



FIJI ELECTRICITY AUTHORITY

BIDDING DOCUMENT

MR14/2018

**PREFERRED SUPPLIER FOR 132KV LINE
HARDWARE**

Addendum # 1

Section 1: Instructions to Bidders

- 1. Scope of Bid** The Fiji Electricity Authority (hereinafter referred to as "the purchaser"), wishes to receive bids for Preferred Supplier for 132kV Line Hardware as specified in these bidding documents (hereinafter referred to as "LINE HARDWARE").
- 2. Eligible Bidders** This Invitation to Bid is open to bidders who have sound financial background and have previous experience in handling such projects.
- Bidders shall provide such evidence of their continued eligibility satisfactory to the purchaser as the purchaser shall reasonably request.
- Bidders shall not be under a declaration of ineligibility for corrupt or fraudulent.
- 3. Eligible Materials, Equipment and Services** The LINE HARDWARE to be supplied under the Contract shall have their origin from reputable companies from various countries. At the Purchaser's request, bidders may be required to provide evidence of the origin of various parts of the LINE HARDWARE.
- 4. Qualification of the Bidder** To be qualified for award of Contract, bidders shall submit proposals regarding work methods, scheduling and resourcing which shall be provided in sufficient detail to confirm the bidder's capability to fulfill the contract.
- 5. Cost of Bidding** The bidder shall bear all costs associated with the preparation and submission of its bid and the Purchaser will in no case be responsible or liable for those costs.
- 6. Sealing and Marking of Bids** The bidder shall furnish and submit 2 Original copies of the bid.
- The inner and outer envelopes shall be addressed to the purchaser at the following address:
- Tuvitu Delairewa
General Manager Corporate Services 2
Marlow Street, Suva, FIJI. Phone: 679 3224
185 Facsimile: 679 331 1882 Email:
TDeலைrewa@fea.com.fj
And
- bear the following identification:
- Bid for: Preferred supplier for the 132 kV LINE HARDWARE
 - Bid Tender Number: MR 14/2018
 - DO NOT OPEN BEFORE Wednesday, 11/04/18
- 7. Deadline for Submission of Bids** Bids must be received by the purchaser at the address specified above no later than 1600 hours (Fiji Time i.e. UTC + 16:00 hrs) (Wednesday, 11/04/18).
- The purchaser may, at its discretion, extend the deadline for submission of bids by issuing an addendum, in which case all rights and obligations of the

purchaser and the bidders previously subject to the original deadline will thereafter be subject to the deadlines extended.

8. Late Bids

Any bid received by the purchaser after the deadline for submission of bids prescribed will be rejected and returned unopened to the bidder.

9. Modification and Withdrawal of Bids

The bidder may modify or withdraw its bid after bid submission, provided that written notice of the modification or withdrawal is received by the Purchaser prior to the deadline for submission of bids.

The bidder's modification or withdrawal notice shall be prepared, sealed, marked and delivered, with the outer and inner envelopes additionally marked "MODIFICATION" or "WITHDRAWAL", as appropriate. A withdrawal notice may also be sent by fax but must be followed by a signed confirmation copy.

No bid may be modified by the bidder after the deadline for submission of bids.

10. Purchaser's Right to Accept any Bid and to Reject any or all Bids

The Purchaser reserves the right to accept or reject any bid, and to annul the bidding process and reject all bids, at any time prior to award of Contract, without thereby incurring any liability to the affected bidder or bidders or any obligation to inform the affected bidder or bidders of the grounds for the Purchaser's action.

11. Notification of Award

Prior to expiration of the period of bid validity prescribed by the Purchaser, the Purchaser will notify the successful bidder by fax/email, confirmed by registered letter, that its bid has been accepted. This letter (hereinafter and in the Conditions of Contract called the "Letter of Acceptance") shall name the sum which the Purchaser will pay the Contractor in consideration of the execution, completion and maintenance of the Works by the Contractor as prescribed by the Contract (hereinafter and in the Conditions of Contract called "the Contract Price").

The notification of award will constitute the formation of the Contract.

Upon the furnishing by the successful bidder of a performance security, the Purchaser will promptly notify the other bidders that their bids have been unsuccessful.

12. Signing of Contract Agreement

At the same time that he notifies the successful bidder that its bid has been accepted, the Purchaser will send the bidder the Form of Contract Agreement provided in the bidding documents, incorporating all agreements between the parties.

Within 7 days of receipt of the Form of Agreement, the successful bidder shall sign the Form and return it to the Purchaser.

**13. Corrupt or
Fraudulent
Practices**

The Purchaser requires that the Contractor observe the highest standard of ethics during the procurement and execution of such contracts. In Pursuance of this policy, the Purchaser:

- (a) defines, for the purposes of this provision, the terms set forth below as follows:
 - (i) "corrupt practice" means behavior on the part of officials in the public or private sectors by which they improperly and unlawfully enrich themselves and/or those close to them, or induce others to do so, by misusing the position in which they are placed, and it includes the offering, giving, receiving or soliciting of anything of value to influence the action of any such official in the procurement process or in contract execution; and
 - (ii) "fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Purchaser, and includes collusive practice among bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the Purchaser of the benefits of free and open competition;
- (b) Will reject a proposal for award if it determines that the bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question.

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Section 2: Technical Specification

1 General Description

The Fiji Electricity Authority invites sealed tenders from reputable companies with the relevant experience, for the Supply of 132kV Line Hardware.

This document specifies the requirements for the design, manufacture, testing and supply of 132,000 Volts – rated Line Hardware for the installation in the Authority’s 132kV transmission network.

2 Scope

The Line hardware shall be installed on the 132,000 Volts transmission network.

2.1 Estimated quantities

The following table shows the Purchaser's total estimated requirement of 132kV Transmission Line hardware to be purchased each year for the next five (5) years. The Tenderers should note that the total estimated requirement for Transmission Line hardware to be purchased under this contract is not guaranteed.

#	Line Hardware	Quantity (pieces)	
1	132 kV Sag Link (160kN) – (187/CTSL)	1000	
2	132 kV Compression Dead End Assembly	Conductor Type: 1). Lime 30/7/3.5 ACSR/GZ	150
		2). Grape 30/7/2.5 ACSR/GZ	150
3	132 kV Compression Jumper terminal	Conductor Type: 1). Lime 30/7/3.5 ACSR/GZ	150
		2). Grape 30/7/2.5 ACSR/GZ	150
4	16mm Stirrup D Shackle (160kN)	100	
5	Shackle 160kN (187/S)	1500	
6	Bow Shackle 120kN	1500	
7	Link Plate (Single) with Provision for Arcing Horn Attachment	150	
8	Arcing Horn (Type 1) – Strain	100	
9	Arcing Horn (Type 2) – Earth End Suspension	100	
10	Arcing Horn (Type 3) – Live End Suspension	100	
11	160kN Ball Clevis	50	

12	Twisted Ball Clevis with provision for Arcing Horn Attachment on suspension insulators		50
13	132 kV Socket Tongue with provision for Arcing Horn Attachment on suspension insulators		600
14	132 kV Armor Grip suspension (Lime Conductor) 30/7/3.5 ACSR/GZ		300
15	132 kV Armor Grip suspension (Grape Conductor) 30/7/2.5 ACSR/GZ		300
16	Stud Bolt - M20 X 500 with Split Pins on both ends and double nuts (40mm Thread on both ends)		300
19	Stud Bolt - M16 X 500 with Split Pins on both ends and double nuts (35mm Thread on both ends)		300
20	132kV Compression mid span joints – full tension	Conductor Type: 1). Lime 30/7/3.5 ACSR/GZ	200
		Conductor Type: 2). Grape 30/7/2.5 ACSR/GZ	200
21	132kV Conductor fittings suspension clamp Aluminum Alloy	Clamping range: (30mm – 45mm) [Lime/Grape with amour rods)	300
		Clamping range: (20mm – 30mm) [Lime]	300
		Clamping range: (11mm – 20mm) [Grape]	300
22	Stock-Bridge Vibrational Dampers with Damper Installation instructions (eg. #/span length)	Conductor Type: 1). Lime 30/7/3.5 ACSR/GZ	1000
		Conductor Type: 2). Grape 30/7/2.5 ACSR/GZ	1000
23	Turnbuckles (Eye-Eye) M20 160kN		10
24	U-Bolt		50

3 Service Conditions

The hardware shall be capable of satisfactory operation outdoors in a tropical environment, which has high solar radiation and varies from hot dry and dusty to hot and humid and subject to cyclonic wind. The following conditions apply:

1. Air Temperature
 - Extreme maximum 45 °C
 - Average maximum 35 °C
 - Average minimum 18 °C
 - Extreme minimum -5 °C
2. Relative Humidity
 - Maximum 93%
3. Solar Radiation
 - Maximum 1.1kW/m²
4. Wind Loading
 - Wind loading shall be assessed in accordance with AS 1170.2—2011, for Region C (Tropical Cyclone)

4 Manufacturer's Qualification/ Certification

4.1 Certification

Every bidder shall include in his bid each Line Hardware manufacturer's supply experience list of the same or similar types of each offered Line Hardware. The list shall include year of supply, type and quantity of supplied insulator, and full name of user.

Manufacturer shall have sufficient supply and manufacturing experience of Line Hardware for at least ten (10) years for the required system voltage and above.

Certificates from customers with satisfactory usage shall be provided with the supply record. Insulators shall be considered, for which a minimum 5 years manufacturing and successful service experience is available, without change of basic design and material.

The qualified manufacturer shall have designed, manufactured, tested and supplied at least 100,000 units of similar hardware for the same system voltage and above. Supplied Line Hardware must have same or higher electro-mechanical strength required in this tender document.

- i. Then less than 1/100,000 of annual failure rate shall be guaranteed.
- ii. The bidder shall include with its bid the Certificate of less than 1/100,000pcs of Annual failure rate issued from at least three different foreign utilities outside of manufacturer's country.

Also, at least two certificates out of above three certificates that show the supplied insulators shall be under successful commercial operation for at least five years shall be submitted.

5 Technical Requirements for the 132kV Line Hardware

5.1 Design and Material Requirements

5.1.1 Galvanising

All ferrous parts shall be hot dip galvanised as per AS/NZS 4680 and other [standard](#) listed.

5.1.2 Mechanical Strength

Each individual Line Hardware shall be capable for withstanding the rated mechanical terminal loads and electromagnetic forces, without effecting the operation and current carrying properties. **The mechanical strength and electrical strength of each Line Hardware accessory shall be submitted with the bid.**

5.1.3 Specifications and standards

The bidder shall provide an original copy of the specification sheet of each Line Hardware Item and all attachments. The standards used for each aspect shall also be cited.

5.1.4 Marking

Markings shall be legible, durable and permanent to include the following:

- a. Manufacturer's name or trademark
- b. Specified mechanical load
- c. Routine mechanical load
- d. FEA Stock Code (The FEA Stock Code will be provided once the tender is awarded)

5.2 Type Tests

The following type tests are required:

- Visual examination
- Verification of dimensions
- Visible discharge tests
- Temperature cycle test
- Mainly active load breaking capacity test
- Mechanical strength tests
- Operational and mechanical endurance test
- Tests for galvanisation of ferrous parts
- Measurement of the resistance of all Line Hardware accessories.
- Operation test

Note: All the above tests shall be conducted as per the relevant IEEE, IEC, ANSI or AS/NZS specification and a copy of the test report shall be furnished along with the tender.

5.3 Factory Acceptance Tests

The FEA reserves the right to witness sample and routine tests at the manufacturing. The bidders shall factor in the entire costs (Visa, air fare, Local Transportation, Hotel, Meals, etc) for facilitating one factory visit by two (2) FEA engineers at the manufacturing facility to witness sample and routine tests, as part of the factory acceptance testing of the hardware, prior to shipment.

6 Warranty

The supplier and/or manufacturer shall provide warranty of a minimum of **3 Years** from the date Fiji Electricity Authority receives the equipment.

On the contrary, if the bidder cannot warranty for 10 years than a preferred warranty period shall be given by the bidder.

7 Drawings

The bidder shall outline dimension drawings for each component, general arrangement drawing showing component layout and a complete drawing of each Line Hardware item with different drawings of variable components.

8 Quality and Environment Assurance

The quality assurance system of design, manufacture, and inspection shall conform to ISO 9001.

Quality assurance certificate according to ISO 9001 issued by an authorized inspection agency shall be submitted with the bid.

The environment management system of manufacture shall confirm to ISO 14001.

Environment assurance certificate according to ISO 14001 issued by an authorized inspection agency shall be submitted with the bid

Bids will not be considered if the manufacturer's experience or quality assurance system does not meet the above requirements.

9 Standards

Standards for Line Hardware Accessories	
AS/NZS 4680—2006 and AS 1650	Hot-dip Galvanized (zinc) Coatings on Fabricated Ferrous Articles
AS/ NZS 7000	Overhead Line Design
AS 1222	Steel conductors and stays
As 1222.1	Part 1: Bare overhead – Galvanized (SC/GZ)
AS 1222.2	Part 2: Aluminum Clad (SC/AC)
AS 1111.1	ISO Metric Hexagon bolts and screws Product Grade C
AS 1112.1	ISO Metric Hexagon Nuts Part 1: Style 1 – Product grade A and B Part 2: Style 2 – Product grade A and B Part 3: Product grade C Part 4: Chamfered thin nuts – Product grade A and B
AS 1214	Hot dip galvanized coatings in threaded fasteners [ISO metric Coarse thread series]
AS 1275	Metric Screws for fasteners
AS 1393	Coach screws - metric series with ISO hexagon heads
AS/NZS ISO 9001:2008	Quality Management Systems - Requirements
AS 1154.1	Insulator and conductor fittings for overhead power lines (Part 1: Performance, material, general requirements and dimensions)
AS 1154.2	Insulator and conductor fittings for overhead power lines (dimensions)
AS 1154.3	Insulator and conductor fittings for overhead power lines (Part 3: Performance and general requirements for helical fittings)

Section 3: Pricing Schedule

1 Incoterms

All pricing shall be done on Cost, Insurance and Freight (CIF) basis, delivered to Suva wharf, Fiji.

2 Currency

All pricing shall be in US dollars.

3 Taxation

The pricing shall be EXCLUSIVE of any type of taxation that needs to be paid in Fiji.

4 Pricing breakdown

The prices quoted will be fixed and NOT variable.

5 Validity

The pricing shall be valid for 180 days.

6 Price Breakdown

#	Line Hardware	Quantity (pieces)	Unit Price	Total Price
1	132 kV Sag Link (160kN) – (187/CTSL)	1000		
2	132 kV Compression Dead End Assembly	Conductor Type: 1). Lime 30/7/3.5 ACSR/GZ	150	
		2). Grape 30/7/2.5 ACSR/GZ	150	
3	132 kV Compression Jumper terminal	Conductor Type: 1). Lime 30/7/3.5 ACSR/GZ	150	
		2). Grape 30/7/2.5 ACSR/GZ	150	
4	16mm Stirrup D Shackle (160kN)	100		
5	Shackle 160kN (187/S)	1500		
6	Bow Shackle 120kN	1500		

7	Link Plate (Single) with Provision for Arcing Horn Attachment		150		
8	Arcing Horn (Type 1) – Strain		100		
9	Arcing Horn (Type 2) – Earth End Suspension		100		
10	Arcing Horn (Type 3) – Live End Suspension		100		
11	160kN Ball Clevis		50		
12	Twisted Ball Clevis with provision for Arcing Horn Attachment on suspension insulators		50		
13	132 kV Socket Tongue with provision for Arcing Horn Attachment on suspension insulators		600		
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15	132 kV Armor Grip suspension (Grape Conductor) 30/7/2.5 ACSR/GZ		300		
16	Stud Bolt - M20 X 500 with Split Pins on both ends and double nuts (40mm Thread on both ends)		300		
19	Stud Bolt - M16 X 500 with Split Pins on both ends and double nuts (35mm Thread on both ends)		300		
20	132kV Compression mid span joints – full tension	Conductor Type: 1). Lime 30/7/3.5 ACSR/GZ	200		
		Conductor Type: 2). Grape 30/7/2.5 ACSR/GZ	200		
21	132kV Conductor fittings suspension clamp Aluminum Alloy	Clamping range: (30mm – 45mm) [Lime/Grape with amour rods)	300		
		Clamping range: (20mm – 30mm) [Lime]	300		
		Clamping range: (11mm – 20mm) [Grape]	300		
22	Stock-Bridge Vibrational Dampers with Damper	Conductor Type:	1000		

	Installation instructions (eg. #/span length)	1). Lime 30/7/3.5 ACSR/GZ			
		Conductor Type: 2). Grape 30/7/2.5 ACSR/GZ	1000		
23	Turnbuckles (Eye-Eye) M20 160kN		10		
24	U-Bolt		50		
Grand Total					

Section 4: Bid Documentation

The Bidder shall furnish, as part of the bid, documents establishing the Bidder's eligibility to bid and its qualifications to perform the contract if its bid is accepted.

The documentary evidence of the bidder's qualifications to perform the contract of its bid is accepted will establish to the purchaser's satisfaction.

- a) that the Bidder has the financial, technical, and production capability necessary to perform the contract;
- b) that the Bidder meets the qualification criteria listed in Section 2.

1 Documents establishing equipment conformity to Bidding documents

The Bidder shall furnish as part of its bid, documents establishing conformity to the bidding documents of each Line Hardware Item, which the Bidder proposes to supply under the contract.

The documentary evidence of conformity of the Line Hardware to bidding documents may be in the form of literature, drawings, and data, and will consist of:

- a) A detailed description of the essential technical and performance characteristics of the Line Hardware.
- b) The bidder should specifically mention about furnishing the test certificates and a specimen form of test certificate should be furnished along with the bid.
- c) A list giving full particulars, including available sources and current prices of spare parts, special tools etc., necessary for the proper and continuing functioning of the materials/equipment following commencement of the use of the Line Hardware by the purchaser; and
- d) An item-by-item commentary on the purchaser's Technical specifications demonstrating substantial responsive-ness of the Insulators and services to those specifications, or a statement of deviations and exceptions to the provisions of the technical specifications.

For purpose of the commentary to be furnished pursuant to above, the Bidder shall note that standards for workmanship, material, and equipment, as well as references to brand names or catalogue numbers designated by the Purchaser in its Technical Specifications, are intended to be descriptive only and not restrictive.

The Bidder may substitute alternative standards, brand names, and/or catalogue numbers in their bid, provided that it demonstrates to the Purchaser's satisfaction that the substitutions ensure substantial equivalence to those designated in the Technical Specifications.

2 Submission Checklist

The following shall be provided in the bid submission:

Particulars	Yes	No
1. Item-by-item commentary on the purchaser's Technical specifications		
2. Descriptive literature giving full technical details of equipment offered;		
3. Outline dimension drawing for each component, general arrangement drawing showing component layout;		
4. Type test certificates and sample routine test reports;		
5. Detailed reference list of customers already using equipment offered during the last 5 years with particular emphasis on units of similar design and rating;		
6. Details of manufacturer's quality assurance standards and programme and ISO 9000 series or equivalent national certification;		
7. Supplier experience details		
8. Deviations from this specification (if any).		
9. Certificates of annual failure rate		
10. Standards Compliance and Listing		
11. Factory Acceptance Test Plan and Breakdown		
12. Complying and Completed pricing schedule		

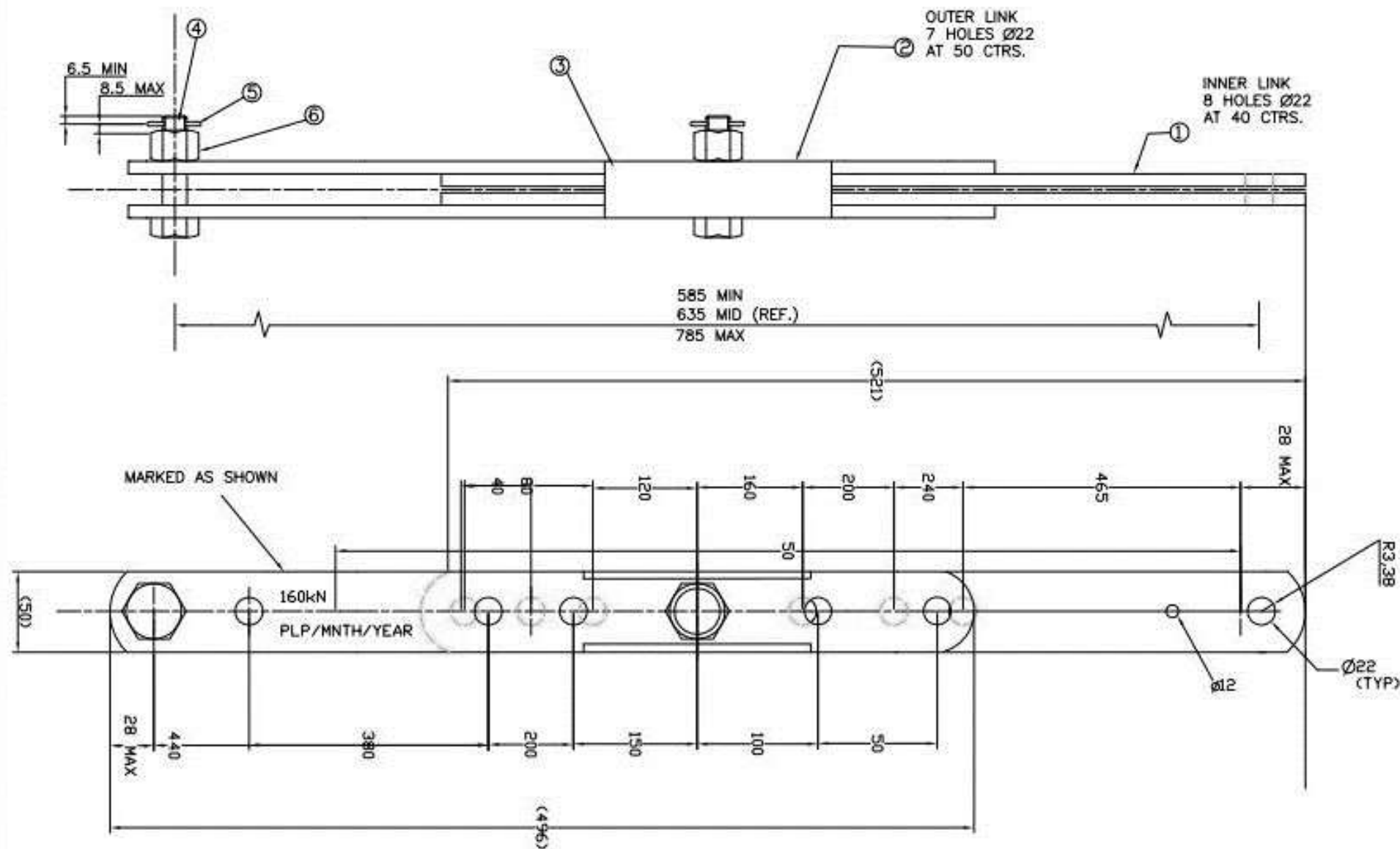
Appendix

A3

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES
2. TOLERANCES UNLESS OTHERWISE STATED:-
 - a. HOLE DIAMETRE $\pm 0.5\text{mm}$
 - b. LINEAR DIMS. OVER 30mm $\pm 5\%$ UP TO A MAX. 5 mm
3. BRACKETED DIMENS. DO NOT AFFECT INTERCHANGEABILITY OR COUPLING AND ARE FOR GUIDANCE ONLY
4. MATERIAL TO AS1154 GALVANISING TO AS/NZ 4680
5. IDENTIFICATION MARKINGS:- MTH/YR. MANF

6	M20 NULT X 80 GRADE 8.8 GA	2	GALV STEEL	AS1112
5	SPLIT PIN - TYPE HP/A	2	STAINLESS STEEL	AS1154
4	M20 BOLT X 80 GRADE 8.8 GAL	2	GALV STEEL	A4-01-041
3	SECURING PLATE	1	GALV STEEL	A4-25-016
2	OUTER LINK	2	STEEL GR300	AS DRAWN
1	INNER LINK	2	STEEL GR300	AS DRAWN
ITEM	DESCRIPTION	REQD.	MATERIAL	REF' No



FIJI ELECTRICITY AUTHORITY 160kN SAG LINK					DRAWING NUMBER	
					A3	
No REVISION DATE BY CHK'PSD APP					SCALE N.T.S	

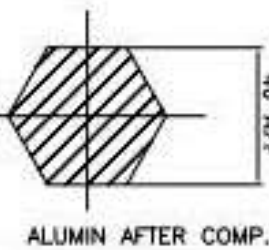
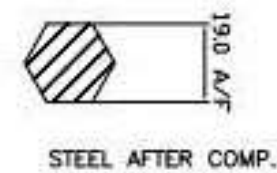
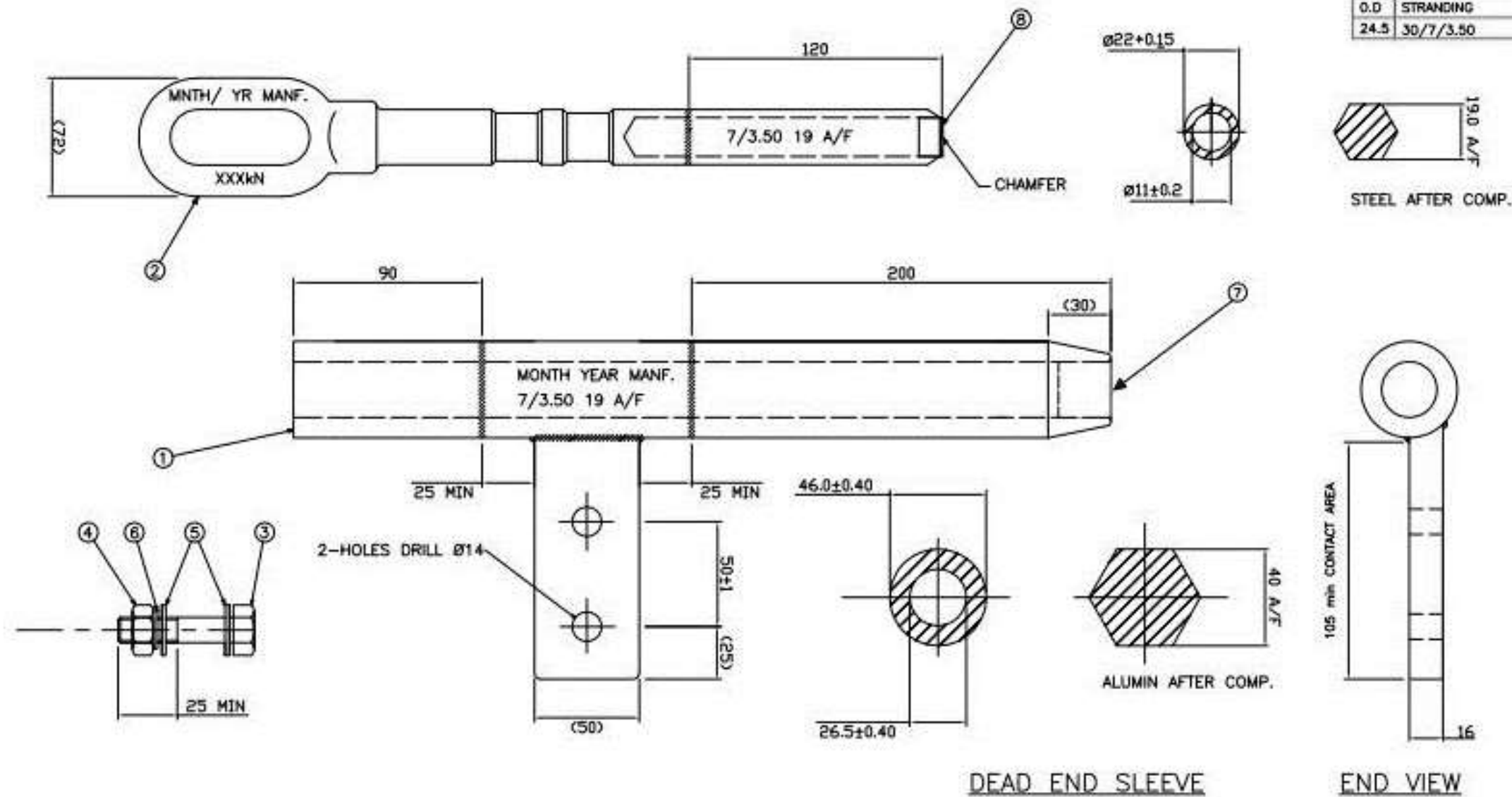
NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS STEEL
2. TOLERANCES UNLESS OTHERWISE STATES
 - a. HOLE DIAMETER $\pm 0.5\text{mm}$
 - b. LINEAR DIMS. UP 30mm $\pm 1.5\text{mm}$
 - c. LINEAR DIMS. OVER 30mm $\pm 5\%$ UP TO A MAX. OF 5mm
3. BRACKETED DIMENSIONS DO NOT AFFECT INTERCHANGEABILITY OR COUPLING AND ARE FOR GUIDANCE ONLY.

4. MATERIAL, 250 GRADE GALVANIZING TO AS1650
5. IDENTIFICATION MARKINGS- MNTH / YR MANF

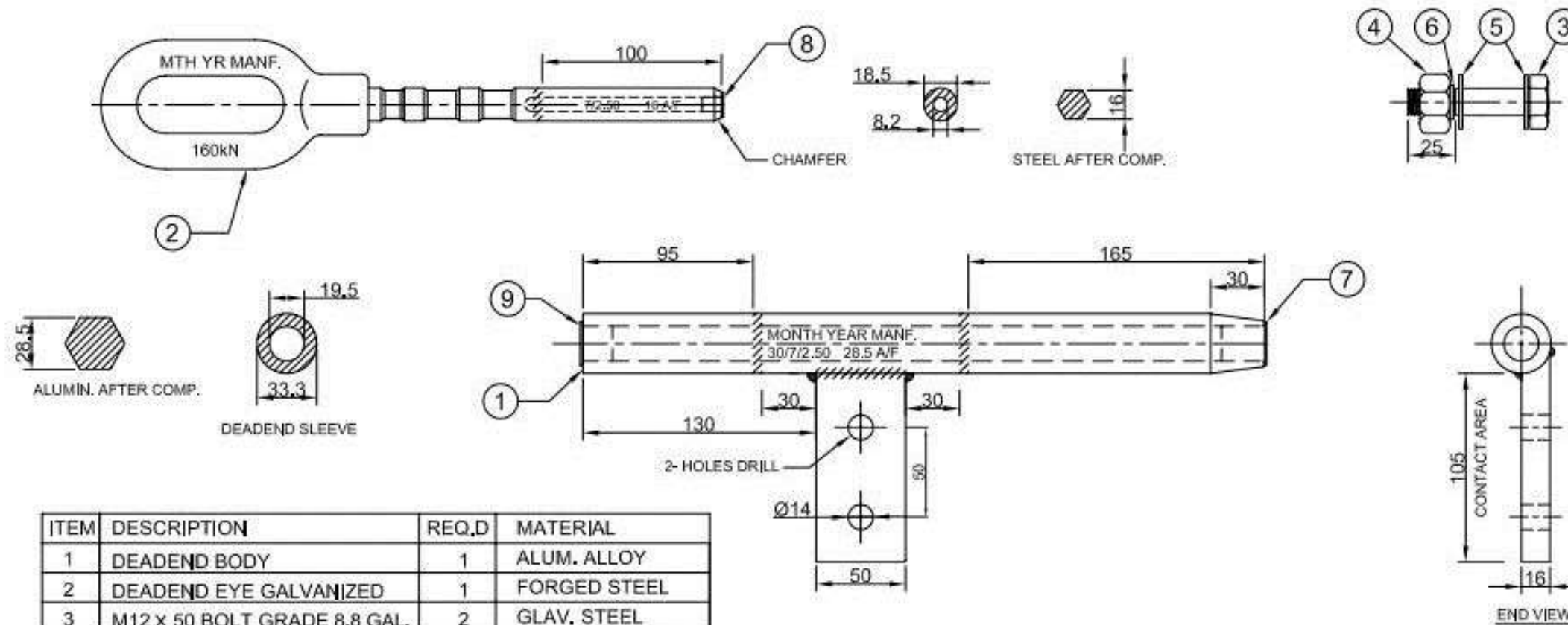
1	DEADEND BODY	1	ALUM. ALLOY
2	DEADEND EYE GALVNZED	1	FORGED STEEL
3	M12X50 BOLT GRADE 8.8 GAL.	2	GALV STEEL
4	M12 NUTGRADE 8 GAL.	2	GALV STEEL
5	M12 FLAT WASHER - GAL.	4	GALV STEEL
6	M12 SPRING WASHER - GAL.	2	GALV STEEL
7	END CAP	2	PLASTIC
8	END CAP	1	PLASTIC
QTY	DESCRIPTION	REQ.D	MATERIAL

QTY			
O.D	STRANDING	GRADE	NAME
24.5	30/7/3.50	ACSR/GZ	LIME



Compression Dead End Assembly- Lime

A3



ITEM	DESCRIPTION	REQ.D	MATERIAL
1	DEADEND BODY	1	ALUM. ALLOY
2	DEADEND EYE GALVANIZED	1	FORGED STEEL
3	M12 X 50 BOLT GRADE 8.8 GAL.	2	GLAV. STEEL
4	M12 NUT GRADE 8 GAL.	2	GLAV. STEEL
5	M12 FLAT WASHER - GAL.	4	GLAV. STEEL
6	M12 SPRING WASHER - GAL.	2	GLAV. STEEL
7	END CAP	1	PLASTIC
8	END CAP	1	PLASTIC
9	END CAP	1	PLASTIC

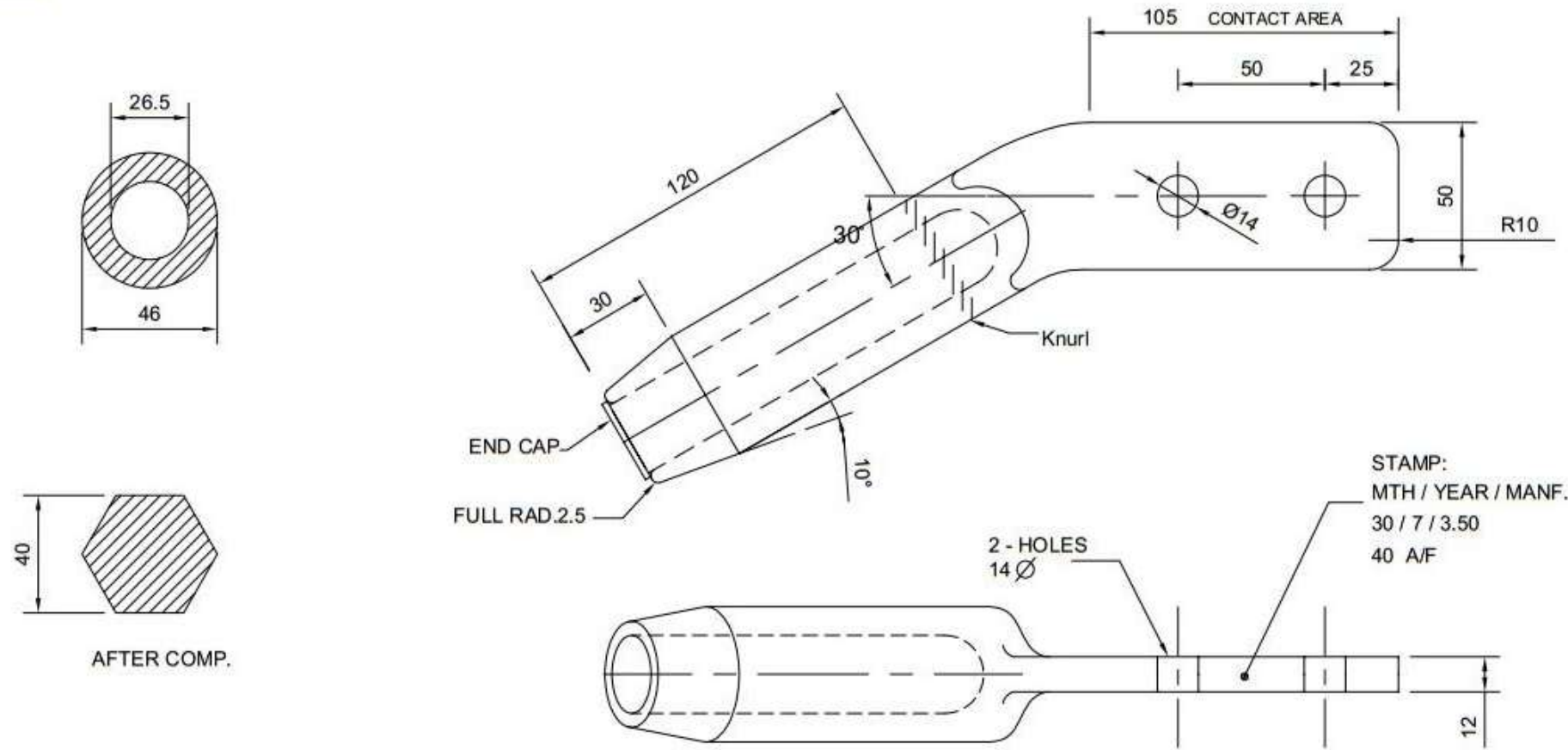
CONDUCTOR DETAIL			
O.D.	STRANDING	GRADE	NAME
17.5	30 / 7 / 2.5	ACSR / GZ	GRAPE

NOTES

- All dimensions in millimetres.
- Tolerances unless otherwise stated :
 - Hole diameter $\pm 0.5\text{mm}$
 - Linear dims. up to 30mm $\pm 1.5\text{mm}$
 - Linear dims. over 30mm $\pm 5\%$ up to a max of 5mm.
- Bracketed dims. do not affect interchangeability or coupling & are for guidance only.
- All design parameters in accordance with AS1154
- Galvanizing to AS/NZS 4680
- Identification markings:-
As shown.

						FIJI ELECTRICITY AUTHORITY	
						COMPRESSION DEADEND ASSEMBLY "GRAPE"	
						DRAWING NUMBER	
						A3	
						SCALE 1:3	
No.	REVISION	DATE	BY	CHK	PSD	APP	
0							

A3

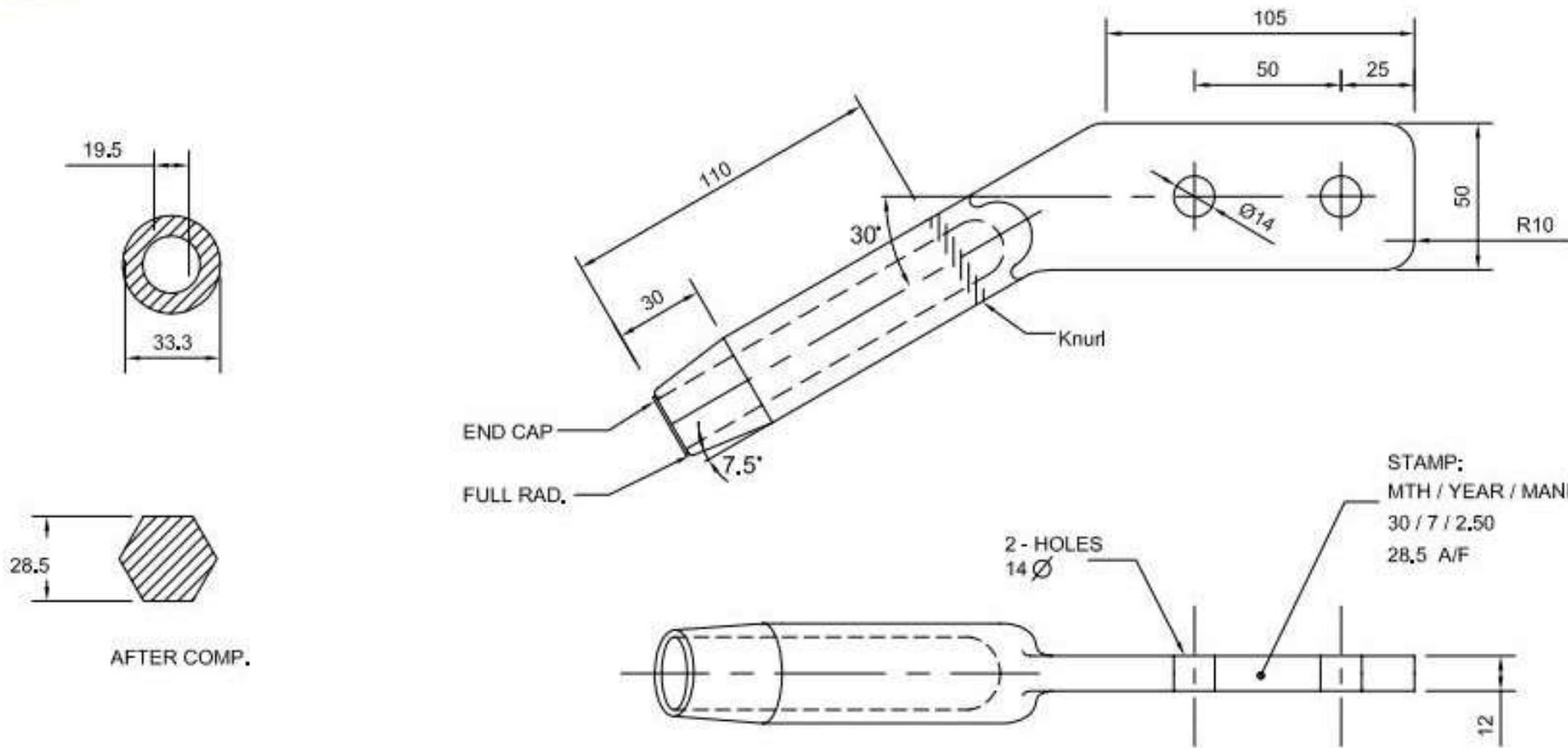


NOTES

1. All dimensions in millimetres.
2. Tolerances unless otherwise stated :
 - a. Hole diameter $\pm 0.5\text{mm}$
 - b. Linear dims. up to 30mm $\pm 1.5\text{mm}$
 - b. Linear dims. over 30mm $\pm 5\%$ up to a max of 5mm.
3. Bracketed dims.do not affect interchangeability or coupling & are for guidance only.
4. All design parameters in accordance with AS1154

						FIJI ELECTRICITY AUTHORITY	
						COMPRESSION JUMPER TERMINAL 'LIME'	
						DRAWING NUMBER	
						A3	
						SCALE 1:2	
0	REVISION	DATE	BY	CHK	PSD	APP	ENGINEER READ BY DATE

A3



NOTES

1. All dimensions in millimetres.
2. Tolerances unless otherwise stated :
 - a. Hole diameter $\pm 0.5\text{mm}$
 - b. Linear dims. up to 30mm $\pm 1.5\text{mm}$
 - b. Linear dims. over 30mm $\pm 5\%$ up to a max of 5mm.
3. Bracketed dims. do not affect interchangeability or coupling & are for guidance only.
4. All design parameters in accordance with AS1154

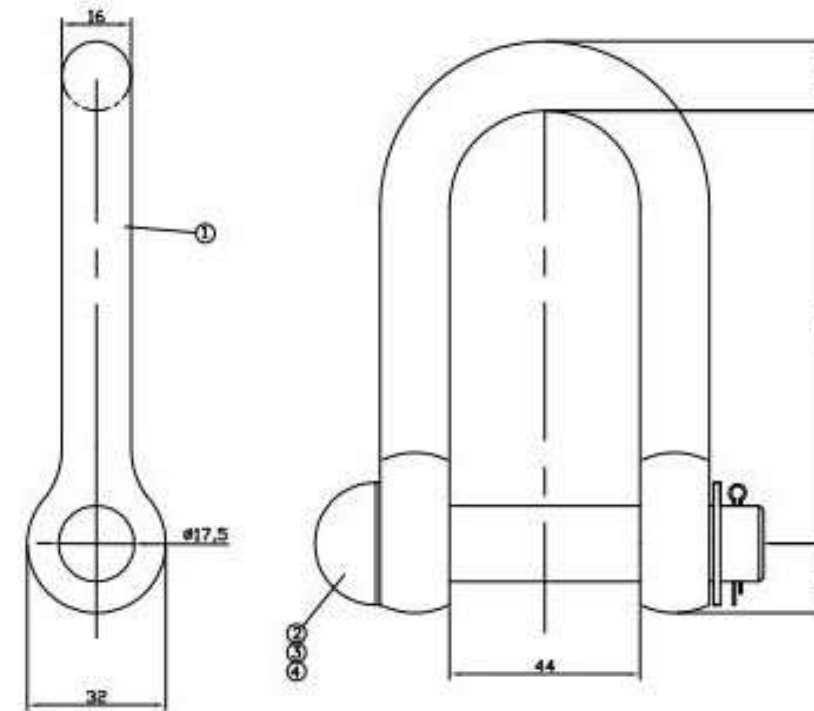
				Drawn	RAULUIORO 4.12.08	FIJI ELECTRICITY AUTHORITY		DRAWING NUMBER		
				Checked						COMPRESSION JUMPER TERMINAL "GRAPE"
				Designed		SCALE 1:2				
				Engineer						
0		4.12.08	RR							
No.	REVISION	DATE	BY	CHK	PSD	APP				

A3

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS
2. TOLERANCES UNLESS OTHERWISE STATES
 - a. HOLE DIAMETER $\pm 0.5\text{mm}$
 - b. LINEAR DIMS. UP 30mm $\pm 1.5\text{mm}$
 - c. LINEAR DIMS. OVER 30mm $\pm 5\%$ UP TO A MAX. OF 5mm
3. BRACKETED DIMENSIONS DO NOT AFFECT INTERCHANGEABILITY OR COUPLING AND ARE FOR GUIDANCE ONLY.

4. MATERIAL TO AS1154.
GALVANIZING TO AS/NZS 4680 & IEC
5. IDENTIFICATION MARKINGS—
MNTH / YR MANF & RATING



ITEM	REF. NO.	QTY	DESCRIPTION	MATERIAL
4		1	SPLIT PIN	STAINLESS ST
3		1	WASHER	ST. GALV.
2		1	RIVET	M.S. GALV
1		1	BOW SHACKLE	FORGED ST GALV

No.	REVISION	DATE	BY	CHK	PSD	APP	ENGINEER	R.N	23.12.10
							CHIEF DRAUGHTSMAN	R.N	23.12.10
0	ORIGINAL ISSUE FOR SI No.	23.12.10	H.C				ENGINEER	R.N	23.12.10
							HEAD OF DEPARTMENT	R.N	23.12.10

FIJI ELECTRICITY AUTHORITY

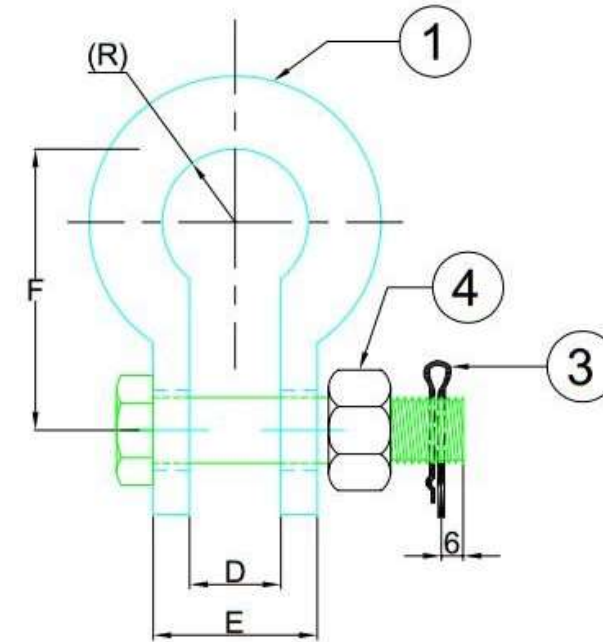
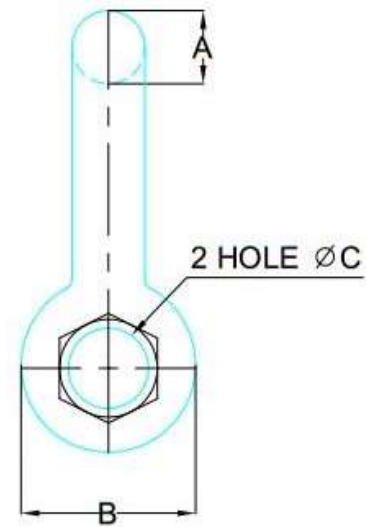
16 m.m. STIRRUP
D SHACKLE

DRAWING NUMBER

A3

SCALE 1:1

A3



ITEM	DESCRIPTION	REQ.D	MATERIAL
1	SHACKLE BODY	1	FORGED STEEL
2	HEX BOLT	1	GLAV. STEEL
3	SPLIT PIN	1	STAINLESS STEEL
4	HEX NUT (CL 8)	1	GLAV. STEEL

PART NO.	RATINGS	A	(B)	C	D	(E)	F	R	BOLT SIZE	MIN GRADE
S-120-1	120 kN	∅16	35	∅18	22 ^{±1}	38	67	17	M16 × 70	8.8
S-160-1	160 kN	∅20	48	∅22	33 ^{±1}	70	100	25	M20 × 85	5.8

NOTES

- All dimensions in millimetres.
- Tolerances unless otherwise stated :
 - Hole diameter $\pm 0.5\text{mm}$
 - Linear dims. up to 30mm $\pm 1.5\text{mm}$
 - Linear dims. over 30mm $\pm 5\%$ up to a max of 5mm.

- Bracketed dims.do not affect interchangeability or coupling & are for guidance only.
- All design parameters in accordance with AS1154 Galvanizing to AS/NZS 4680
- Identification markings: MTH / YR.MANF. & rating.

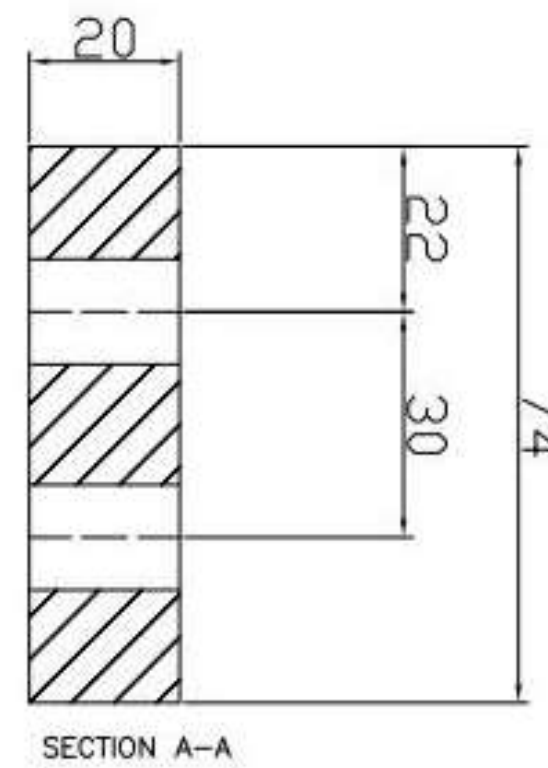
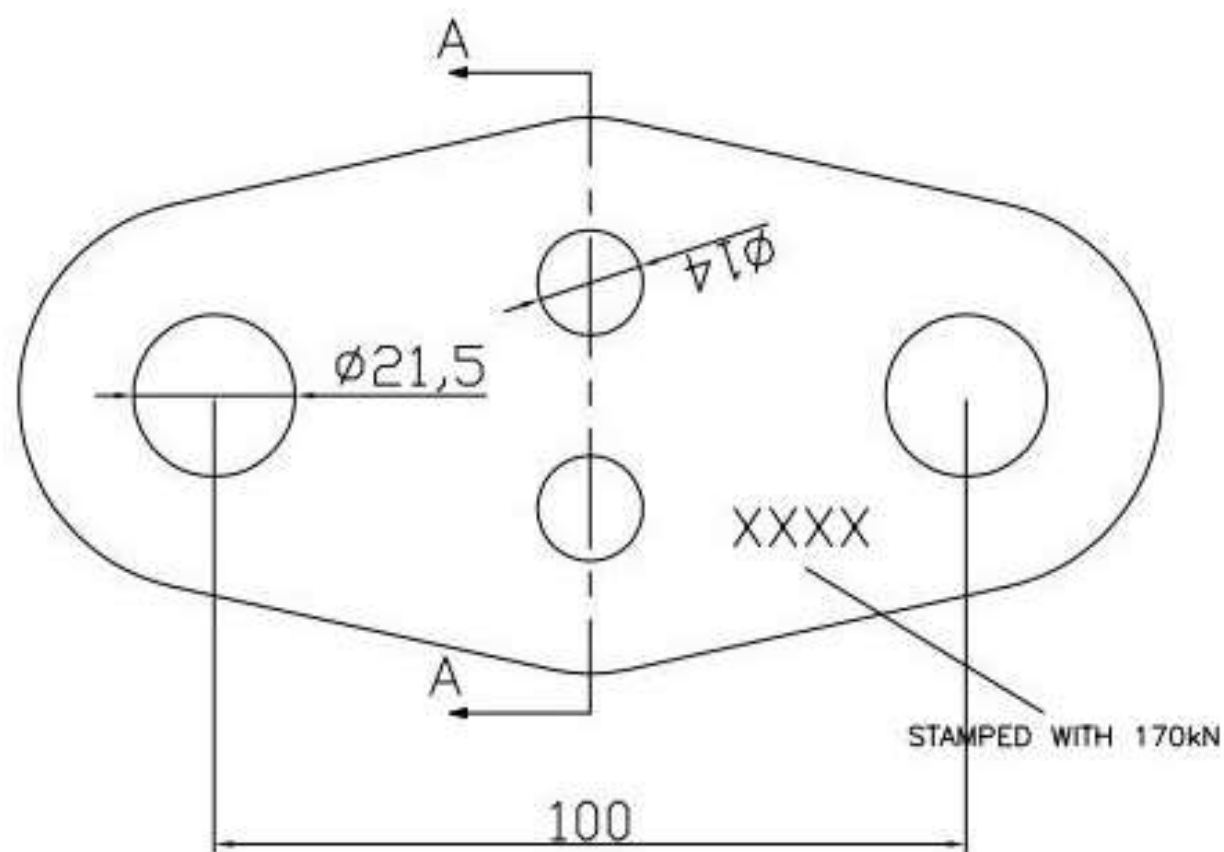
						DRAWN		RAULUIORO 01.12.08		FIJI ELECTRICITY AUTHORITY			
						CHECKED				132KV BOW SHACKLE ASSEMBLY			
						DESIGNATOR				DRAWING NUMBER			
						ENGINEER				A3			
						HEAD OF DEPARTMENT				SCALE 1:2			
0													
No.	REVISION	DATE	BY	CHK	PSD	APP							

1	PLATE LINK FOR A/H	GALV STEEL
QTY	DESCRIPTION	MATERIAL

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS
2. TOLERANCES UNLESS OTHERWISE STATES
 - a. HOLE DIAMETER $\pm 0.5\text{mm}$
 - b. LINEAR DIMS. UP 30mm $\pm 1.5\text{mm}$
 - c. LINEAR DIMS. OVER 30mm $\pm 5\%$ UP TO A MAX. OF 5mm
3. BRACKETED DIMENSIONS DO NOT AFFECT INTERCHANGEABILITY OR COUPLING AND ARE FOR GUIDANCE ONLY.

4. MATERIAL 250 GRADE STEEL GALVANIZING TO AS1650
5. IDENTIFICATION MARKINGS--
Mnth / Yr MANF & RATING

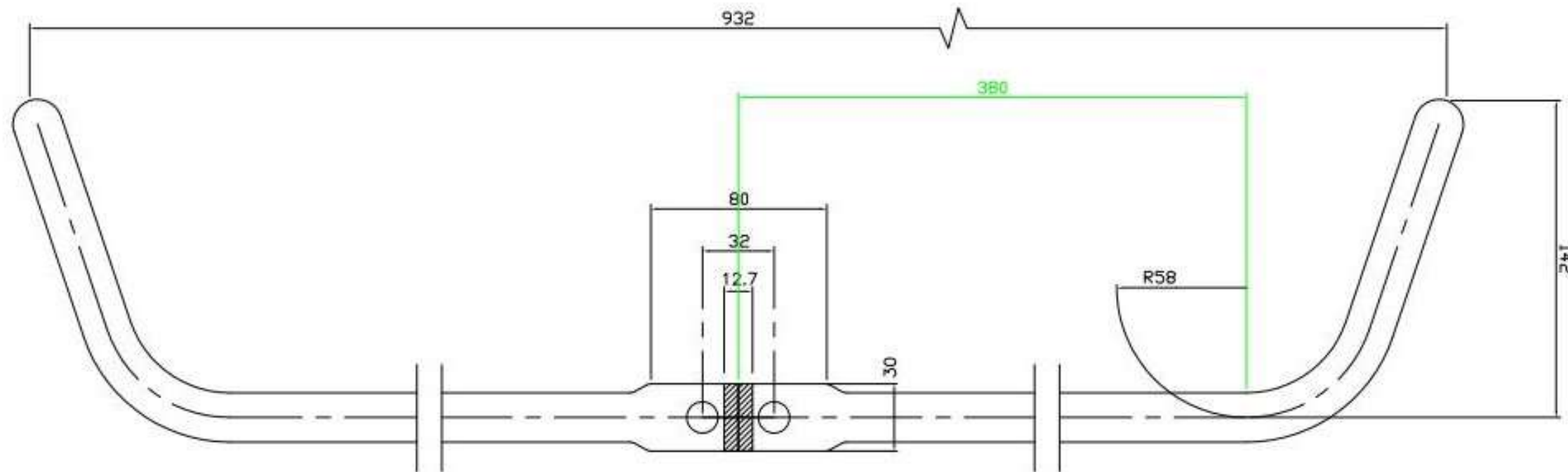


A3

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS
2. TOLERANCES UNLESS OTHERWISE STATES
 - a. HOLE DIAMETER $\pm 0.5\text{mm}$
 - b. LINEAR DIMS. UP 30mm $\pm 1.5\text{mm}$
 - c. LINEAR DIMS. OUER 30mm $\pm 5\%$ UP TO A MAX. OF 5mm
3. BRACKETED DIMENSIONS DO NOT AFFECT INTERCHANGEABILITY OR COUPLING AND ARE FOR GUIDANCE ONLY.
4. MATERIAL, 250 GRADE STEEL GALVANIZING TO AS1650
5. IDENTIFICATION MARKINGS- MNTH / YR MANF & RATING

QTY	DESCRIPTION	MATERIAL
1	LIVE/EARTH END HORN	GALV STEEL



Arcing Horn – Type 3

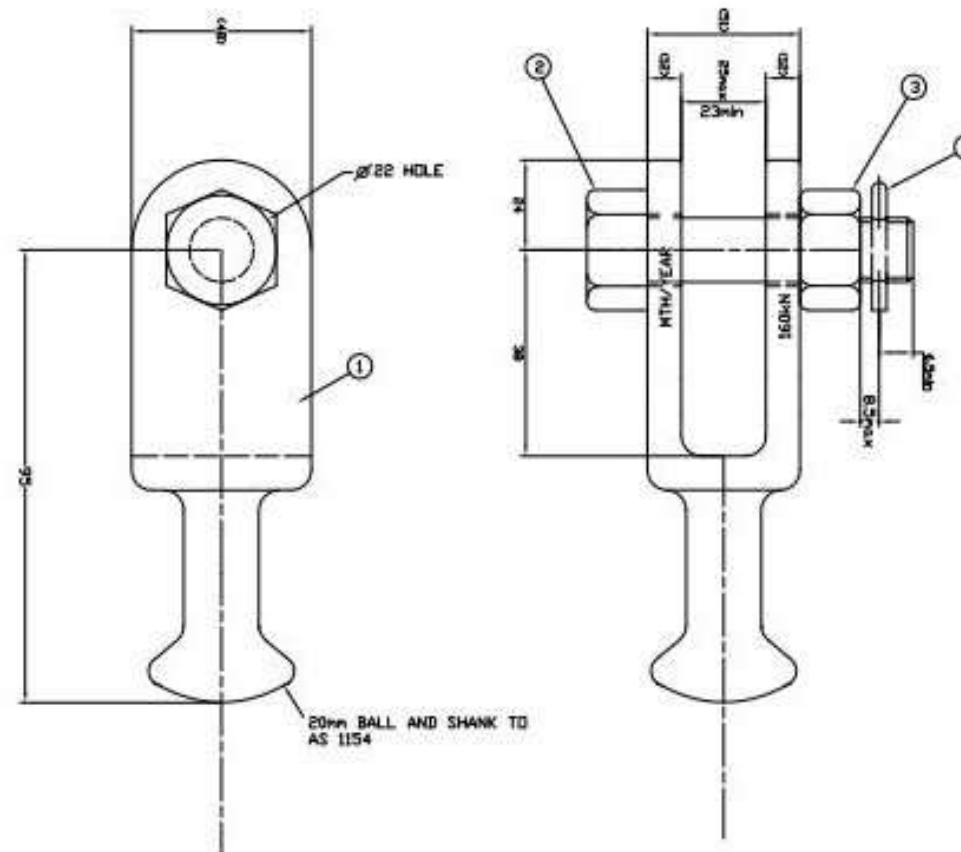
							DRAWN	H. C	26.01.11	FIJI ELECTRICITY AUTHORITY			
							CHECKED						
							CHIEF DRAUGHTSMAN			A3			
							ENGINEER			SCALE N.T.S			
							HEAD OF DEPARTMENT						
0	ORIGINAL ISSUE FOR SI No.		26.01.11	H.C			DOUBLE POINT LIVE END ARCING HORN						
No.	REVISION		DATE	BY	CHK	PSD				APP			

A3

NOTES

- 1. ALL DIMENSIONS ARE IN MILLIMETRES.
- 2. TOLERANCES UNLESS OTHERWISE STATED-
 - a) HOLE DIAMETRE $\pm 0.5mm$
 - b) LINEAR DIMS. UP TO 30mm $\pm 0.5mm$
 - c) LINEAR DIMS. OVER 30mm $\pm 0.5%$ UP TO A MAX OF 5mm
- 3. BRACKETED DIMENSIONS DO NOT AFFECT INTERCHANGEABILITY OR COUPLING AND ARE FOR GUIDANCE ONLY
- 4. MATERIAL TO AS1154
- 5. GALVANISING TO AS/NZS 4680

SP-HPA	4	HUMPBACK SPLIT PIN	1	S/STEEL
GHN-20-B	3	M20 NUT GRADE 8 GAL	1	STEEL
GCB-20085	2	M20 X 85 BOLT GRADE 5.8 GAL	1	STEEL
BC-160-IF	1	BALL CLEVIS BODY	1	S/STEEL
CAT No	ITEM	DESCRIPTION	REQ.D	S/STEEL



0		08.07.09				DESIGN	HONSON C08.07.09
						CHECKED	
						APPROVED	
						ENGINEER	
						HEAD OF	
						DEPARTMENT	

FIJI ELECTRICITY AUTHORITY

SOCKET CLEVIS FOR ARCING HORN SCTAH-120

DRAWING NUMBER

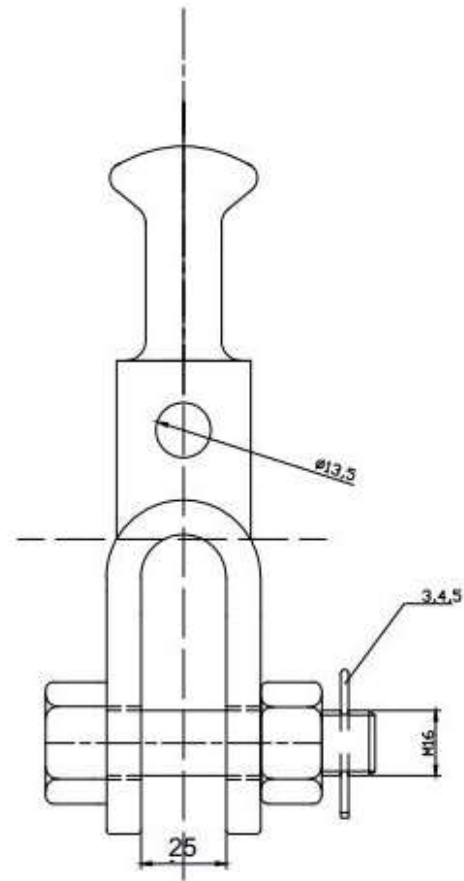
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SCALE N.T.S

No. REVISION

DATE BY CHK PSD APP

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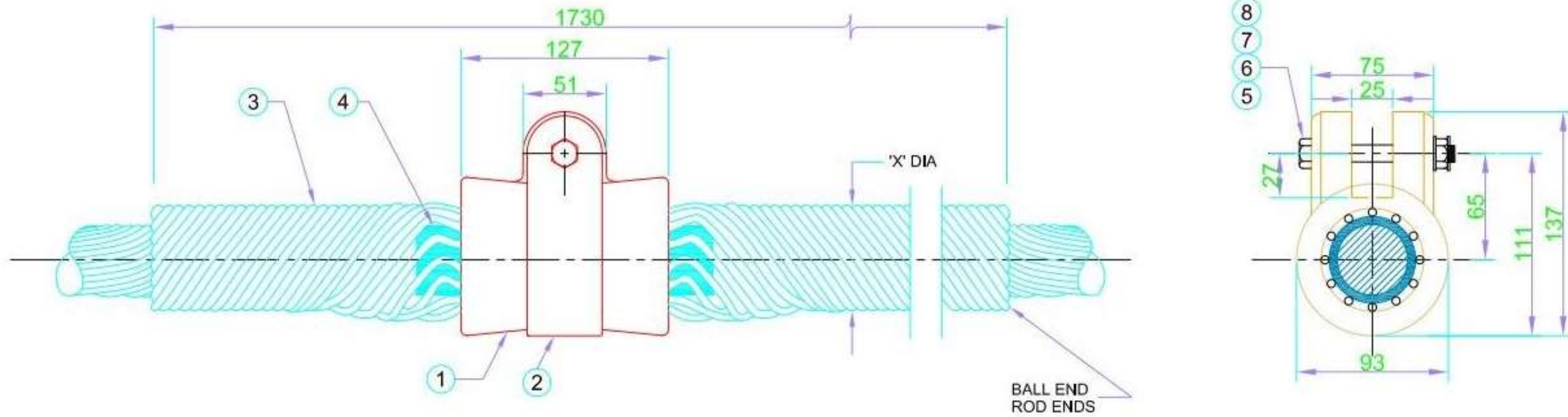


ITEM	DESCRIPTION	QTY	MATERIAL
5	SPLIT PIN	1	STAINLESS STEEL
4	NUT M16, GRADE 6	1	GALVANISED STEEL
3	BOLT M16, GRADE 6.8	1	GALVANISED STEEL
2	SECURITY SPLIT PIN 18R	1	STAINLESS STEEL
1	BALL CLEVIS BODY	1	CAST STEEL GALV.

GENERAL TOLERANCES		
≤ 30	± 1.5mm	ANGLE ± 5°
> 30	± 5%	
MAX	± 5mm	

NOTE
 1. MINIMUM FAILING LOAD 120kN
 2. GALVANISED TO BS729
 3. ALL DIMENSIONS ARE IN MILLIMETERS

						FIJI ELECTRICITY AUTHORITY	
						TWISTED BALL CLEVIS FOR ARCING HORN	
						DRAWING NUMBER	
						A3	
						SCALE N.T.S	
0	REVISION	DATE	BY	CHK	PSD	APP	DRAWN CHECKED FOR FORMATION ENGINEER HEAD OF DEPARTMENT



ITEM	DESCRIPTION	REQ.D	MATERIAL
1	AGS HOUSING	2	ALUM. ALLOY
2	AGS STRAP	1	ALUM. ALLOY
3	AGS RODS ϕ 6.35	13/SET	ALUM. ALLOY
4	AGS INSERT	2	NEOPRENE
5	M16 BOLT	1	GAL. STEEL
6	M16 NUT	1	GAL. STEEL
7	M16 SPRING WASHER - GAL	1	GAL. STEEL
8	SPLIT PIN - HUMPBACK	1	STAIN. STEEL

CONDUCTOR DETAIL			
'X'	STRANDING	AGS COLOUR CODE	NAME
37.2	30 / 7 / 3.50 ACSR/GZ	PURPLE	LIME
	30 / 7 / 2.50 ACSR/GZ	PURPLE	GRAPE

NOTES

- All dimensions in millimetres.
- Tolerances unless otherwise stated :
 - Hole diameter ± 0.5 mm
 - Linear dims. up to 30mm ± 1.5 mm
 - Linear dims. over 30mm $\pm 5\%$ up to a max of 5mm.
- Bracketed dims.do not affect interchangeability or coupling & are for guidance only.
- All design parameters in accordance with AS1154
- Galvanizing to AS/NZS 4680
- Nominated holding tension - 13kN
- Minimum vertical failing load - 65kN

NOTES

1. ALL PARTS SHALL BE MANUFACTURED, TESTED AND SUPPLIED TO COMPLY WITH TRANSPOWER PURCHASE SPECIFICATION TP.PL 02.02.
2. ALL DIMENSIONS ARE IN MILLIMETRES, AND SHALL BE CORRECT AFTER GALVANIZING.
3. UNLESS OTHERWISE STATED, TOLERANCES ON DIMENSIONS SHALL BE:
 - i) $\pm 1.5\text{mm}$ FOR DIMENSIONS UP TO AND INCLUDING 30mm.
 - ii) $\pm 5\%$ UP TO A MAXIMUM OF $\pm 5\text{mm}$ FOR DIMENSIONS GREATER THAN 30mm.
 - iii) $\pm 0.5\text{mm}$ FOR HOLE DIAMETERS.
4. MINIMUM FAILING LOAD (MFL) AS SHOWN IN TABLE 1. DESIGNERS TO APPLY A CAPACITY REDUCTION FACTOR AS PER TP.DL 12.01 FOR CAST FITTINGS TO DETERMINE THE MAXIMUM LOAD CAPACITY.
5. EACH SUSPENSION CLAMP SHALL BE PERMANENTLY MARKED WITH:
 - i) A SYMBOL TO IDENTIFY THE MANUFACTURER.
 - ii) TRANSPOWER'S ITEM CODE AS SHOWN IN TABLE 1.
 - iii) THE MFL AS SHOWN IN TABLE 1.
 - iv) THE MONTH AND YEAR OF MANUFACTURE (EG 4/97).
6. MATERIALS FOR THIS FITTING SHALL BE AS SHOWN IN THE MATERIAL LIST.
7. HOT-DIP GALVANIZE AFTER FABRICATION ALL STEEL PARTS EXCEPT THE SPLIT PIN IN ACCORDANCE WITH THE PURCHASE SPECIFICATION
8. EACH SUSPENSION CLAMP SHALL BE SUPPLIED COMPLETE AND ASSEMBLED WITH ALL PARTS SHOWN IN THE MATERIAL LIST.
9. PRIOR TO ASSEMBLY, THE BOLT THREADS SHALL BE LIGHTLY GREASED WITH A SUITABLE LUBRICANT TO PREVENT CORROSION OF THE THREADS OCCURRING.
10. THE THREAD LENGTH ON ITEM 6 SHALL BE SUCH THAT WHEN THE NUT IS FULLY WOUND ON TO THE END OF THE BOLT THREAD, THE BOLT DOES NOT BIND ON THE SUSPENSION CLAMP. (BOLT FREE TO ROTATE).
11. ITEM 3 SHANK LENGTH SHALL BE SUCH THAT A 6mm THICK PLATE CAN BE FITTED BETWEEN ITEM 1 AND 4 AND STILL ALLOW THE FITTING OF ITEMS 4, 5 AND 8 WHEN THE LARGEST SIZE OF CONDUCTOR IS FITTED IN THE CLAMP.
12. EACH SUSPENSION CLAMP SHALL BE DESIGNED TO CLAMP ALL CONDUCTORS WITHIN THE CONDUCTOR DIAMETER RANGE SHOWN IN TABLE 1.
13. MAXIMUM TURNING ANGLE = 30° (REFER DIAGRAM).
14. ITEM 8 END RADIUS SHALL BE SMOOTH AND CONTINUOUS WITH NO RAISED SURFACES OR MACHINING MARKS.

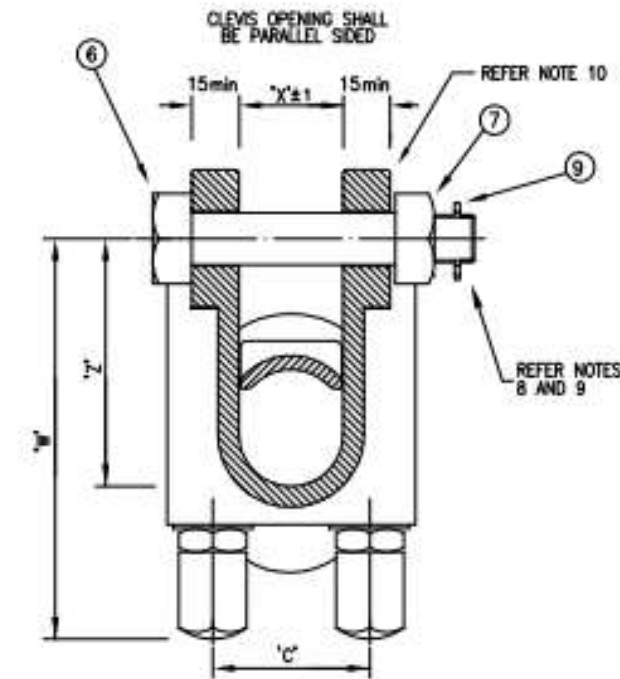
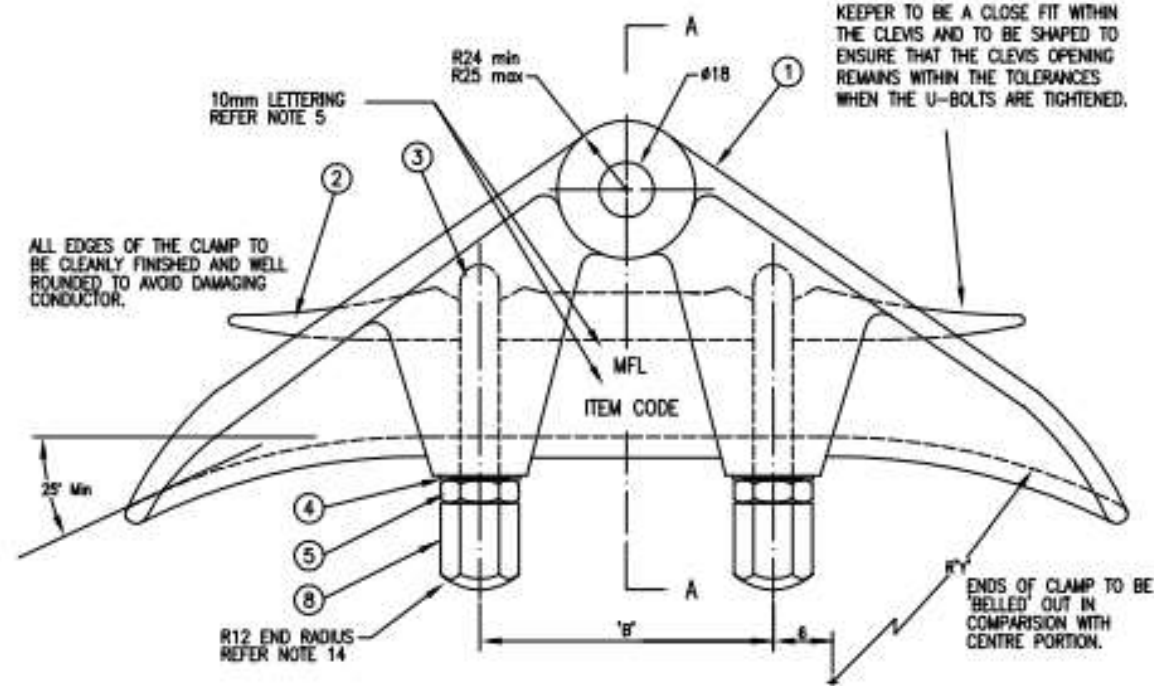


TABLE 1: CONDUCTOR, ITEM CODE AND DIMENSION DATA

CLAMP No.	MFL (kN)	CONDUCTOR DIAMETER RANGE	NOMINAL DIMENSIONS					
			'b'	'c'	'w'	'x'	'y'	'z'
1	70	11-20	78	41	125	25	125	62
2	70	20-30	90	48	140	33	125	76
3	70	30-45	80	64	175	47	150	100

TABLE 2: MATERIAL LIST

ITEM No.	No. OFF	DESCRIPTION
1	1	AL. ALLOY CLAMP BODY
2	1	AL. ALLOY KEEPER
3	2	M12 GALV. STEEL U-BOLTS (REFER NOTE 11)
4	4	M12 GALV. STEEL SPRING WASHERS
5	4	M12 GALV. STEEL HEX NUTS
6	1	M16 GALV. STEEL ISO METRIC PROPERTY CLASS 8.8 HEXAGON BOLT, CROSS DRILLED TO ACCEPT A HUMPBACK SPLIT PIN. LENGTH OF BOLT AND THREAD AS PER AS 1154.1.
7	1	M16 GALV. STEEL ISO METRIC HEX FULL NUT
8	4	M12 AL. ALLOY DOME NUTS (REFER NOTE 14)
9	1	HUMPBACK SPLIT PIN TO AS 1154.1, TYPE A

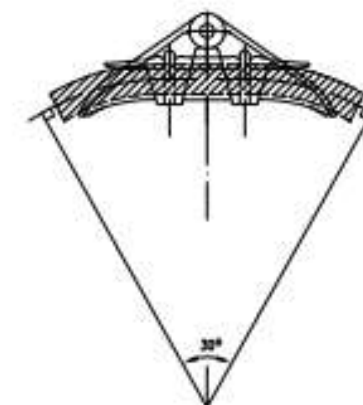


DIAGRAM SHOWING DETERMINATION OF MAXIMUM TURNING ANGLE

