



ENERGY FIJI LIMITED

**TECHNICAL SPECIFICATION FOR DESIGN,
PRODUCTION, TESTING AND SUPPLY OF
HARDWOOD CROSS-ARMS FOR
DISTRIBUTION POWER LINE SUPPORT**

MR 189/2019

Revision History & Document Control

Rev no.	Notes	Prepared By	Reviewed By	Date of Issue
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2	Reviewed		Rajiv Singh	29/04/19

Next Scheduled Revision

Date of Next Revision	Notes	Revision By	Revision Approved By
March 2022			

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1.0 Introduction

Energy Fiji Limited [EFL] is responsible for generation, transmission and distribution of electricity in Viti Levu, Vanua Levu, Ovalau and Taveuni in Fiji. By the end of 2017, EFL had 182,439 customers. This includes residential, commercial and institutional customers.

EFL is requesting proposal for the Preferred Supplier to supply item listed below for EFL's consumption to carryout repair, Construction and maintenance of Power line Network in Fiji.

The preferred Supplier arrangement will be for a period of 3 (three) years from the date of signing of the contract. The award of this Tender may be split and awarded to more than one successful bidder.

This specification stipulates a guide to the Suppliers on the requirements for the production, works testing and delivery to Energy Fiji Limited the Hardwood Cross-arms for use on its distribution overhead line support.

The items covered under this specification are tabulated below.

No.	Stock Code	Item Description
1	I05418	1.2m Hardwood Cross-arm
2	New Item	1.5m Hardwood Cross-arm
3	I05420	2m Hardwood Cross-arm

This Specification covers the general requirements of design, manufacture, testing, supply and delivery of 1.2m, 1.5m and 2m hardwood cross-arms for overhead distribution systems.

2.0 References

2.1 Applicable Standards

The item shall be designed, manufactured and tested in accordance with the latest edition of the Standards specified below and all amendments issued prior to the date of closing of tenders except where varied by this specification.

AS 3818.1:2009	Timber - Heavy structure products - Visually graded Part 1: General Requirements
AS 3818.4:2010	Timber - Heavy structure products - Visually graded Part 4: Cross-arms for overhead lines
AS/NZS 2878: 2000	Timber - Classification into strength groups
AS 5604:2005	Timber - Natural Durability Ratings
AS 1720.1	Timber structures - Design methods
AS 1720.2	Timber structures Timber properties
BS 373:1957	Methods of testing small clear specimens of timber
AS 3818.11	Timber - Heavy structural products - Visually graded; Part 11 Utility Poles
AS/NZS ISO 9001:2016	Quality management systems - Requirements

Should inconsistencies be identified between standards and/or this specification, the tenderer shall immediately refer such inconsistencies to EFL for resolution.

3.0 System Conditions

3.1 Environmental Conditions

The hardwood cross-arms shall be suitable for installation outdoors and shall be designed to withstand the following service conditions.

Description		Conditions
Atmosphere Pollution Level	:	Very heavy (IEC 815), corrosive and dusty
Ambient Temperature	:	Peak: 40°C 24 Hour Average: 30°C Annual Average: 22°C Minimum: 10°C
Relative Humidity (Average)	:	85%
Rainfall	:	Annual Average: 2663mm
Isokeraunic (Thunder day) level	:	60 thunder days per year
Seismic	:	To a maximum of 7 on the open-ended Richter Scale

Note: Fiji is situated in a region where cyclones are experienced frequently. All plant and equipment shall be designed and constructed to withstand these extreme conditions.

3.2 Service Conditions

Nominal Voltage	240V/ 415V	11kV
System Highest Voltage	660V	12kV
System Frequency	50Hz	50Hz
Number of Phases	1 or 3	3
System Earthing	Effectively Earthed	Effectively Earthed
Impulse Withstand Voltage (peak)	-	95kV
Short Duration Power Frequency Withstand Voltage (rms)	15kV	28kV

4.0 Design and Construction

4.1 Quality of Cross-arms

Quality cross-arms shall be manufactured from the approved species and grade of timber available locally or overseas. The timber selected for such purpose shall be of straight grained sound true wood, well sawn and free from brittle wood, decay, cross-grain knots, stakes, splits, holes, gum pockets, compression failures and other defects liable to affect the utilization of the cross-arm.

4.2 Dimensional Details

The cross-arms, before inspection, shall be sawn with adjacent faces at right angles and the ends cut square and to the required lengths. The dimensions shall conform to the specified values in **Table 1**; with strict compliance with the tolerances band stipulated below:

Dimensional Parameter	Tolerance
Width of Cross-arm	-0.0mm to +5 mm
Thickness of Cross-arm	-0.0mm to +5 mm
Length of Cross-arm	-0.0mm to +5 mm
Cross-arm Hole Diameter	-0.0mm to +3 mm

Table 1: Dimensional Requirements of Cross-arms

Description of Item	Length (mm)	Width (mm)	Height (mm)	Reference Drawing for Drilling Holes
High voltage and medium voltage distribution power line support	2000	100	75	01 E43 025
Service Mains Support (Consumer Cross-arm)	1200	100	75	01 E43 029
Service Mains Support (Consumer Cross-arm)	1500	100	75	A3 01 E43 045

NOTE: All dimensional details of the physical size of the cross-arm sample and the drilling details shall be verified by the Standards Engineer of EFL prior to commencing the production of any batch of the delivery requirement.

4.3 Specific Requirements

All relevant information shall be given in Appendix 15.2. Any additional information may also be provided.

4.3.1 Species and Grade

The species suitable for cross-arms shall be selected from AS 3818.1 and AS 3818.4 Section 1 Clause 1.6. The timber shall be visually stress graded in accordance with AS 3818.4. The minimum stress grade for timber supplied to this specification shall be as per **AS 3818.4 Appendix B Table B1**.

4.3.2 Size of Cross-arms

1. 2000 x 100 x 75
2. 1200 x 100 x 75
3. 1500 x 100 x 75

4.3.3 Treatment of Cross-arms

All Cross-arms shall be full length preservative treated in accordance with Section 5 of AS 3818.11 and in compliance to the Fiji Forestry Test Body. Cross-arms shall be air dried prior to treatment until such time as the moisture content of Sapwood is not greater than 25% when determined in accordance with Appendix C of AS 3818.11.

4.3.4 Allowance for Partial Seasoning

The provision of Clauses 4.1 and 4.2, therein, relate to green timber and if inspection is carried out, an appreciable time after sawing, reasonable allowance shall be made for the timber shrinkage.

Surface checks shall not exceed the tolerances as stipulated in clause 4.2. Bow and twist in the finished timber cross-arm shall not be permitted.

4.3.5 Defects in Wood

All timbers used for the purpose of cross-arms manufacture shall be free of any defect.

4.3.6 Durability

The approved local and overseas timbers selected for cross-arms shall have a life expectancy exceeding 20 years in a weather condition of high humidity and heat as stipulated in Clause 3.1.

4.4 Basic Working Stresses of Timber

Compression Stress Perpendicular to Grain and Shear at Joint Details

The basic working stresses for timber subject to compression perpendicular to the grain and to shear at joints are given in Table 2 for each strength group and are applicable to all stress-grade within the strength group.

Table 2: Basic Working Stresses (MPa) for Compression Perpendicular to Grain and Shear at Joint

Strength Group		Compression Perpendicular to Grain (MPa)	Shear at Joints (MPa)
Green	Seasoned		
	SD1	10.4	4.15
	SD2	9.0	3.45
	SD3	7.8	2.95
S1	SD4	6.6	2.45
S2	SD5	5.2	2.05
S3	SD6	4.1	1.70

Cross-arms shall be produced from timbers in strength groups S1, S2 and S3 in the Green condition in accordance with details in Table 2.

The cross-arms shall be sized in accordance with the latest edition of AS1720.2 - Timber structures Timber properties.

4.5 Specific Requirements for Cross-arms

4.5.1 Drilling of Holes in Cross-arms

All specific cross-arms are to be drilled with zero negative tolerance with the limited allowance in the upper limit and as per dimensional details in Appendices.

4.5.2 Treatment of Wood

4.5.2.1 *Drying*

Cross-arms are to be spread in open air for a period of 10 - 12 weeks until touch dry.

4.5.2.2 *Retention of Chemical*

Cross-arms can be pressure treated with pigment emulsified creosote (PEC) to the following levels:

- Charge retention minimum 40 kg/m³ of the total volume [min 80 kg/m³ of creosote in treatment zone]

Note: CCA Oxide Treatment is not permitted.

4.5.3 Finished Cross-arms

4.5.3.1 *End Ganged Nailed (Compulsory)*

The cross-arms shall be facilitated with End gang nailed with a galvanized steel plate of minimum thickness 1.2mm at both ends to avoid splitting of the timber from the ends.

5.0 Quality Assurance

The manufacture shall submit evidence that the design and manufacture of hardwood cross-arms are in accordance with AS/NZS ISO 9001 and shall include the Capability Statement associated with the Quality System Certification.

Where the bidder is an agent of the manufacturer, it shall provide a letter of authorization from the manufacturer to verify that it has the nominated agency.

6.0 Performance and Testing

6.1 Type Tests

The cross-arms shall be tested as per *AS/NZS 2878-2000 Appendix B Mechanical Tests Clause B1 and B2 and section 2 Clause 2.2*.

The type test report shall be included for every approved species of timber recommended for the cross-arm production.

6.2 Routine Tests

The routine strength tests shall be made on representative samples of one cross-arm out of a batch of fifty (50), to be delivered as per the requirements stipulated in Table 2 of this specification. Strength test shall be carried out in accordance to a relevant AS/NZS or ASTM standards.

6.3 Witnessing of Tests

The EFL reserves the right to witness all testing. The Supplier shall give EFL reasonable notice of when testing will be carried out and two (2) EFL engineers to be invited to witness the testing. The return-air travel, accommodation, meals and other expense related to test witnessing shall be borne by the Bidder as a value adding service.

6.4 Compliance

The Supplier shall state in writing that their offer complies with the relevant Standards and this specification. If the Supplier is offering equipment manufactured to an equivalent standard, full details of that standard must be given including a copy written in English.

7.0 Additional Requirements

7.1 Packaging

The supplied items shall be appropriately packaged to avoid damage during transportations and storage and fit for use. The vendor shall be responsible for nominating standard pack quantities and standard packs shall be clearly marked with the following:

1. Manufacturer's name
2. Purchase Order Number, Contract Number and EFL Stock Number
3. Compliance standards
4. Item description
5. Package weight

The marking shall not fade out during the stored period of 24 months in EFL stores.

7.2 Storage

The equipment shall be capable of being stored without deterioration within the temperature range of 10°C to 40°C for no less than 24 months.

8.0 Technical Information to be supplied

The following information shall be supplied with the offer:

- a) List showing similar equipment supplied to or on order for other utilities for at least the past 5 years
- b) Completed schedule as provided in Appendix
- c) Electronic drawings of item to be supplied in AutoCAD format including hole details
- d) End of service life disposal method
- e) Origin of materials used in manufacture of hardwood cross-arms
- f) Quality assurance certificate as per clause 5.0
- g) Type and routine test certificates as per clauses 6.1 and 6.2

Offers of vendors who fail to furnish above particulars shall be rejected.

9.0 Stock Availability

The bidder is required to show the size of his/her stock holding and the ability to meet the required estimate quantity per annum. The movement of the hardwood cross-arms will depend on EFL's project works and for operation and maintenance purposes. An estimate movement of the item are outlined in the table below but it will not be purchase as a lump sum quantity at once. Hence, the successful bidder

will be required to carry a consignment / safety stock at times to meet EFL's demand within the three year contract period.

No.	Stock Code	Item Description	Approximate 3 Year Stock Movement
1	I05418	1.2m Hardwood Cross-arm	7057
2	New Item	1.5m Hardwood Cross-arm	1000
3	I05420	2m Hardwood Cross-arm	49,563

10.0 Product Warranty Period

The bidder is required to provide the warranty period as part of the proposal. A minimum warranty period of twenty-four (24) months from time of dispatch from factory shall be provided.

11.0 Environmental Considerations

Suppliers are required to comment on the environmental soundness of the design and the materials used in the manufacture of the items tendered. In particular, comments should address such issues as recycling and disposal at the end of service life.

12.0 Reliability

Suppliers are required to comment on the reliability of the equipment and the performance of the materials tendered for a service life of 20 years under the specified system and environmental conditions.

13.0 Samples

13.1 Production Samples

Samples of items may be required during the tender assessment period. Samples would normally be required from tenderers who have previously not supplied the items to EFL.

13.2 Sample Delivery

When samples are required, production samples shall be delivered freight free (Delivery Duty Paid (DDP)), suitably packaged and labelled including reference to the Tender Number.

Samples shall be supplied within 7 days of official request.

14.0 Training

No trainings are required as part of this tender.

15.0 Appendix

15.1 Price Schedule

All tenderers are required to complete and submit a copy of the price schedule form with their bid submissions. EFL requests if the prices offered are in CIF.

No.	Stock Code	Item Description	Price (CIF)
1	I05418	1.2m Hardwood Cross-arm	
2	New Item	1.5m Hardwood Cross-arm	
3	I05420	2m Hardwood Cross-arm	

15.2 Technical Data - Hardwood Cross-arms

All tenderers are required to complete and submit a copy of this form with their bid submissions.

Description	Units	Bidders Response		
		1.2m Cross-arm	1.5m Cross-arm	2m Cross-arm
Name of Supplier				
Address of Supplier				
Name of Manufacturer				
Address of Manufacturer				
Name of Mill				
Address of Mill				
Name of Chemical Treatment Plant				
Address of Chemical Treatment Plant				
Hardwood Country of Origin				
Name of Timber				
Stress Grade				
Durability class				
Strength group				
Cross-arm Dimensions (mm)	mm			

Working Load	kN			
Ultimate Breaking Load	kN			
Factor of Safety				
Preservative Used				
Penetration	kg/m ³			
Period of service of Hardwood Cross-arms as per system conditions in Clause 3.0	Years			
Applicable Standards of treatment for hardwood cross-arms used				
Testing Standards used				
List of tests conducted on the hardwood cross-arms				
Type Test reports provided?	Yes/No			

Name of Tenderer: _____

Signature of Tenderer: _____

Date: _____

15.3 Submission Requirements

All tenderers are required to complete and submit a copy of the submission requirements with their bid submissions. **Note that details below are mandatory requirements.**

Requirements	Response from Bidders
Validity of bid (180 days required) (Yes/No)	
Detailed reference list of customers already using equipment offered during the last 5 years with particular emphasis on units of similar design and rating.	
List of type test and routine test certificates provided. (As per Clause 6.1 & 6.2)	
Minimum warranty period from time of acceptance of item required is 24 months.	
Completed price and technical schedules (Clause 15.1 and 15.2) (Yes/No)	
Complete dimensional drawing including hole details as per EFL drawings provided.	
The bidding pricing to be in CIF incoterm.	
Lead time of delivery after tender award.	
Price review period after award of tender. (months)	
Bidders company profile outlining financial, technical and production capabilities.	
Disposal method after service life.	
Witnessing included as part of bid. (Yes/No)	
Quality management system used in the production of hardwood cross-arms, attached certificate.	

Complete the following schedule as part of the bid:

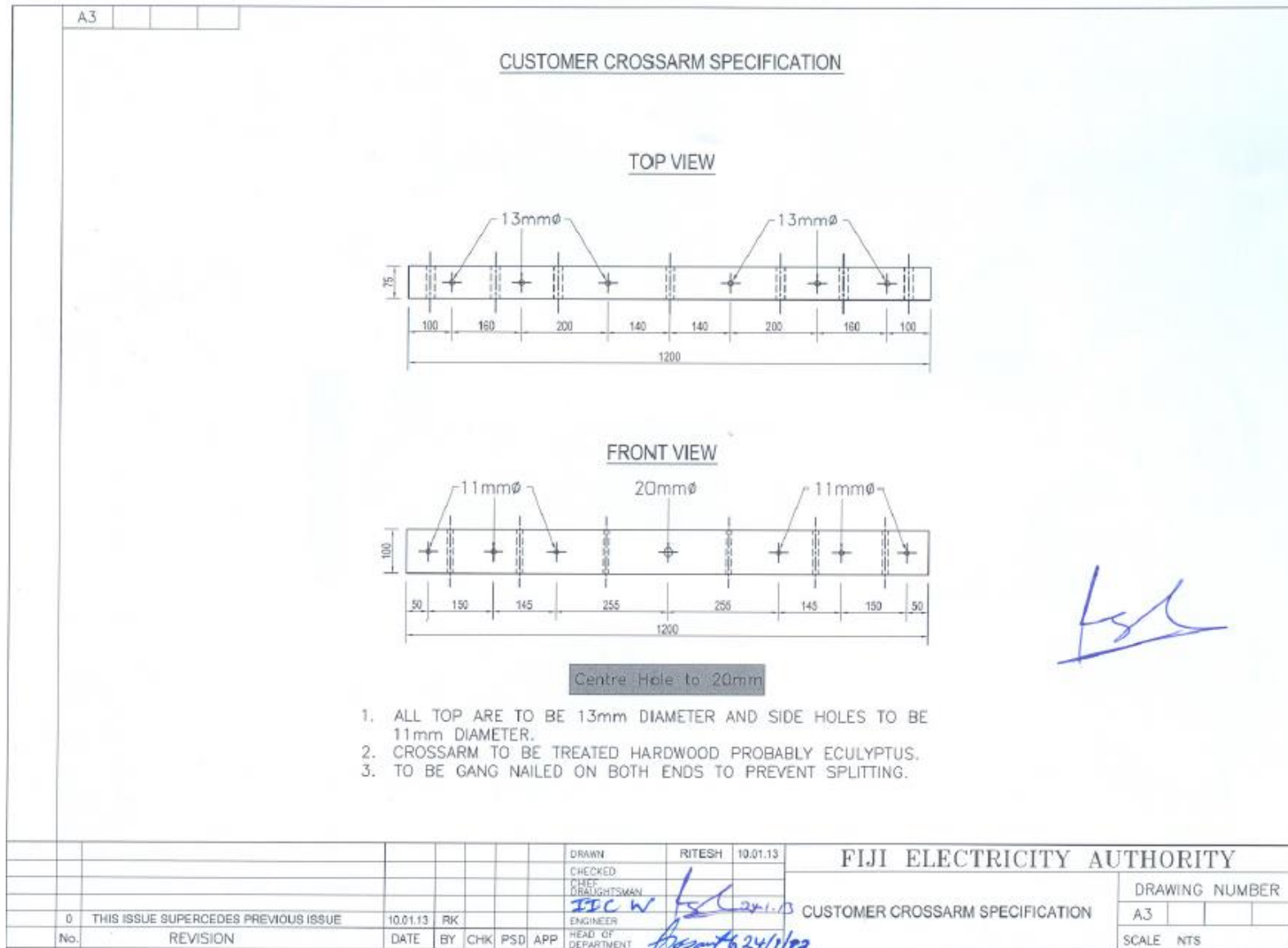
Stock Codes	Items	Country of Manufacture	Manufacturer of product	Brand Offered	Manufactured to standards	ISO Certification of Manufacturer
I05418	1.2m Hardwood Cross-arm					
New Item	1.5m Hardwood Cross-arm					
I05420	2m Hardwood Cross-arm					

Name of Tenderer: _____

Signature of Tenderer: _____

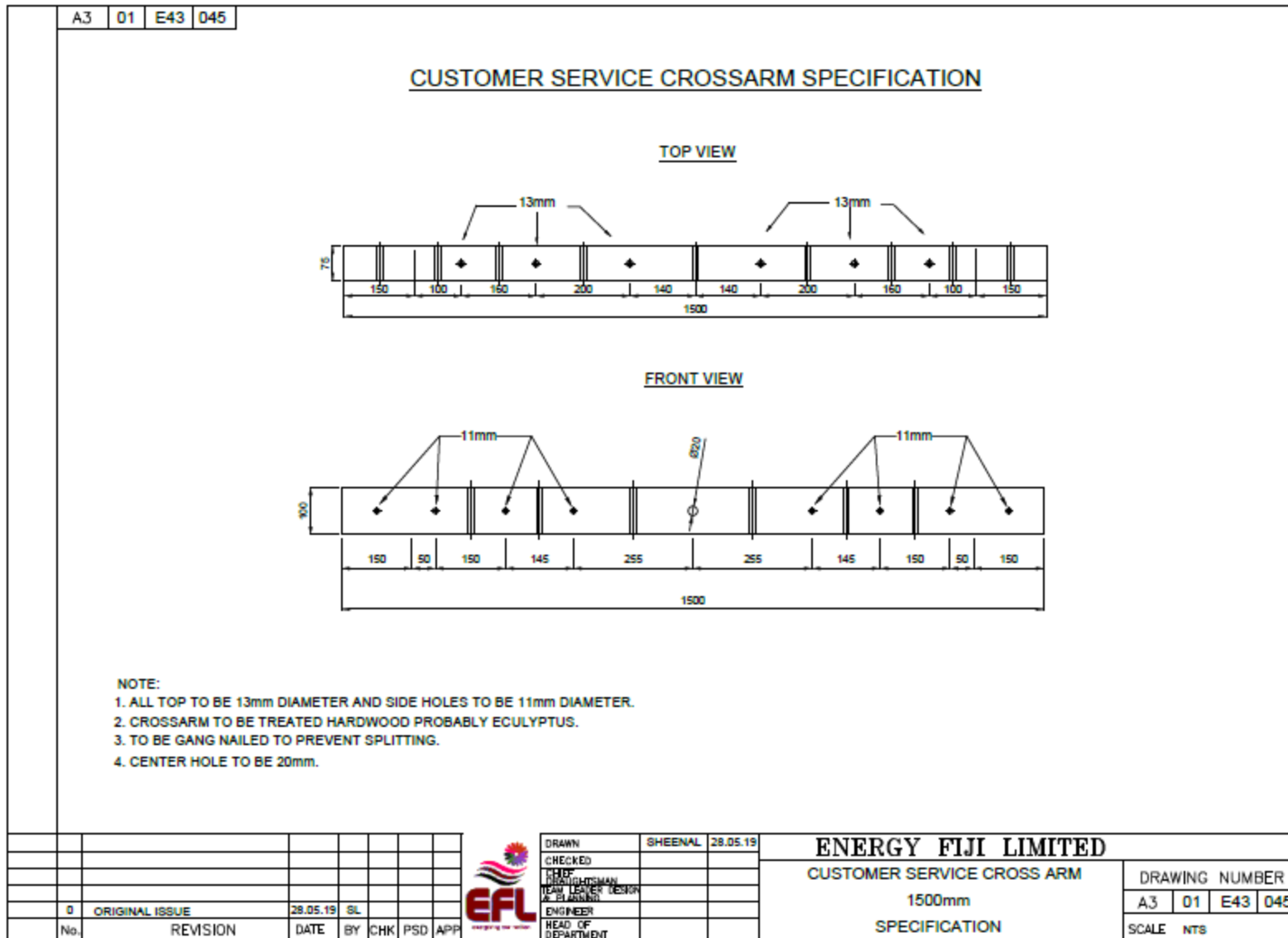
Date: _____

15.4 Hole Details for 1.2m Cross-arm

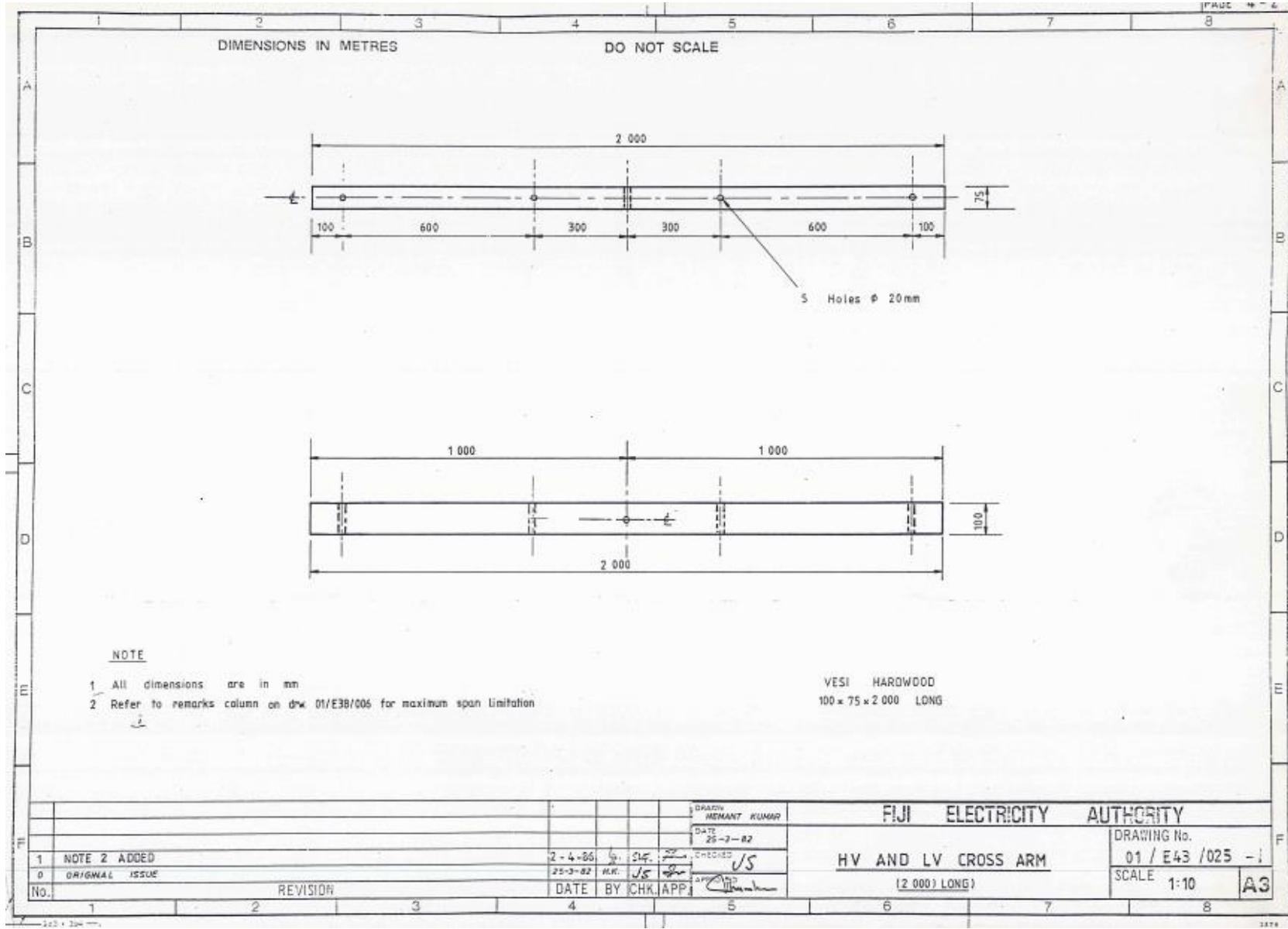


Handwritten signature in blue ink.

15.5 Hole Details for 1.5m Cross-arm



15.6 Hole Details for 2m Cross-arm



15.7 Tender Submission - Instruction to Bidders

It is mandatory for Bidders to upload a copy of their bid in the TENDER LINK Electronic Tender Box no later than 4.00pm (1600hrs Fiji Time) Wednesday 3rd July, 2019.

To register your interest and tender a response, view 'Current Tenders' at:
<https://www.tenderlink.com/efl>

For further information contact The Secretary Tender Committee, by e-mail
TDelairewa@efl.com.fj

In addition, hard copies of the tender, one original and one copy must be deposited in the tender box located at the EFL Head Office, 2 Marlow Street, Suva, Fiji no later than new time and date to be inserted - Addressed as

Tender - MR 189/2019 - Preferred Supplier for Supply of Hard Wood Cross Arms

The Secretary Tender Committee
Energy Fiji Limited
Head Office
Suva
Fiji

Hard copies of the Tender bid will be accepted after the closing date and time provided a soft copy is uploaded in the e-Tender Box and it is dispatched before the closing date and time.

Tenders received after closing time 4.00pm (1600hrs Fiji Time) Wednesday 3rd July, 2019.

- Will not be considered.
- Lowest bid will not necessarily be accepted as successful bid.

It is the responsibility of the bidder to pay courier chargers and all other cost associated with the delivery of the hard copy of the Tender submission.

TENDER SUBMISSION CHECK LIST

The Bidders must ensure that the details and documentation mention below must submitted as part of their tender Bid

Tender Number _____

Tender Name _____

1. Full Company Name: _____

(Attach copy of Registration Certificate)

2. Director/Owner(s): _____

3. Postal Address: _____

4. Phone Contact: _____

5. Fax Number: _____

6. Email address: _____

7. Office Location: _____

8. TIN Number: _____

(Attach copy of the VAT/TIN Registration Certificate - Local Bidders Only)

9. Company Registration Number: _____

(Attach copy of the Business License)

10. FNPF Employer Registration Number: _____

(For Local Bidders only)

11. Contact Person: _____

I declare that all the above information is

correct. Name: _____

Position: _____

Sign: _____ Date: _____