

MATERIAL SPECIFICATION CELL

**TECHNICAL SPECIFICATION OF GLASS REINFORCED POLYESTER SHEET
MOULDING COMPOUND (SMC) “V” CROSS ARM AND TOP FITTINGS
SUITABLE FOR 11 KV OVERHEAD LINES**



TECHNICAL SPECIFICATION NO.

CE/MMC/MSC-I/ SMC “V” CROSS ARM & TOP FITTINGS/2018

Date: 25.10.18

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1.0 Scope:

This specification covers details of Glass Reinforced Polyester sheet moulding compound (SMC) 'V' Cross Arm & Top Fittings to be used on 11 KV Overhead lines in Distribution System.

2.0 Service conditions:

The Cross Arm to be supplied against this Specification shall be suitable for satisfactory continuous operation under the following service conditions.

Maximum ambient Temperature (°C)	50
Relative humidity (%)	10 To 100
The Maximum annual rainfall (mm)	1450
Maximum Wind Pressure (Kg/Sq.mtr)	150
Maximum Altitude above mean sea level (Mtrs)	1000
Seismic level (Horizontal acceleration)	0.3g
Isoceraunic Level (Days/Year)	50 days
General Nature of Climate	Moderately hot & humid tropical climate Conducive to rust and fungus growth

3.0 Applicable Standards :-

Unless otherwise specified elsewhere in this specification, the raw materials used for SMC 'V' Cross Arm & Top Fittings shall comply with IS : 13410-1992, IS : 4249-1967, IS : 11731-1986 & IS : 13360-1997 or their latest version.

Hot Dip Galvanization shall be carried out by Hot Dip Method as per IS : 4826-1979 for all M.S. Material. Galvanizing shall be 25 micron min.

4.0 Specific Requirements:-

- a. The Cross Arms shall be of V Shape having moulded flat surfaces with holes for Pin Insulator & Pole Back Clamp fixing. The length shall be suitable for installation of Pin Insulators @ 1070 mm centre to centre.
- b. The Cross Arms shall have two holes of 25 mm dia. for fixing of Pin rods. The centre to centre distance between the holes shall be 1070 mm & holes shall be in the middle of the top width of Cross Arm.
- c. Top Fittings shall have one hole of 25 mm dia. for fixing of Pin rod.
- d. V Cross Arm & Top Fittings shall have two holes each of 18 mm dia. for fixing of Pole Back Clamp.

- e. The enclosed Drawing gives the general details of “V” Cross Arms & corresponding Top Fittings showing various dimensions, size of holes, mounting arrangement etc.
- f. The Cross Arm & Top Fittings shall have wall thickness of SMC material of min. 5 mm excluding ribs/stiffeners, tie beams & certain design features like hole etc.

5.0 General Requirements :-

- a. The Cross Arms & Top Fittings shall be made from good quality Glass Reinforced Polyester Sheet Moulding Compound (SMC) with S₃ Grade conforming to the requirement of IS : 13410-1992 unless otherwise specified in this specification. It shall be suitable for outdoor application & shall be manufactured by automatic moulding process.
- b. The Cross Arms shall have smooth surface finish.
- c. The Cross Arms & Top Fittings shall be of light colour preferably of off white colour so as not to attract birds. It shall not corrode while in contact with steel fittings/fixtures, PSC Poles and Aluminium Conductor.
- d. The Cross Arms & Top Fittings shall be with Ultra Violet resistant.

6.0 Mechanical Properties :-

- a. The Cross Arms shall be able to withstand a vertical load of 300 kg applied at each of the two points coinciding with the centre of the Pin Insulators on both sides. For the purpose of this test, the Cross Arm shall be mounted on a support with 230 mm centre to centre distance between clamp bolts. With application of this load, no damage should occur to the Cross Arm & it should remain serviceable.
- b. In the horizontal direction, the Cross Arm should be able to withstand a load of not less than 100 Kg applied on both sides.
- c. For improving the Mechanical Strength, Tie Beam moulded to “V” Shape shall be provided.
- d. Pin Insulators centre & hole position where the Cross Arm is fixed to the PSC Pole as well as overall V Shape shall invariably remain same as shown in drawings so as to maintain required clearances.

7.0 Tests:-

The Tenderer shall furnish following detailed Type Tests of the offered Material /equipment carried out at the NABL approved Laboratories to prove that the material / equipment offered meet the requirements of the specification. These Type Tests should have been carried out as per IS 13410-1992 within five years prior to date of opening of tender.

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a. Type Tests : The following Tests shall constitute the Type Tests:

Sr. No.	Particulars	Reference Standard		Required Value	Method of Test, Ref to
1.	Visual Inspection	Free from Cracks and smooth finish			-
2.	Dimensional check	Dimension as per drawing			-
3.	Load Test	Technical Spec. Cl. No. 6a & 6b	X=300 kg Y=100 kg	No Damage	-
4.	Glass Content, Percent by mass, Min	IS:13410 -1992	Cl. No.7.1 Table 1, Sr. No. i	20% Min.	IS 13411 : 1992 Annexure A
5.	Water Absorption, Percent, Max	IS:13410 -1992	Cl. No.7.1 Table 2, Sr. No. ii	0.20 % Max.	Annexure D of IS 13411 : 1992
6.	Izod Impact Strength KJ/m ² , Min	IS:13410 -1992	Cl. No.7.1 Table 2, Sr. No. iv	55 KJ/m ² Min.	Annexure E of IS 13411 : 1992
7.	Tensile Strength, MPa, Min	IS:13410 -1992	Cl. No.7.1 Table 2, Sr. No. v	70 Mpa Min	IS 8543 (Part 4/ Sec 1) : 1984
8.	Flexural Strength, Mpa, Min.	IS:13410 -1992	Cl. No.7.1 Table 2, Sr. No. vi	170 Mpa Min.	Annexure F of IS 13411 : 1992
9.	Modulus of elasticity, 10 ³ Mpa	IS:13410 -1992	Cl. No.7.1 Table 2, Sr. No. vii	12 to 15	IS 8543 (Part 4/ Sec 1) : 1984
10.	Tracking Resistance CTI, Min	IS:13410 -1992	Cl. No.7.1 Table 2, Sr. No. x	1000 Min.	IS 2824 : 1975
11.	Power Arc Resistance, Sec, Min.	IS:13410 -1992	Cl. No.7.1 Table 2, Sr. No. xi	180 Min.	Annexure G of IS 13411 : 1992
12.	Dielectric Strength at 90°C in oil kV/mm	IS:13410 -1992	Cl. No.7.1 Table 2, Sr. No. xii	11	IS 6262 : 1971
13.	Dissipation factor (4 days at 80 percent RH and at 1 KHz)	IS:13410 -1992	Cl. No.7.1 Table 2, Sr. No. xiii	0.01	IS 4486 : 1967
14.	Heat Distortion Temperature ,°C , Min.	IS:13410 -1992	Cl. No.7.1 Table 2, Sr. No. xiv	150 Min.	Annexure H of IS 13411 : 1992

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Sr. No.	Particulars	Reference Standard		Required Value	Method of Test, Ref to
15.	Oxygen Index, percent, Min.	IS:13410-1992	Cl. No.7.1 Table 2, Sr. No. xv	24 Min.	IS 13360 (Part 6/ Sec 6) : 1992

b. Acceptance & Routine Tests :-

The following Tests shall constitute the Acceptance & Routine Tests. All Acceptance & Routine Tests shall be carried out by supplier in presence of Purchaser's representative.

Immediately after finalization of the program of Type/Acceptance/Routine testing, the supplier shall give three weeks advance intimation to purchaser, to enable him to depute his representative for witnessing the tests.

Sr. No.	Particulars	Reference Standard		Required Value	Method of Test, Ref to
1.	Flow, mm, Min	IS : 13410-1992	Cl. No.7.1 Table 1, Sr. No. ii	170 Min.	IS 13411 : 1992 Annexure C
2.	Mould shrinkage, linear percent, Max	IS : 13410-1992	Cl. No.7.1 Table 1, Sr. No. iii	0.25 Max.	IS 13411 : 1992 Annexure B
3.	Density of Moulding, g/ml	IS : 13410-1992	Cl. No.7.1 Table 2, Sr. No. i	1.8 to 2.1	IS 8543 (Part 1/Sec 2) : 1970
4.	Post shrinkage, percent, Max	IS : 13410-1992	Cl. No.7.1 Table 2, Sr. No. iii	0.01	IS 13411 : 1992 Annexure B
5.	Tensile Strength, MPa, Min	IS:13410-1992	Cl. No.7.1 Table 2, Sr. No. v	70 Mpa Min	IS 8543 (Part 4/ Sec 1) : 1984
6.	Surface Resistivity (24 h in water), ohm, Min	IS : 13410-1992	Cl. No.7.1 Table 2, Sr. No. viii	1 x 10 ¹³ Min	IS 3396 : 1979
7.	Volume Resistivity, Ohm-cm, Min	IS : 13410-1992	Cl. No.7.1 Table 2, Sr. No. ix	1 x 10 ¹⁴ Min	IS 3396 : 1979

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Sr. No.	Particulars	Reference Standard Required Value		Required Value	Method of Test, Ref to
8.	Power Arc Resistance, Sec, Min.	IS:13410-1992	Cl. No.7.1 Table 2, Sr. No. xi	180 Min.	Annexure G of IS 13411 : 1992
9.	Flammability	UL-94/IS :11731 (Pt. II)	-	V0	-
10.	Exposure to flame	IS : 4249 - 1967	-	Self Extinguishing	-
11.	Melting Point	IS : 13360	-	Does not Melt	-
12.	Glow Wire Test	IEC-695-2-1 or IS 11000 (Pt 2/Sec.1)	-	-	-
13.	Ball Pressure Test	IEC 335			

The routine and acceptance Tests should be performed on one sample chosen at random out of every lot (max 10,000 Nos.) subject to maximum of 2% of each supply batch.

8.0 Marking :-

The SMC "V" Cross Arm & Top Fittings shall be indelibly & distinctly marked with all essential particulars as per relevant standards. In addition to the requirements as per relevant standard, following information shall be marked on each Cross Arm & Top Fittings :

- a. Name of Purchaser : MSEDCL
- b. Manufacturer's Name or Trade mark
- c. Year of manufacture
- d. Tender Reference No.

9.0 Inspection :

- a. The inspection may be carried out by the purchaser at any stage of manufacture. The successful bidder shall grant free access to the purchaser's representative at any reasonable time when the work is in progress. All facilities must be made available by supplier / manufactures for unrestricted inspection of the works, raw material, and manufacture of all the accessories and for conducting necessary tests as declared herein.
- b. The supplier shall keep the purchaser informed, in advance, of the time of starting and of the progress of manufacture of equipment in its various stages so that arrangement should be made for inspection.
- c. No material shall be dispatched from its point of manufacture unless the material has been satisfactorily inspected and tested.

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- d. Inspection and acceptance of any equipment under this specification by the purchaser shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specification and shall not prevent subsequent rejection, if the equipment is found to be defective.

10.0 Documentation :

The successful bidder shall furnish drawings viz. SMC “V” Cross Arms, Top Fittings, Nut and Bolts for “V” Cross Arms & Top Fittings ‘C’ Clamps etc. in triplicate to CE (MMC) & get approved before commencement of supply.

11.0 Packing :-

The Glass Reinforced Polyester sheet moulding compound (SMC) ‘V’ Cross Arm & Top Fittings will be packed in quantities of 10 to 20. Each cross arm & Top Fittings will be covered with stretch wrapping film. The items so wound will be grouped as per numbers per packet. The information like product quantity should be mentioned on the packets.

12.0 Schedules :

- a. The bidder shall fill in the following schedule which forms part 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 – ‘A’ - Guaranteed Technical Particulars of SMC “V” Cross Arms & Top Fittings
Schedule – ‘B’ - Bidder’s Experience
Schedule – ‘C’ - Proforma of Undertaking
- b. The Tenderer shall submit the list of orders for similar type equipments executed or under execution during last five years, with full details, in the schedule of tenderers experience (Schedule “B”) to enable the purchaser to evaluate the tender. In case the equipments are being designed and manufactured in collaboration with other manufacturer, the following additional information shall be submitted by the tenderer along with his offer.
- i) Copy of collaboration agreement executed between the tenderer and the collaborator.
 - ii) List of orders for similar equipments, executed / being executed by the collaborator during last ten years and performance certificate for seven years of satisfactory operation.

SCHEDULE - 'A'

GTP OF SMC "V" CROSS ARMS AND TOP FITTINGS			
Sr. No.	Particulars	Required	Offered
1.	Material	Glass Reinforced Polyester Sheet Moulding compound (SMC)	
2.	Grade of Material	SMC Grade S ₃ as per IS 13410 : 1992	
3.	Construction Features of "V" Cross Arm (Refer Drawing)		
a.	Length	1170 mm	
b.	Height	375mm	
c.	Width	65mm	
d.	Thickness of SMC Material	5mm	
4.	Construction Features of Top Fittings (Refer Drawing)		
a.	Length	300 mm	
b.	Height	200 mm	
c.	Width	65 mm	
d.	Thickness of SMC Material	5 mm	
5.	Properties of "V" Cross Arm & Top Fittings (Refer Drawing)		
a.	Load Test	X=300 kg, Y=100 kg	
b.	Glass Content, Percent	20 % Min.	
c.	Water Absorption, Percent	0.20 % Max.	
d.	Izod Impact Strength KJ/ m ²	55 KJ/ m ² Min.	
e.	Tensile Strength, MPa	70 MPa Min.	
f.	Flexural Strength, MPa	170 MPa Min.	
g.	Modulus of Elasticity, 10 ³ MPa	12 to 15	
h.	Tracking Resistance CTI	1000 Min.	
i.	Power Arc Resistance, Sec	180 Min.	
j.	Dielectric Strength at 90°C in oil kV/mm	11	
k.	Dissipation factor (4 days at 80 percent RH and at 1 KHz)	0.01	
l.	Heat Distortion Temperature , °C	150 Min.	
m.	Oxygen Index, percent	24 Min.	
n.	Flow, mm	170 Min.	
o.	Mould Shrinkage linear percent	0.25 Max.	

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GTP OF SMC "V" CROSS ARMS AND TOP FITTINGS			
Sr. No.	Particulars	Required	Offered
p.	Density of Moulding g/ml	1.8 to 2.1	
q.	Post shrinkage, percent, Max	0.01 Max.	
r.	Surface Resistivity (24 h in water), Ohm	1×10^{13} Min	
s.	Volume Resistivity Ohm-cm	1×10^{14} Min	
t.	Flammability	V0	
u.	Exposure to flame	Self Extinguishing	
v.	Melting Point	Does not Melt	
6.	Distance for hole for mounting Pin Insulator	CC = 1070 mm	
7.	Dia. of Hole for mounting Pin Insulator for Cross Arm & Top Fittings	Dia. of Hole 25 mm	
8.	Dia. of Hole for mounting Pole Back Clamp for Cross Arm & Top Fittings	Dia. of Hole 18 mm	
9.	Distance for hole for mounting pole back clamp for Cross Arm and Top Fittings	CC = 230 mm	
10.	Pole Back Clamp	GI 50 x 6 mm as per drawing	
11.	Nuts and Bolts		
a.	Nut & Bolt for mounting Tie Beam	1 No. M16x180mm	
b.	Nut & Bolt for mounting "V" Cross Arm	2 Nos. M16x115mm	
c.	Nut & Bolt for mounting Top Fittings	2 Nos. M16x65mm	

SCHEDULE - 'B'

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 of order	Value of order	Period of supply and commissioning	Names & Addresses to whom reference may be made

Name of the firm_____

Signature of the tenderer_____

Designation_____

Date_____

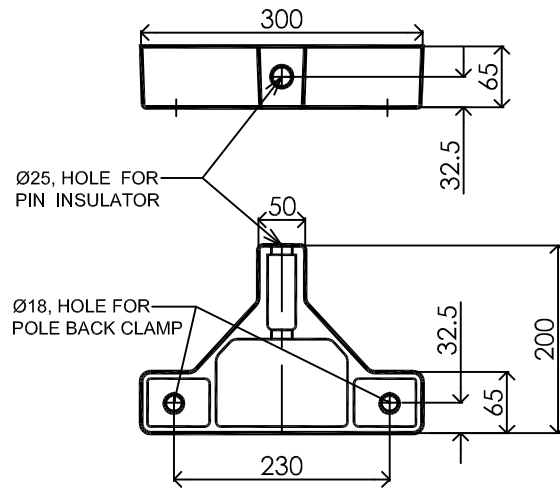
SCHEDULE - ‘C’

PROFORMA OF UNDERTAKING

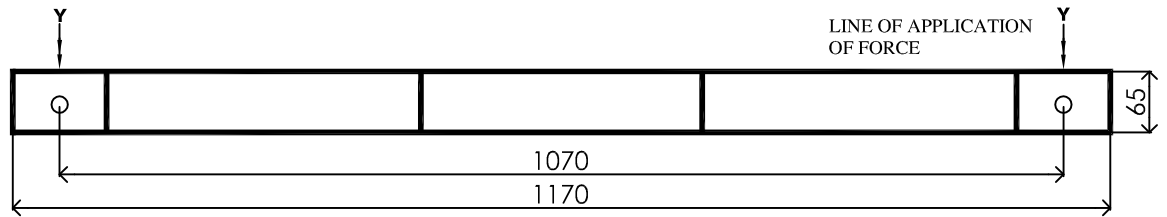
We hereby confirm that SMC “V” Cross Arm & Top Fittings offered by us against this tender are of the same design and type as have been supplied to M.S.E.D.C.L. against earlier order No. _____ dtd. _____ and all the Type Test Reports thereof were approved by C.E. (M.M. Cell) vide letter No. _____ dtd. _____ (copy enclosed.)

We further confirm that the said Type Test have been carried out at _____ within five years prior to the date of opening of present tender.

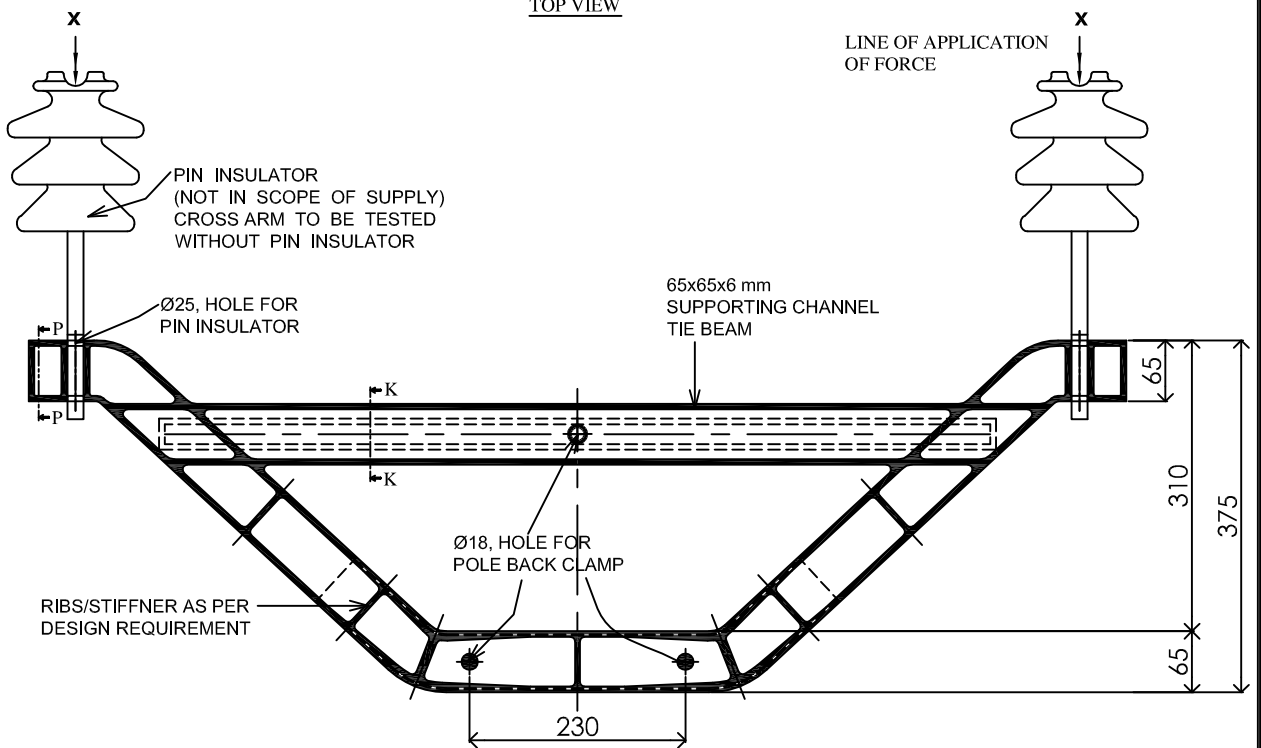
SEAL AND SIGNATURE OF TENDERER



SMC TOP FITTING



TOP VIEW

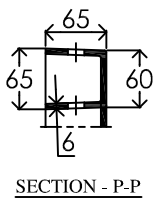


SMC 'V' CROSS ARM

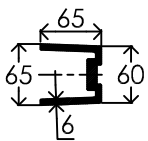
NOTES: TOLERANCE AS PER IS
ALL DIMENSIONS ARE IN MM

TITLE : SMC 'V' CROSS ARM & TOP FITTING
FOR 11 KV OVERHEAD LINES

ORDER NO.		
REV NO.	DATE	DRAWING NO
SCALE	NTS	APPROVED BY

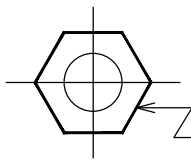


SECTION - P-P

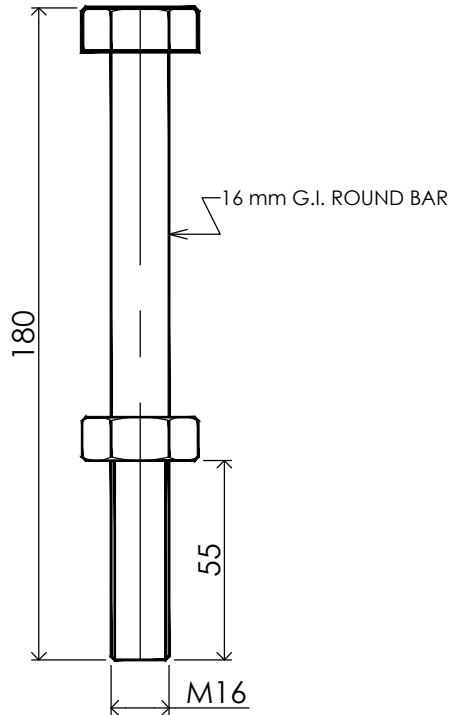


SECTION - K-K

DIRECTION OF FORCE TO BE APPLIED X & Y :
FORCE X = 300 KG, Y = 100 KG.

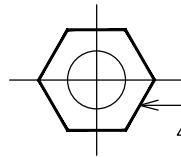


G.I. NUT SUITABLE FOR
Ø16 mm ROUND BAR

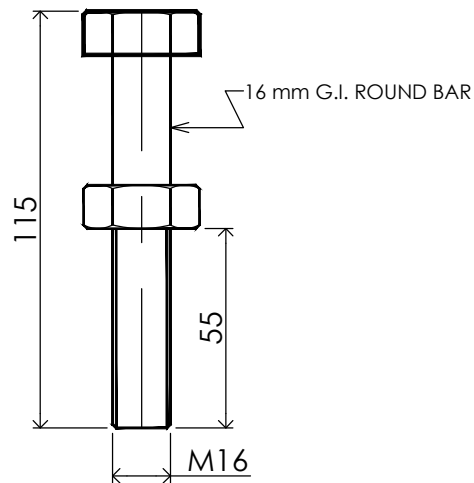


SIZE :-

M16 mm X 180 mm

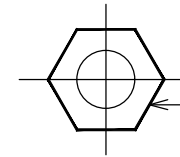


G.I. NUT SUITABLE FOR
Ø16 mm ROUND BAR

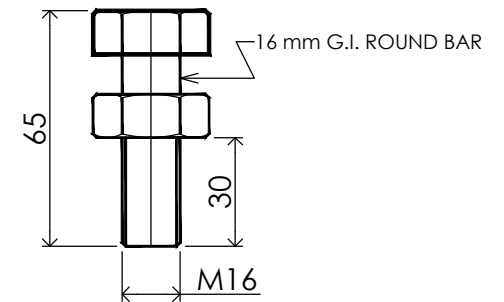


SIZE :-

M16 mm X 115 mm



G.I. NUT SUITABLE FOR
Ø16 mm ROUND BAR



SIZE :-

M16 mm X 65 mm

NOTES: TOLERANCE AS PER IS
ALL DIMENSIONS ARE IN MM

TITLE : G.I. BOLTS & NUTS WITH
2 NOS. OF G.I. WASHERS PER
BOLT

ORDER NO.

REV NO.

SCALE

DATE

NTS

DRAWING NO

APPROVED BY

G.I NUT & BOLT

QTY

TO BE USED FOR

M 16X180mm

1 No.

FOR MOUNTING TIE BEAM

M 16X115mm

2 Nos.

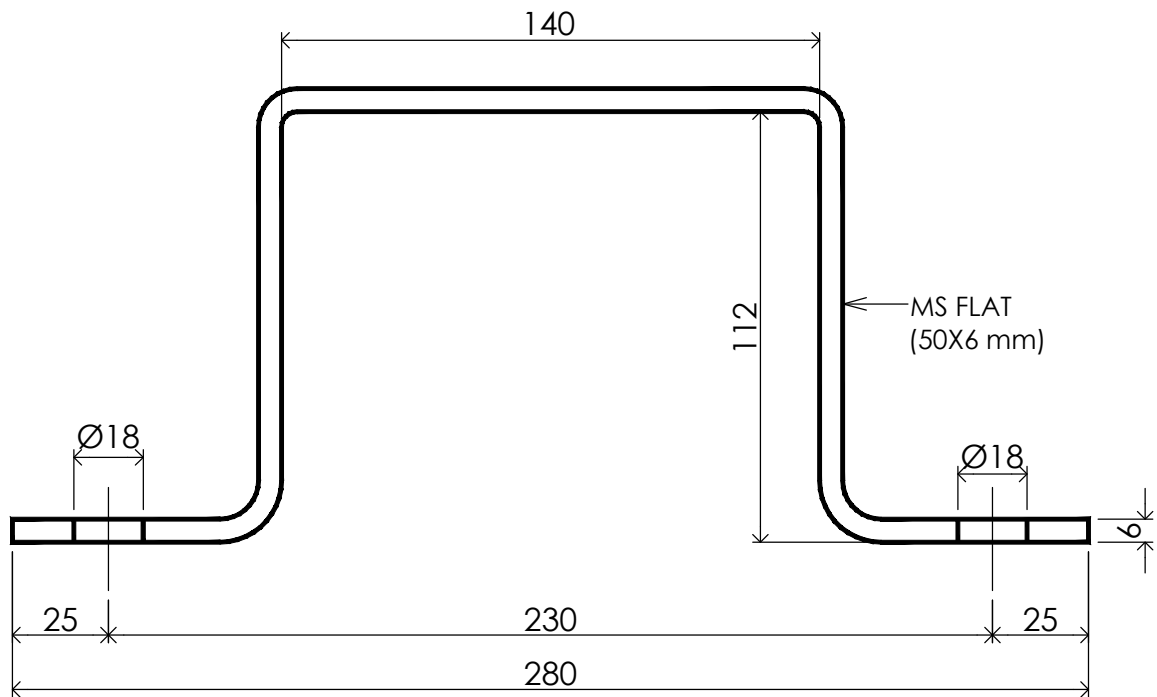
FOR MOUNTING V CROSS ARM

M 16X 65mm

2 Nos.

FOR MOUNTING TOP FITTING

'C' CLAMP FOR P.S.C. POLE (HOT DIP GALVANIZE)



NOTES: TOLERANCE AS PER IS
ALL DIMENSIONS ARE IN MM

TITLE : 'C' CLAMP FOR 200 kg P.S.C. POLE

ORDER NO.		
REV NO.	DATE	DRAWING NO
SCALE	NTS	APPROVED BY