

**ANNEXURE - D**

SCHEDULE - 'A'

**TECHNICAL SPECIFICATION FOR  
CONDUCTOR HARDWARE FITTING FOR**

**11/22/33 kV OVERHEAD POWER LINES**

SPECIFICATION NO: DIST/MM/I/CONDHARD-2006)

**INDEX**

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# Maharashtra State Electricity Distribution Company Limited

## TECHNICAL SPECIFICATION FOR CONDUCTOR HARDWARE FITTING FOR 11/22/33 kV OVERHEAD POWER LINES

SPECIFICATION NO: DIST/MM/II/CONDHARD-2006).

### 1. SCOPE :

This specification covers the design, manufacture, testing and supply of hardware fittings for use on 11/22/33 kV distribution lines, in the state of Maharashtra.

### 2. APPLICABLE STANDARDS :

2.1 Unless otherwise stipulated in this specification, the insulator fittings shall comply with IS: 2486. Part I, 1993 and Parts II, III, IV, 1974 with the latest revision thereof.

2.2 Principal technical parameters of line conductors shall be as per Annexure – I.

### 3. STRING INSULATOR FITTINGS (CONVENTIONAL) :

#### 3.1 GENERAL REQUIREMENTS :

3.1.1 All forgings and castings shall be of good finish and free from flaws and other defects.

3.1.2 All parts of different fittings which provide for connection, shall be made such that sufficient clearance is provided, at the connection point to ensure free movement and suspension of the insulator string assembly. All ball and socket connections shall be free in this manner. Care shall be taken that too much clearance between ball and socket is avoided.

3.1.3 All ferrous fittings and parts other than those of stainless steel, shall be hot deep galvanized, small fittings like spring washers, nuts etc. may be electro-galvanized.

#### 4. TYPE AND DIMENSIONS :

4.1 Hardware sets suitable for only ball and socket type insulator shall be used. The nominal dimensions of the ball and socket eye, cross arm straps and assembly shall be as per enclosed drawings.

4.2 The common snail type strain clamp shall be suitable for ACSR conductor 'Squirrel', 'Weasel' and 'Rabbit' and equivalent AAAC.

4.3 The tension hardware with 3 or 4 bolts, shall have a minimum failing load, not less than 95 % of strength of respective conductor.

The bolted type strain clamp shall be -

- 1) Common for Raccoon , Dog and Equivalent AAAC ..... 3 bolted type.
- 2) Panther and Equivalent AAAC ..... 4 bolted type.

4.4 Suspension hardware fittings shall be -

- a) Envelope type clamp and hardware for Dog & equivalent AAAC .
- b) Common envelope type clamp and hardware for Panther & equivalent AAAC.

4.5 The envelope type suspension hardware suitable for AAAC, Dog , Panther & Equivalent AAAC shall have minimum failing load of 30 kN.

The suspension clamp shall have slip strength not exceeding 20% of conductor rated strength. The conductor shall not slip at loads less than 12.5% of rated strength of conductor.

#### 5.0 TESTS :

##### 5.1 Type Tests :

- a) Slip strength for suspension clamp and tension clamp.
- b) Mechanical tests for clamps and hardware.
- c) Galvanizing test.
- d) Chemical composition test for component like ball eye, ball hook ,cross arm, U bolts, suspension clamp, snail clamp, tension clamp etc.

All above tests shall be carried out as per the applicable relevant Indian Standards.

##### 5.2 TEST CERTIFICATE :

The tenderer shall furnish detailed type test reports of the offered conductor hardware fittings for the tests as per clause 5.1 of this specification. All the above Type Tests shall be carried out as per the procedures given in IS: 2486 Part I,1993 and Parts II,III,IV ,1974 or latest version thereof at laboratories which are accredited by the National Accreditation Board of Testing and Calibration Laboratories( NABL) of Government of India to prove that the conductor hardware fittings offered meet the requirements of the specification. These type tests should have been carried out within five years prior to the date of opening of this tender. However, the tenderers who have supplied the conductor hardware fittings to this Company against order from Central Purchase Agency of M.S.E.D.C.L. shall be exempted from submission of type test reports against this tender provided

- (i) their offered conductor hardware fittings are already fully type tested at Laboratories accredited by the National Accreditation Board for Testing and Calibration Laboratories( NABL) within five years prior to the date of opening of the tender
- (ii) there is no change in the design of type tested conductor hardware fittings and those offered against this tender
- (iii) such tenderers complying (i) and (ii) above shall furnish an undertaking in the format scheduled 'F' enclosed herewith.

The detailed type test reports alongwith the relevant certified drawings etc. or undertaking seeking exemption from their submission in the format schedule 'F', are to be submitted in sealed cover on or before 14.00 hours on the same date of the month one month after the date of tender opening (e.g. if the tender is opened on 3<sup>rd</sup> June, the submission of type test reports shall be on or before 3<sup>rd</sup> July ) or the next working day in case the same date is a holiday duly superscribed on it following details :

" Type Test Reports of conductor hardware fittings against Tender No. ----- opened on ----- "

The sealed covers shall be opened at 15.00 hours on the same day in presence of the tenderers who choose to be present.

The purchaser reserves the right to demand repetition of some or all the Type Tests in presence of purchaser's representative at purchaser's cost. For this purpose, the tenderer shall quote unit rates for carrying out each Type Test. However, such unit rates will not be considered for evaluation of the offer. In case the unit fails in the type tests, the complete supply shall be rejected.

The successful tenderer shall take approval / waiver of type tests from C.E.( Dist.), M.S.E.D.C.L., Prakashgad, Bandra , Mumbai prior to commencement of supply.

## 5.2 ACCEPTANCE TESTS :

- a) Dimensional check
- b) Galvanizing test
- c) Mechanical test

The acceptance tests are to be carried out in presence of Company's representative. The supplier shall, therefore, give sufficient advance notice to the Company for arranging witnessing of the tests.

### 5.3 ROUTINE TESTS :

- a) Visual examination test.
- b) Routine mechanical test.

### 6.0 MARKING :

The clamp should have markings duly engraved / punched visibly the name / trade mark of the manufacturer and year of manufacture.

### 7.0 DRAWINGS :

Following drawings shall form part of the offer. The supplier has to supply conductor hardware fittings manufactured as per the details given in the enclosed drawings. Hence tenderer successful in getting LOA / order, is not required to take drawing approval from the Chief Engineer (Dist.).

- 1) Drg. 63.709( R-1) - Strain hardware with socket end snail clamp suitable for Squirrel, Weasel, Rabbit ACSR or equivalent AAAC.
- 2) Drg. 63.723( R-1) - Single tension hardware 3 bolted type suitable for Raccoon & Dog ACSR or equivalent AAAC.
- 3) Drg. 63.723( R-1) & 63.710 (R-1) - Single tension hardware 4 bolted type suitable for Panther ACSR or equivalent AAAC.
- 4) Drg. 63.711( R-2) - Single suspension hardware for Raccoon, Dog, Panther ACSR or equivalent AAAC.

### 8.0 PACKING :

For packing, Wooden cases / Boxes / Double Gunny bags shall be used. The packing shall be fit to withstand rough handling during transit and storage at destination. The heads and threaded portion of fasteners fitting should be properly protected against damage. The gross weight of the packing shall not normally exceed 50 kg per box or case. All different fitting components shall be packed in different cases and shall be completed with minor accessories fitted in places. All Nuts shall be hand-tightened over the bolts and screwed upto the farther point. The packing list should be got approved by the tenderer before dispatching the material.

9.0 SCHEDULES :

9.1 The tenderer shall fill in the following schedules which are part & parcel of the tender specification and offer. If the schedules are not submitted duly filled in with the offer, the offer shall be liable for rejection.

Schedule 'C' - Schedule of Tenderer's Experience.

Schedule 'F' - Proforma of undertaking

9.2 The tenderer shall submit the list of orders for similar type of equipment, executed or under execution during the last three years, with full details in the schedule of Tenderer's experience (Schedule 'C') to enable the purchaser to evaluate the tender.

ANNEXURE - I

**PRINCIPAL TECHNICAL PARAMETERS OF LINE CONDUCTOR**

A) TYPE : ACSR

1	Name	Squirrel	Weasel	Rabbit	Raccoon	Dog	Panther
2	Stranding	6+1/ 2.11	6+1/ 2.59	6+1/ 3.35	6+1/ 4.10	6/4.72 +7/1.57	30+7/3.0
3	Overall Dia. (mm)	6.33	7.77	10.05	12.30	14.15	21.00
4	Approx.Wt. (kg/km)	85	128	214	320	394	974
5	Resistance At 20 deg.C Ohm/km	1.368	0.908	0.5426	0.3622	0.2733	0.1363
6	Ultimate tensile Strength (kg)	803	1167	1871	2774	3335	9409

B) TYPE : AAAC (Equivalent size )

1	Name	22 mmsq	34 mmsq	55 mmsq	80 mmsq	100 mmsq	232 mmsq
2	Stranding	7/ 2.00	7/ 2.50	7/ 3.15	7/ 3.81	7/ 4.26	19/ 3.94
3	Overall Dia. (mm)	6.00	7.50	9.45	11.43	12.78	19.70
4	Approx.Wt. (kg/km)	60.16	94.00	149.20	218.26	272.86	636.67
5	Resistance At 20 deg.C Ohm/km	1.541	0.990	0.6210	0.4250	0.3390	0.1471
6	Calculated Breaking Load ( kN )	6.45	10.11	16.03	23.41	29.26	68.05

**SCHEDULE - C**

SCHEDULE OF TENDERER'S EXPERIENCE

Tenderer shall furnish here a list of similar orders executed/under execution by him to whom a reference may be made by Purchaser in case he considers such a reference necessary.

Sr. No.	Name of Client & Description.	Value of order	Period of supply and commissioning	Name & Address to whom reference may be made
1	2	3	4	5

NAME OF FIRM \_\_\_\_\_

NAME & SIGNATURE OF TENDERER \_\_\_\_\_

DESIGNATION \_\_\_\_\_

DATE \_\_\_\_\_

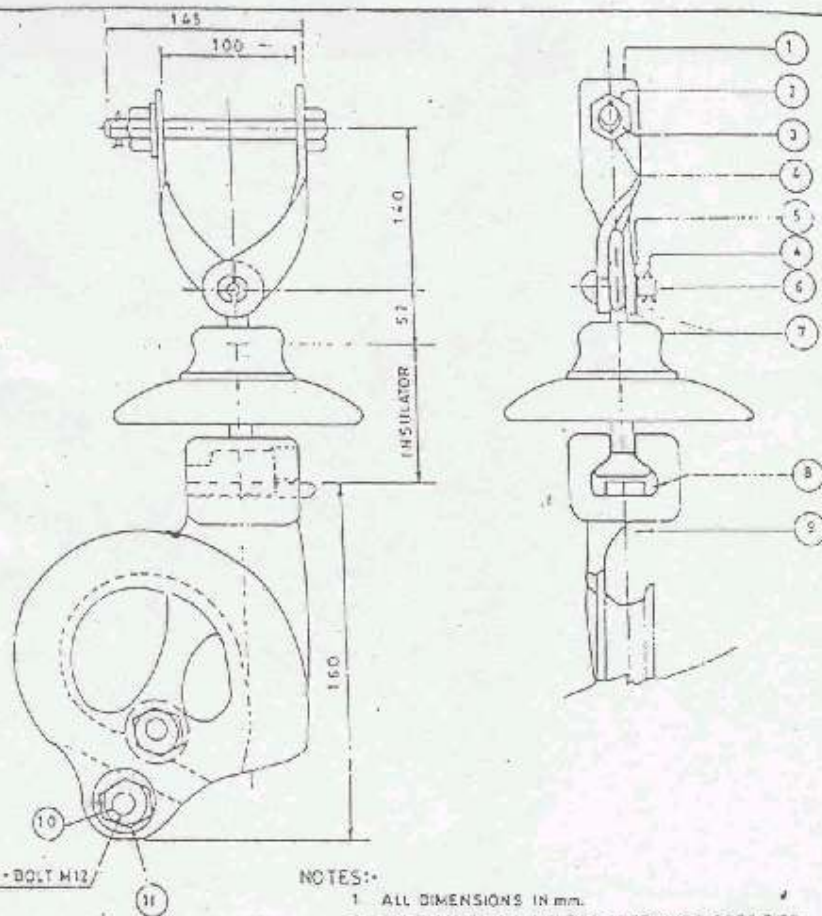
**SCHEDULE ' F '**

**PROFORMA OF UNDERTAKING**

We hereby confirm that Conductor Hardware Fittings offered by us against this tender are of the same design and type as have been supplied to M.S.E.D.C.L. against earlier order No. \_\_\_\_\_ dated \_\_\_\_\_ and all the type test reports thereof were approved by C.E.(Dist.) vide letter No. \_\_\_\_\_ dated \_\_\_\_\_ (copy enclosed).

We further confirm that the said type tests have been carried out at the laboratories accredited by NABL within five years prior to the date of opening of the present tender.

**SEAL & SIGNATURE OF THE TENDERER**



U-BOLT M12

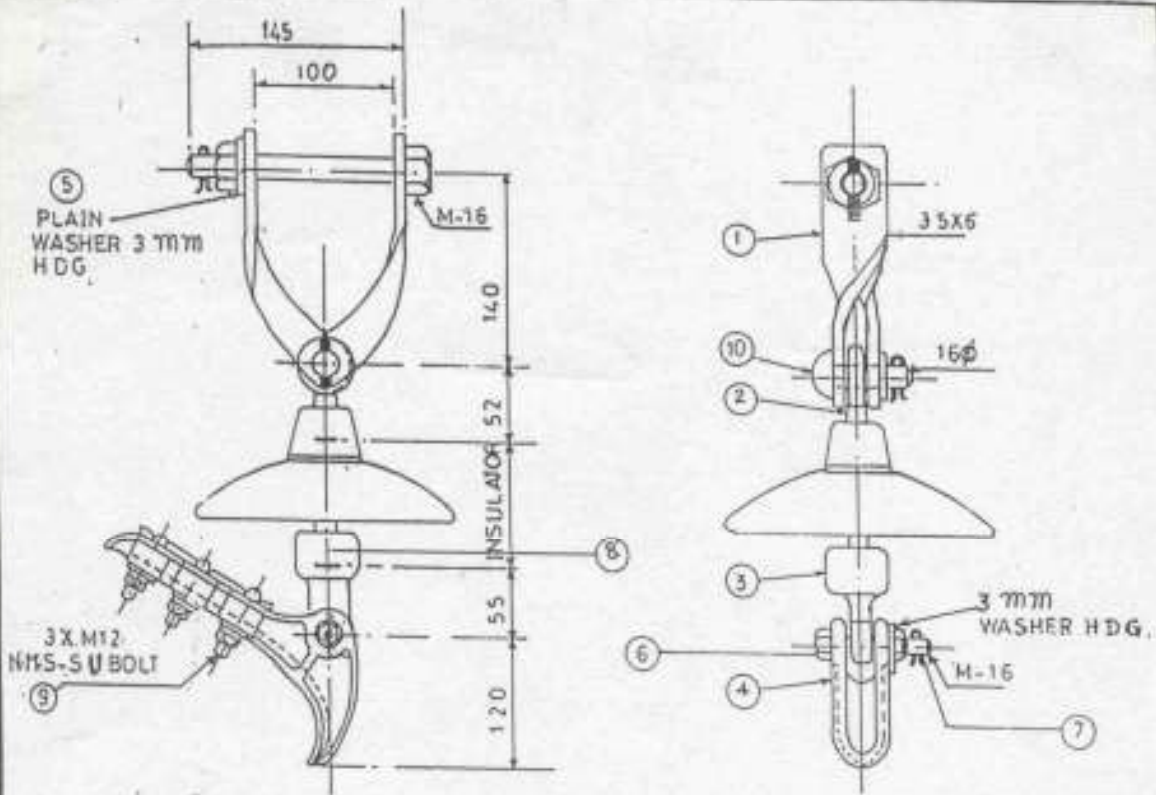
NOTES:-

- 1 ALL DIMENSIONS IN mm.
- 2 TOLERANCE ± 3% UNLESS OTHERWISE SPECIFIED.
- 3 SUITABLE FOR 15mm Ø PIN SHANK.
- 4 MINIMUM FAILING LOAD 30KN.
- 5 CLAMP SUITABLE FOR 'SQUIRREL' WEASEL 'RABBIT' ACSR & EQVT AAC.
- 6 REFER IS 2486 FOR HARDWARE FITTINGS.

NO	DESCRIPTION	MATERIAL	FINISH	QTY
11	SPRING WASHER.	SPRING STEEL	E.G.	2
10	U-BOLT, NUT, PLAIN WASHER	STAINLESS STEEL 304		1 Set
9	SNAIL CLAMP KEEPER.	ALU. ALLOY G D C		1 Set
8	W-CLIP.	PHOSPHOR BRONZE		1
7	BALL EYE	EN 8 STEEL DROP FORGED	H.O.G.	1
6	RIVET (15 Ø).	MILD STEEL	H.O.G.	1
5	PLAIN WASHER (M16).	MILD STEEL	H.O.G.	1
4	SPLIT PIN.	NON MAGNETIC S.S.		2
3	SPRING WASHER (M16)	SPRING STEEL	E.G.	1
2	BOLT & NUT (M16 X145)	MILD STEEL	H.O.G.	1
1	CROSS ARM STRAP (35X6)	MILD STEEL	H.O.G.	2
NO	DESCRIPTION	MATERIAL	FINISH	QTY

**STRAIN HARDWARE** (WITH SOCKET ENDED SNAIL CLAMP) SUITABLE FOR SQUIRREL, WEASEL, RABBIT ACSR OR EQUIVALENT AAA CONDUCTOR. M.S.E.D.C.L.

DRN. S. P. RAUT	CHECKED <i>[Signature]</i> JE	SUBMITTED <i>[Signature]</i> EE	APPROVED S.P.	DWG. NO. 63-709 (A-1)	DISTRIBUTION SECTION
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**NOTES :-**

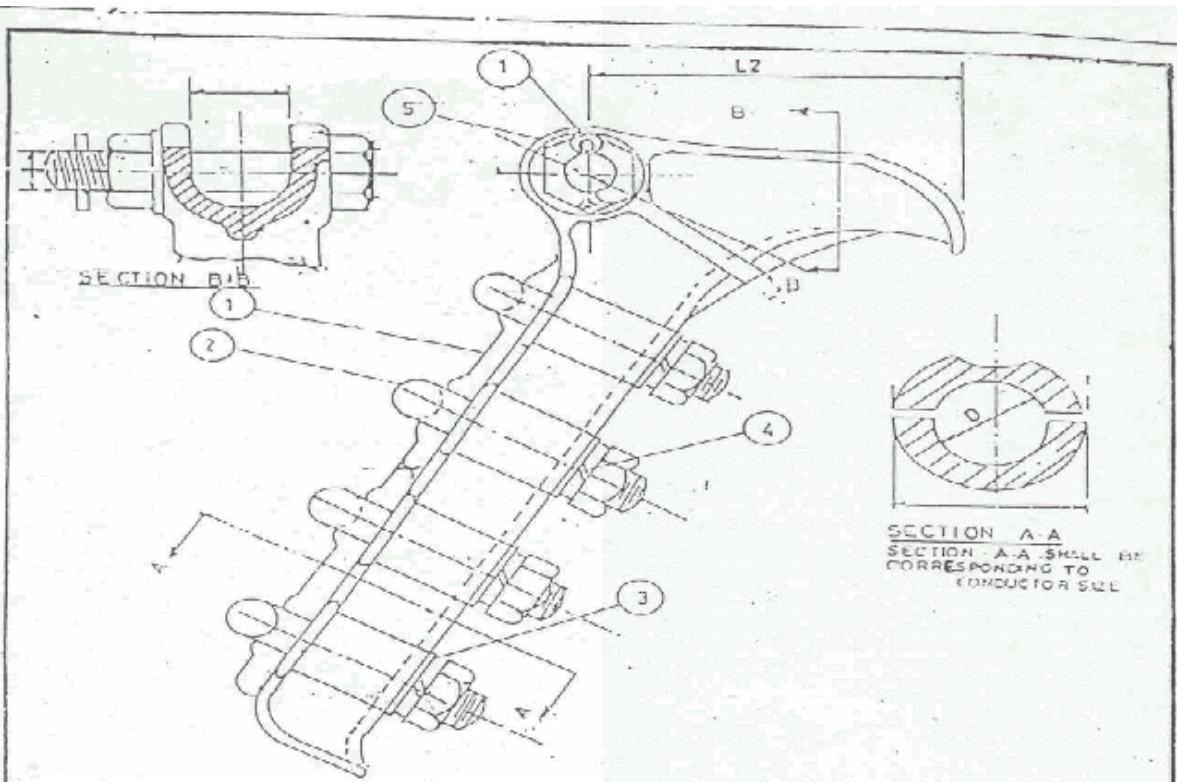
- 1 ALL DIMENSIONS IN mm .
- 2 TOLERANCE  $\pm 3\%$ .
- 3 B&S SIZE-16 mm ,
- 4 MIN. FAILING LOAD AS PER SPEC.
- 5 CONFORMS TO IS-2486
- 6 DIAMETER OF CONDUCTORS AS PER SPECIFICATION.

10	RIVET	M.S. H.D.G.	1
9	U BOLT	NON MAGNETIC S.S.	3
8	R- CLIP	NON MAGNETIC S.S.	1
7	SPLIT PIN	NON MAGNETIC STAINLESS STEEL	3
6	BOLT NUT	M.S. H.D.G.	1
5	PLAIN WASHER	M.S. H.D.G.	1
4	TENSION CLAMP (BOLTED TYPE)	ALL. ALLOY	1
3	SOCKET EYE	FORGED STEEL H.D.G.	1
2	BALL EYE	FORGED STEEL H.D.G.	1
1	CROSS ARM STRAP	MILD STEEL HDG	1 PAIR
NO.	DESCRIPTION	MATERIAL	QTY.

**STRAIN HARDWARE (WITH 3 BOLTED TYPE TENSION CLAMP SUITABLE FOR RACCOON, DOG, ACSR OR EQUIVALENT AAA CONDUCTOR).**

**M.S.E.D.C.L.**

DRN. P. D. SAWANT 31.10.94	CHECKED <i>[Signature]</i> L.S.	APPROVED <i>[Signature]</i> L.S. (Dist)	DATE 30.10.94	DRG. NO. 63.723(R1)	DISTRIBUTION DEPARTMENT
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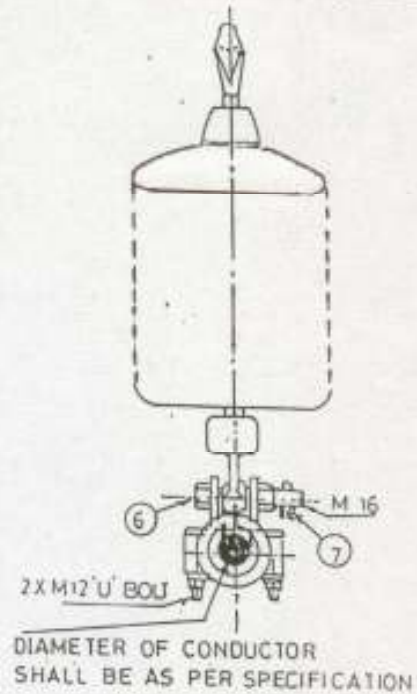
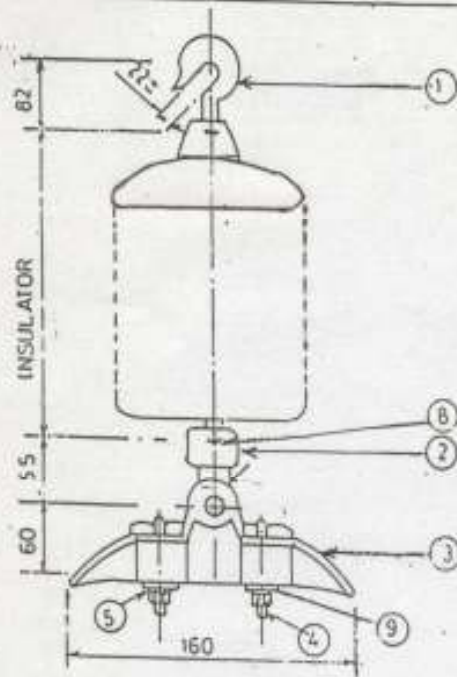


SECTION A-A  
SECTION A-A SHALL BE  
CORRESPONDING TO  
CONDUCTOR SIZE

ITEM NO.	DESCRIPTION	MATERIAL
1	BODY & KEEPER	ALL ALLOY AL. C GRADE
2	U-BOLTS & NUTS	STAINLESS STEEL 12mm $\phi$
3	FLAT WASHER	STAINLESS STEEL
4	SPRING WASHER	SPRING STEEL
5	SPLIT PIN ('R' TYPE)	STAINLESS STEEL

- NOTES**
- SUPPLY STRENGTH, 95% B.R.L. OF CONDUCTOR (MAX)
  - ALL EDGES AND CORNERS SHALL BE ROUNDED OFF
  - BALL SOCKET PORTIONS 16mm A3. B OF IS 2486 FITTING SHALL CONFORM TO IS 2486
  - GENERAL TOLERANCE  $\pm 3\%$
  - ALL DIMENSIONS ARE IN MM
  - FOR OTHER DETAILS SEE DRAWING NO 63.723,R-1

<b>TENSION CLAMP (4 BOLTED TYPE) SUITABLE FOR PANTHER ACSR OR EQUIVALENT AAA CONDUCTOR.</b>				<b>M. S. E. D. C. L.</b>	
DRAWN 	CHECKED 	SUBMITTED 	APPROVED 	DRG. NO. 63.710 (R-1)	DIST. SECTION



**NOTES :-**

- 1 ALL DIMENSIONS ARE IN mm
- 2 TOLERANCE  $\pm 3\%$
- 3 BALL AND SOCKET SIZE 16 mm AS PER 15.2486
- 4. MIN. BR. LOAD - 30kN
- 5 CLAMP SLIP STRENGTH BETWEEN 10 % & 20% OF COND. U.T.S.

9	PLAIN WASHER	3 mm M.S. H.D.G.	2
8	R-CLIP	NON MAGNETIC STAINLESS STEEL	1
7	SPUT PIN.	NON MAGNETIC STAINLESS STEEL	1
6	BOLT NUT	M.S. H.D.G.	1
5	SPRING WASHER	SPRING STEEL, E.G.	4
4	U-BOLT, NUT, WASHER	NON MAGNETIC S. S.	2
3	SUSPENSION CLAMP	ALU ALLOY.	1
2	SOCKET EYE	FORGED STEEL H.D.G.	1
1	BALL HOOK	FORGED STEEL H.D.G.	1
NO.	DESCRIPTION	MATERIAL	QTY.

SINGLE SUSPENSION HARDWARE (NORMAL) SUITABLE FOR  
**RACCOON, DOG, PANTHER ACSR OR EQUIVALENT AAA CONDUCTOR.**

M.S.E.D.C.L.

DRAWN <i>[Signature]</i>	CHECKED <i>[Signature]</i> J.E.	SUBMITTED <i>[Signature]</i> E.E.	APPROVED <i>[Signature]</i> S.E.	DATE 24-06-94	DRG NO. 63-711. R2	DISTRIBUTION SECTION
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