KN** and maintained for one minute. There shall be no movement of the conductor relative to the clamp during this one minute period and no failure of the Clamp. The conductivity of the clamp shall not be less than that of conductor. Non-Compression zone shall be clearly marked on each dead end clamp.

5.0	**MARKING**: Hardware Fittings suitable for ACSR Wolf Conductor & ACSR Panther Conductor should be supplied in a string. Tension Clamp shall be legibly & indelibly marked with Name or Trade mark of manufacturer, year of manufacture, 70 KN and suitable identification marking of the property 'WBSEDCL'. The marking should be engraved/embossed.
6.0	**TESTS AND TEST CERTIFICATES :** **Type Test** Along with the bid, the bidder has to submit Type Test Reports on same fittings carried out within last five years from the date of opening of techno-commercial bid of the tender from any NABL accredited Laboratory having NABL logo. Otherwise the tender may be rejected. The following shall constitute the Type Test for Dead End Clamps (Compression type) 1. Visual Examination 2. Verification of dimensions 3. Mechanical Test (Slip strength Test) 4. Ultimate Tensile Strength Test 5. Electrical Resistance Test - As per IS: 2486 (Part-I) 6. Heating Cycle Test - As per IS: 2486 (Part-I) 7. Galvanizing/Electroplating Test (for ferrous parts) The following shall constitute the Type Test for Jumper Cone 1. Visual Examination 2. Verification of dimensions 3. Electrical Resistance Test - As per IS: 2486 (Part-I) 4. Heating Cycle Test - As per IS: 2486 (Part-I) 5. Galvanizing/Electroplating Test (for ferrous parts) The following shall constitute Type Tests on tension hardware fittings except Clamp: 1. Visual Examination 2. Verification of dimensions 3. Mechanical Test 4. Galvanizing Test 5. Chemical Composition Test **ACCEPTANCE TEST** The following shall constitute acceptance test for Dead End Clamps (Compression type): 1. Visual Examination 2. Verification of dimensions 3. Mechanical Test (Slip Strength Test) 4. Ultimate Tensile Strength Test 5. Galvanizing Test (for ferrous parts) 6. Chemical Composition Test 7. Electrical Resistance Test Acceptance Test for tension hardware fittings except Clamp 1. Visual Examination 2. Verification of dimensions 3. Ultimate Tensile Strength Test 4. Galvanizing Test 5. Chemical Composition Test
8.0	**TOLERANCE :** Tolerance shall be as per IS: 2486 (Part-I).

9.0	**GUARANTEE:** In the event of any defect in the equipment/materials arising out of faulty design, materials, workmanship within a period of 12(twelve) months of commissioning or18 (eighteen) months from the date of last dispatch of any integral part of the equipment/materials which ever is earlier the supplier shall guarantee to replace or repair the same to the satisfaction of the purchaser. If the supplier fail to do so within a reasonable time, WBSEDCL reserves the right to effect repair or replacement by any other agency and recover charges for repair or replacement from the supplier.
10	**SUBMISSION OF DRAWING:** Along with tender document, the tenderer must submit drawing in line with tender specification which will be used for bid evaluation purpose. The drawing in line with tender specification shall also to be submitted within ten days from the next date of issuance of Purchase Order for approval. Any Delay in submission of drawing beyond the above stipulated period will be their own cost.

GUARANTEED TECHNICAL PARTICULARS

FOR TENSION HARDWARE FITTINGS COMPRISING OF G.I. CROSS-ARM STRAP, BALL CLEVIS & SOCKET CLEVIS AND DEAD END CLAMP (COMPRESSION TYPE)TO BE USED IN 33 KV LINE WITH 70 KN B&S TYPE DISC INSULATOR FOR WOLF CONDUCTOR

1.	**Name & Address of the Firm**	
2.	**Type of Insulator Fittings**	B&S type
3.	**Diameter of Ball**	16 mm
4.	**Ultimate Tensile Strength**	
a)	Dead end Clamp (Compression type)	70 KN
b)	Complete Fittings	70 KN
5.	**Material used**	
a)	Cross arm Strap	Mild Steel, hot dip galvanized
b)	Ball Clevis	Forged Steel and hot dipped galvanized
c)	Socket Clevis	Forged Steel and hot dipped galvanized
d)	Dead end Clamp (Compression type) i) Outer Sleeve: ii) Inner Sleeve iii) Jumper Cone	i) Outer Sleeve- EC grade Aluminium ii) Inner Sleeve- Forged Steel, hot dip galvanized iii)Jumper Cone- EC grade Aluminium
e)	Locking devices for ball and socket lockers	Stainless Steel conforming to IS: 6603-1972 with minimum hardness of 160 HV.
f)	Split pins	Stainless Steel conforming to IS: 5522-1992 with minimum hardness of 160 HV.
g)	U-Bolts & Nut	MS, Hot Dip Galvanized
h)	Hexagonal Bolt & Nut	MS, Hot Dip Galvanized
i)	Spring Washer	Spring Steel, Electro Galvanized
j)	Plain Washer	MS Hot Dip Galvanized
6	**Zinc conforming to grade**	As per IS 209: 1992
7	**Weight per set**	
a)	Gross weight of complete fittings	
b)	Weight of Dead end Clamp (compression type) & Jumper Cone	
c)	Weight of Cross Arm Strap	
d)	Weight of Ball Clevis	
e)	Weight of Socket Clevis	
f)	Weight of Nut, Bolts, Rivet, U-Bolt & accessories	
g)	Weight of non ferrous parts	
h)	Minimum Guaranteed weight of Fittings	
i)	Whether galvanizing confirm to IS : 2633 - 1986	
8.	**Packing details**	
a)	Net Weight	
b)	Gross Weight	
c)	Contents of each Pack	
d)	Type of Packing	
9.	**Tolerance in dimension, if any**	IS:2486 Part I

GUARANTEED TECHNICAL PARTICULARS

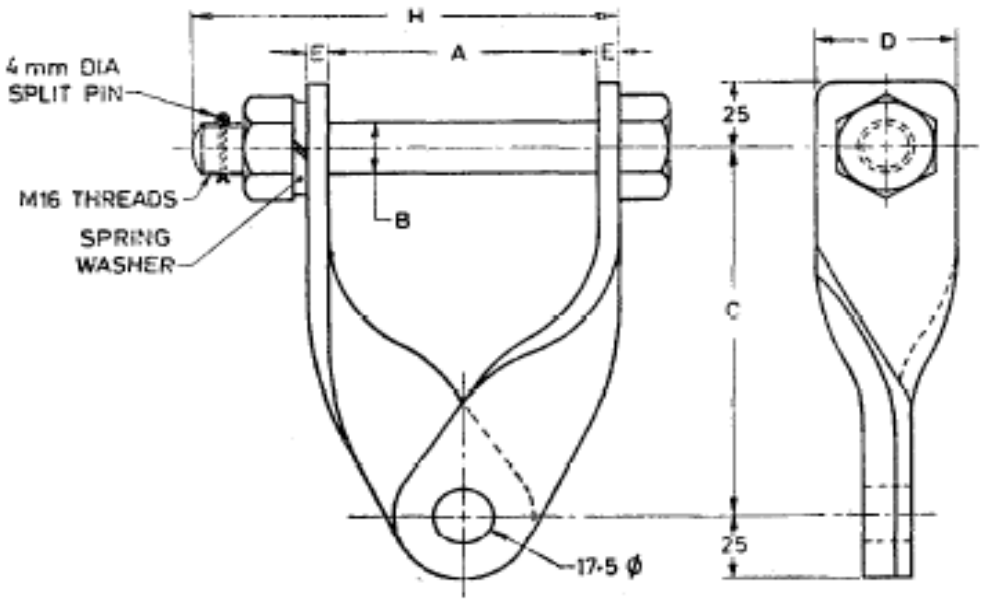
FOR TENSION HARDWARE FITTINGS COMPRISING OF G.I. CROSS-ARM STRAP, BALL CLEVIS & SOCKET CLEVIS AND DEAD END CLAMP (COMPRESSION TYPE)TO BE USED IN 33 KV LINE WITH 70 KN B&S TYPE DISC INSULATOR FOR PANTHER CONDUCTOR

1.	**Name & Address of the Firm**	
2.	**Type of Insulator Fittings**	B&S type
3.	**Diameter of Ball**	16 mm
4.	**Ultimate Tensile Strength**	
a)	Dead end Clamp (Compression type)	70 KN
b)	Complete Fittings	70 KN
5.	**Material used**	
a)	Cross arm Strap	Mild Steel, hot dip galvanized
b)	Ball Clevis	Forged Steel and hot dipped galvanized
c)	Socket Clevis	Forged Steel and hot dipped galvanized
d)	Dead end Clamp (Compression type) i) Outer Sleeve: ii) Inner Sleeve iii) Jumper Cone	i)Outer Sleeve- EC grade Aluminium ii) Inner Sleeve- Forged Steel, hot dip galvanized iii)Jumper- EC grade Aluminium
e)	Locking devices for ball and socket lockers	Stainless Steel conforming to IS: 6603-1972 with minimum hardness of 160 HV.
f)	Split pins	Stainless Steel conforming to IS: 5522-1992 with minimum hardness of 160 HV.
g)	U-Bolts & Nut	MS, Hot Dip Galvanized
h)	Hexagonal Bolt & Nut	MS, Hot Dip Galvanized
i)	Spring Washer	Spring Steel, Electro Galvanized
j)	Plain Washer	MS Hot Dip Galvanized
6	**Zinc conforming to grade**	As per IS 209: 1992
7	**Weight per set**	
a)	Gross weight of complete fittings	
b)	Weight of Dead end Clamp (compression type) & Jumper Cone	
c)	Weight of Cross Arm Strap	
d)	Weight of Ball Clevis	
e)	Weight of Socket Clevis	
f)	Weight of Nut, Bolts, Rivet, U-Bolt & accessories	
g)	Weight of non ferrous parts	
h)	Minimum Guaranteed weight of Fittings	
i)	Whether galvanizing confirm to IS : 2633 - 1986	
8.	**Packing details**	
a)	Net Weight	
b)	Gross Weight	
c)	Contents of each Pack	
d)	Type of Packing	
9.	**Tolerance in dimension, if any**	IS:2486 Part I

DRAWINGS FOR TENDER PURPOSE

Fig-1

CROSS ARM STRAP :

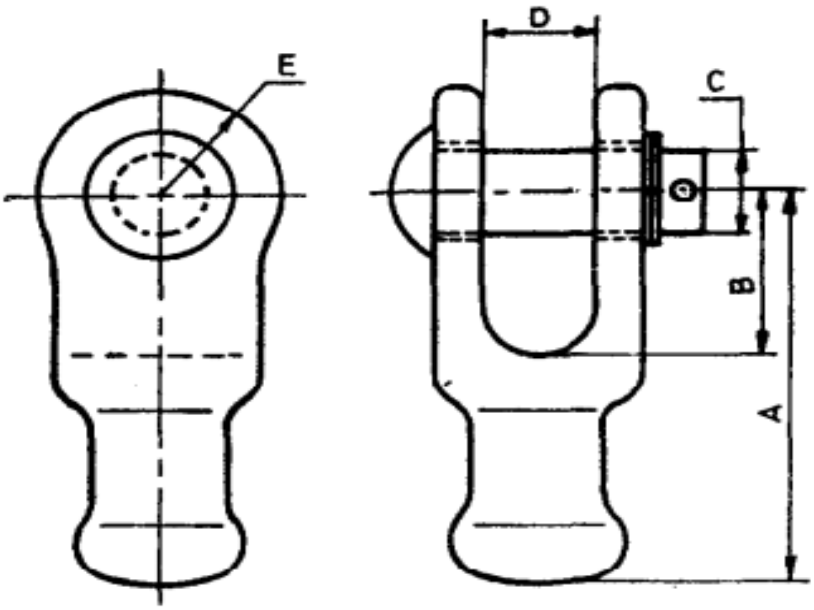


A	B(Dia)	C	H
100	16	140	145

Sl. No.	Description	Material
1	Twisted Strap	Mild Steel, Hot Dip Galvanized
2	Bolt & Nut, M-16	MS, Hot Dip Galvanized
3	16 mm Spring Washer	Spring Steel, Electro Galvanized
4	Split Pin	Stainless Steel conforming to IS: 5522-1992 with minimum hardness of 160 HV.

Fig-2

BALL CLEVIS

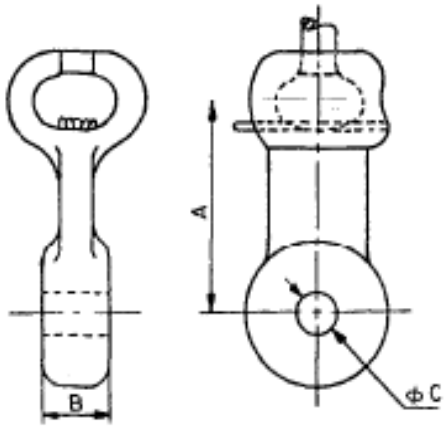


A	B	C	PIN BALL DESIGNATION
76	32	16	16 mm

Sl. No.	Description	Material
1	Ball Clevis	Forged Steel, Hot Dip Galvanized
2	Bolt & Nut, M-16	MS, Hot Dip Galvanized
3	Plain Washer	MS, Hot Dip Galvanized
4	Split Pin	Stainless Steel conforming to IS: 5522-1992 with minimum hardness of 160 HV.

Fig-3

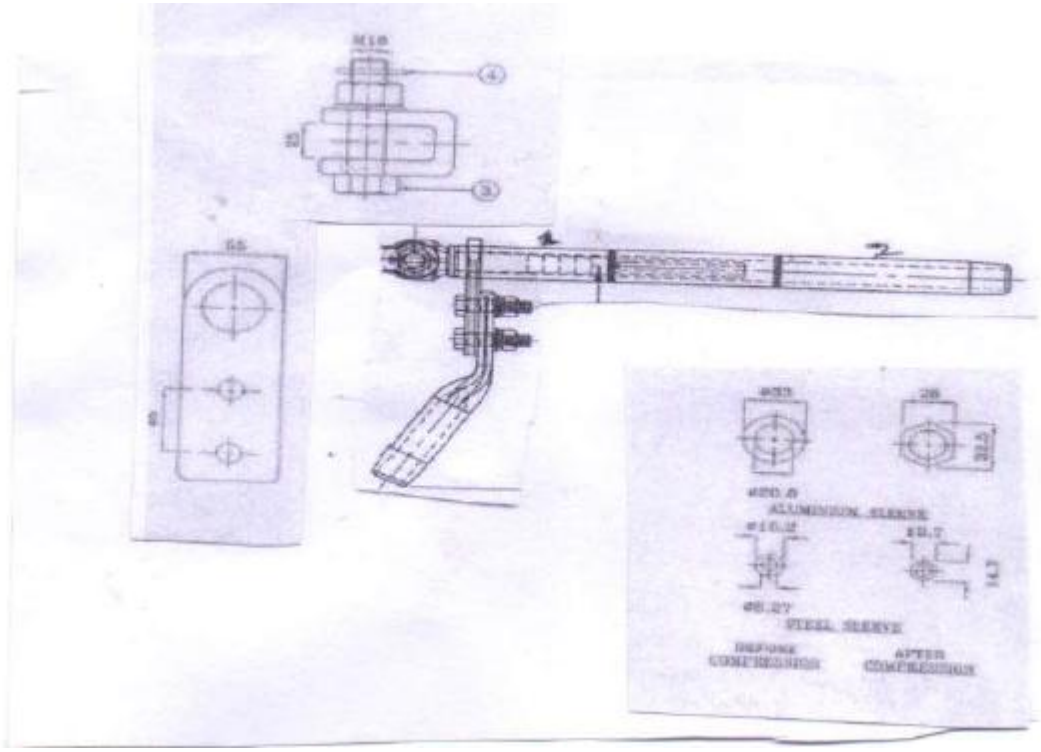
SOCKET TONGUE



Sl. No.	Description	Material
1	Socket Tongue	Forged Steel, Hot Dip Galvanized
2	R-Clip	**Stainless Steel conforming to IS: 6603-1972** with minimum hardness of 160 HV.
3	Bolt & Nut, M-16	MS, Hot Dip Galvanized
4	Plain Washer (2.5 mm thick)	MS, Hot Dip Galvanized
5	Split Pin	Stainless Steel conforming to IS: 5522-1992 with minimum hardness of 160 HV.

Fig-4

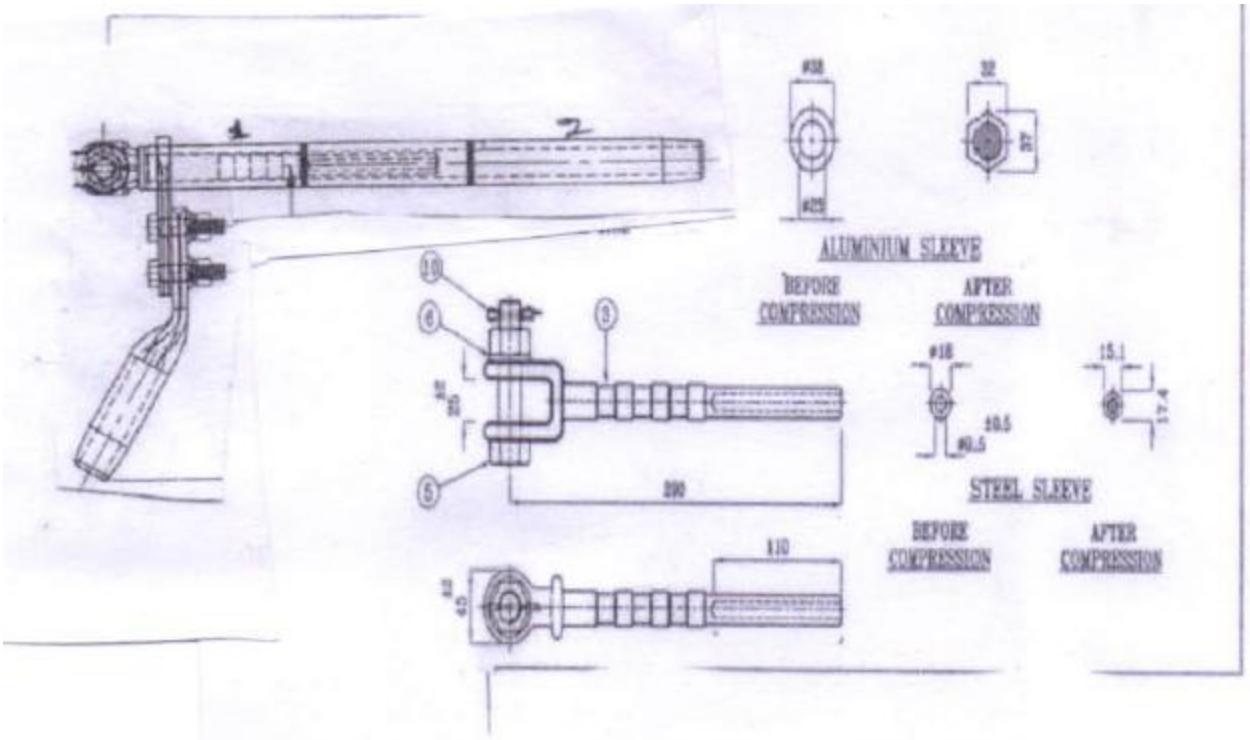
DEAD END CLAMP (COMPRESSION TYPE) WITH JUMPER CONE FOR ACSR WOLF CONDUCTOR



Sl. No.	Description	Material
1	Inner Sleeve	Forged Steel, Hot Dip Galvanized
2	Outer Sleeve & Jumper Cone	EC grade Aluminium
3	Bolt & Nut, M-12	MS, Electro Galvanized
4	Split Pin	Phospher Bronze conforming to IS 7814:1975 with minimum hardness of 160 HV.

Fig-5

DEAD END CLAMP (COMPRESSION TYPE) WITH JUMPER CONE FOR ACSR PANTHER CONDUCTOR



Sl. No.	Description	Material
1	Outer Sleeve	EC grade Aluminium
2	Jumper Cone	EC grade Aluminium
3	Inner Sleeve	Forged Steel, Hot Dip Galvanized
4	Jumper Plate	EC grade Aluminium
5	Bolt & Nut, M-16	MS, Electro Galvanized
6	Plain Washer	MS, Electro Galvanized
7	Bolt & Nut, M-12	MS, Electro Galvanized
8	Plain Washer	MS, Electro Galvanized
9	Spring Washer	Spring Steel, Electro Galvanized
10	Split Pin	Phospher Bronze conforming to IS 7814:1975 with minimum hardness of 160 HV.