



# Request for Tender

## MSAF Tender No. 05/2023

for the

# SUPPLY, INSTALLATION & CONSTRUCTION OF STANDARD LIGHTBEACONS BETWEEN NATOVI – NABOUWALU – OVALAU WATERWAYS

Date of Issue	27 January 2024
Closing Date	16 February 2024
Lodgment Address	MSAF Tender Box Level 4, Kadavu House, 414 Victoria Parade Suva, Fiji

## **REQUEST FOR TENDER**

**PROJECT: SUPPLY, INSTALLATION & CONSTRUCTION OF STANDARD LIGHTBEACONS BETWEEN NATOVI – NABOUWALU – OVALAU WATERWAYS**

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## DEFINITIONS & INTERPRETATION

### DEFINITIONS

“**AS**” means Australian Standard;

“**BSS**” means British Standard Specification;

“**DBGA**” means Department of Buildings & Government Architect, Ministry of Public Works, Transport & Meteorological Services;

“**inclement weather**” means continuous heavy rain or storm which may impede the progress of work

“**MSAF**” means Maritime Safety Authority of Fiji;

“**NZS**” means New Zealand Standard;

“**Standard Contract**” means Fiji Standard Form of Building Contract;

“**Tenderer**” may include Contractor and/or sub-contractor;

### INTERPRETATION

Headings are for convenience only and do not affect interpretation. The following rules of interpretation apply unless the context requires otherwise:

- (a) The singular includes the plural and conversely.
- (b) A gender includes all genders.
- (c) Where a word or phrase is defined, its other grammatical forms have a corresponding meaning.
- (d) A reference to a person includes a body corporate, an unincorporated body or other entity and conversely.

# **SECTION 1: FORM OF TENDER**

for the

## **Supply, Installation & Construction of Standard Lightbeacons between Natovi – Nabouwalu – Ovalau Waterways**

FORM OF TENDER:	TENDER DETAILS
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APPENDIX 5:	ADDITIONAL INFORMATION REQUIRED FROM TENDERERS

# FORM OF TENDER

(To be submitted with the Tender Submission)

Tender for:

## SUPPLY, INSTALLATION & CONSTRUCTION OF STANDARD LIGHTBEACONS BETWEEN NATOVI – NABOUWALU – OVALAU WATERWAYS

Name of Tenderer.....

We, the undersigned hereby offer to execute and complete the whole works as stated on the said documents and as required for the Fixed Lump Sum of:

(in words and numbers)

.....  
.....  
.....  
.....

### TOTAL TENDER PRICE (F\$ .....VIP)

The above fixed Lump Sum must include VAT (15%) and with no provision for fluctuations in the cost of Labour and Materials.

As witness our hands this day ..... day of .....

**Tenderer's Name:** .....

**Signature:** .....

**Office Stamp** .....

**Address:** .....

**Witness (Name in Capitals)** .....

**Signature:** .....

**Address** .....

**Occupation** .....

## **APPENDIX 1**

### **PROJECT DURATION AND COMPLETION DETAILS**

#### **Tender for:**

#### **SUPPLY, INSTALLATION & CONSTRUCTION OF STANDARD LIGHTBEACONS BETWEEN NATOVI – NABOUWALU – OVALAU WATERWAYS**

- |  |   |  |
|--|---|--|
| a) Duration  | : | 12 Calendar Weeks                              |
| b) Defects Liability Period (Clause 15, 16 & 30) * | : | 12 months                                      |
| c) Retention                                       | : | 10% at the end of the Defects Liability Period |
| d) Liquidated & Ascertained Damage (Clause 22) *   | : | \$200.00 per day                               |
| e) Public Liability Insurance (Clause 19 [1] a) *  | : | \$500,000.00 (minimum)                         |
| f) Insurance for the Works                         | : | Value of the total Contract Sum (minimum)      |
| g) Contractors All Risks                           | : | Approved Contract Sum plus 10%                 |
| h) Workers Compensation Insurance                  | : | \$500,000.00                                   |
| i) Performance Bond                                | : | 30% of the project value                       |

***All prices to be in Fiji Dollars.***

\* Clauses referred to above are contained in the Fiji Standard Form of Building Contract (Without quantities, Public Works Edition 1978).

## **APPENDIX 2**

### **SUMMARY OF TRADES/COSTS**

	<b>Trade Description</b>	<b>Total Cost</b>
<b>A</b>		
1.0	Preliminaries & General	
2.0	Demolition works (where required)	
3.0	Mobilization & Setting out	
4.0	Piling	
5.0	Fixing and Connections (Welding & Bolting)	
6.0	Reinforcing steel	
7.0	Concrete pouring	
8.0	Painting	
9.0	Supply and Installation of the beacon top marks & lights as per MSAF specification	
	Sub Total	
	plus <b>VAT</b> (15%)	
	<b>TOTAL TENDERED SUM</b>	

Signature of Tenderer:.....

Tenderer's Stamp:.....

Date:.....

### **APPENDIX 3**

#### **LABOUR RATES SCHEDULE**

##### **Labour Rates Summary**

- 3.1** All Tenderers shall submit their Labour and Plant rates for this Project; this is a mandatory requirement. If any job/trade or plant/equipment classification is missing from below, the Tenderer is required to add into the spaces provided.
- 3.2** Labour Rates Summary

<b>Item</b>	<b>Job Classification (Trades)</b>	<b>Hourly Rate (\$)</b>
01	Supervisor	
02	Foreman	
03	Civil Technician	
04	Leading Hand	
05	Painter	
06	Labourers	
07	Diver	
08	Machinery operator	
09	<i>(Please enter other Trades as required for this project).</i>	
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11		
12		
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## **APPENDIX 4**

### **PLANT HIRE RATES**

#### **Plant/Equipment Rates Summary**

- 4.1** All Tenderers shall submit their Plant/equipment rate that is applicable to this Project; this is a mandatory requirement. If any job or equipment classification is missing from below the Tenderer is required to add into the spaces provided.

<b>item</b>	<b>Plant/Equipment Classification</b>	<b>Hourly Rate (\$)</b>
01	Vibro/Drop Hammer	
02	Concrete pump	
03	Barge	
04	Back Hoe with hydraulic Auger	
05	Tip Truck	
06	<i>(Please enter other plants &amp; equipment required for this project).</i>	
07		
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## **APPENDIX 5**

### **ADDITIONAL INFORMATION REQUIRED FROM ALL TENDERERS**

**Project:**

**SUPPLY, INSTALLATION & CONSTRUCTION OF STANDARD  
LIGHTBEACONS BETWEEN NATOVI – NABOUWALU – OVALAU  
WATERWAYS**

#### **Contents**

- A. Structure and Organization
- B. Financial Status
- C. Resources (Personnel/Plant/Equipment)
- D. Resources (Other)
- E. Relevant Experience

#### **Notes to Tenderers**

1. *Please fill-in clearly and neatly in the spaces provided.*
2. *Additional information may be attached at the back, if necessary.*
3. *Any queries regarding the filling of the Form of Tender are to be directed to MSAF.*

## **A STRUCTURE AND ORGANIZATION**

1. Name of Company:

Certificate No. :

Tax Identification No. (T.I.N)

Contact Person:

Telephone Number:

Mobile:

E-mail Address:

2. Description of Company (for example, General Contractor)

3. Number of years' experience as a General Contractor in Fiji:

4. Please present organization chart showing the Tenderer/Company structure including the position of directors and key personnel.

### **Notes to Tenderers**

1. Please fill-in clearly and neatly in the spaces provided.
2. Additional information may be attached at the back, if necessary.
3. Any queries regarding the filling of the Form of Tender are to be directed to MSAF.

**B FINANCIAL STATUS**

1. Annual value of construction work undertaken for each of the last two years.

2021	2022

2. Current commitments and value of work at hand in 2021/2022.

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.....

.....

3. Attach copies of the Tenderer's previous two years audited financial accounts.

4. Name and address of Banker where references can be obtained. Provide Bankers Report or financial status and overdraft facilities.

**Notes to Tenderers**

1. Please fill-in clearly and neatly in the spaces provided.
2. Additional information may be attached at the back, if necessary.
3. Any queries regarding the filling of the Form of Tender are to be directed to MSAF.

**C. RESOURCES: PERSONNEL/PLANT EQUIPMENT****1. Total Number of Staff in the Company:**

Technical:	Administrative:
------------	-----------------

**2. Staff proposed to work on this Project:**

Name:	Position:	No. of Years of experience in construction:

**3. Main plant/equipment:**

Considered by the Tenderer to be necessary for executing the Project and whether the plant is owned, or will be purchased or hired.


**Notes to Tenderers**

1. Please fill-in clearly and neatly in the spaces provided.
2. Additional information may be attached at the back, if necessary.
3. Any queries regarding the filling of the Form of Tender are to be directed to MSAF.



## **SECTION 2: CONDITIONS OF TENDER**

for the

### **Supply, Installation & Construction of Standard Lightbeacons between Natovi – Nabouwalu – Ovalau Waterways**

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- 14.0 Delays / Time Extensions
- 15.0 Completion
- 16.0 Liquidated and Ascertained Damages
- 17.0 Claims and Payments
- 18.0 Retention
- 19.0 Defects Liability Period
- 20.0 Insurance
- 21.0 Duration of Work
- 22.0 Miscellaneous



## 1.0 General Description of the Scope of Works

The said works entails all necessary works for the **SUPPLY, INSTALLATION & CONSTRUCTION OF STANDARD LIGHTBEACONS BETWEEN NATOVI – NABOUWALU – OVALAU WATERWAYS**

## 2.0 Tenderer to Inform Himself

- 2.1. The Tenderer shall inspect and examine the structural drawings including sites and surroundings as to the form and nature of the project site and the cost implications of the provision of ships, accessories, electricity and water supply lines to the site for the construction of light-beacons. This shall be satisfied before the submission of the tender. The tenderer should also have a clear understanding of the quantities of work and materials necessary, accommodation required, the availability of conditions and rates of pay of labour and shall inform himself of all risks, contingencies and other circumstances which may affect this Tender.
- 2.2. Inspection of the site is to be carried out with MSAF and DBGA through arrangement with MSAF before submitting the Tender.

## 3.0 Detailed Description of the Work

- 3.1 The extent of this Contract comprises of the supply of all materials, labour and plant for the execution of the said Project complete in all respects in accordance with this specification and structural drawings.

## 4.0 Tenders

- 4.1. Tenders are to be submitted on the enclosed FORM OF TENDER fully completed. This shall be submitted in a plain sealed envelope, marked:

**Request for Tender – MSAF Tender 05/2023**

**“SUPPLY, INSTALLATION & CONSTRUCTION OF STANDARD LIGHT BEACONS BETWEEN NATOVI – NABOUWALU – OVALAU WATERWAYS**

*and addressed to:*

**The Chairman, Tender Committee  
Maritime Safety Authority of Fiji  
Level 4, Kadavu House, 414 Victoria Parade  
Suva, Fiji**

Tenders are to be submitted no later than **Friday, 16 February 2024 at 1500 hours**. (Late tenders will not be accepted).

- 4.2. The lowest or any tender need not necessarily be accepted.
- 4.3. MSAF reserves the right to REDUCE THE SCOPE OF WORKS to suit budgetary requirements. This will be decided prior to the signing of the contract.

- 4.4 All clarification/discrepancies on Tender documents must be made and resolved before the closing of Tenders in writing or verbally to MSAF.

## 5.0. Qualifications of Tenders

- 5.1. Any Tenders not complying with any Tender condition/requirement stated in the Tender documents shall be considered non-conforming and will be disqualified.
- 5.2. Failure to submit the Tender Form fully completed, will make the Tender invalid.

## 6.0. Tender Documents

- 6.1. The documents for this Tender (inclusive in the Contract) shall include of the following:
- a) Tender Letter
  - b) Conditions of Tender
  - c) Form of Letter
  - d) Specification
  - e) Structural Drawing
  - f) Light-beacons Location/Positions

If there are discrepancies or divergence between two or more of the documents including a divergence between parts of any one of them, or between documents of the same description, the order of precedence shall be:-

- a) Structural Drawings
- b) Conditions of Tender
- c) Specification

## 7.0 Project Management

- 7.1 GENERAL: The Contractor shall be responsible for work executed under the Contract including the work of the Sub-contractor nominated or otherwise. The Contractor shall be responsible for the proper supervision of all works for which he is responsible and shall take all necessary measures to ensure quality control and workmanship.
- 7.2 Foreman: a competent Supervisor/Foreman shall be appointed and shall be in charge of the work for the duration of the Contract. Instructions given to him by MSAF shall be deemed to have been given to the Contractor. The foreman must be able to fully understand the drawings and instructions he has to administer.

## 8.0 Progress Gantt Charts

- 8.1 The tenderer shall within seven (7) days of the official acceptance of his tender, submit **three (3) copies of detailed work programme and order of work for approval**. The works include ordering of materials, elemental construction, fabrication, plant and equipment.
- 8.2 One (1) copy of the approved programme shall be kept on the site at all times and shall be marked regularly and clearly to indicate the progress throughout the construction period.

## **9.0 Site Meetings**

9.1 MSAF with DBGA may arrange site meetings with the contractor and subcontractors (as necessary). The Minutes of the meeting shall be recorded by MSAF.

## **10.0 Inspection of Works**

10.1 MSAF and DBGA shall at all times during construction have full access to all phases of the work for inspection.

## **11.0 Fluctuations**

11.1 For the purpose of this Contract, the tender costs is to be the Fixed Lump Sum and will not be subject to government regulated monetary fluctuations.

## **12.0 Performance Bond**

12.1 The successful Contractor shall be expected to provide a Performance Bond from a Bank or Financial Institution equivalent of **10%** of the Contract Sum within seven (7) days from the date of the letter of notification. The Bond shall be released upon Practical Completion. Performance Bond is to be directly paid to MSAF by the successful bidder upon signing the contract.

## **13.0 Period of Final Inspection**

13.1 The period of final valuation shall be twelve (12) months from the date of the issuance of the practical completion certificate.

## **14.0 Delays / Time Extensions**

14.1 Period of delay and extension of time shall be allowed a maximum of one (1) month.

## **15.0 Completion**

15.1 At completion, remove from the work site all plant, equipment, surplus materials, wastes and clean up the worksite. Make good where necessary (checked and determined by MSAF/DBGA) and facilitate testing of all hardware and equipment as necessary to ensure all are in working order before handover.

## **16.0 Liquidated and Ascertained Damages**

16.1 This shall be in accordance with the Standard Contract and to be **two hundred dollars (\$200) per day**.

## **17.0 Claims and Payments**

17.1 Progress payment claims and certified payments are to be made on the construction progress basis and in accordance with the Contract.

## **18.0 Retention**

18.1 Retention shall be ten percent (**10**) % of the value of the contract which shall be paid

at the end of the Defect Liability Period.

## **19.0 Defects Liability Period**

19.1 This period shall be twelve (12) months.

## **20.0 Insurance**

20.1 The Contractor is specifically required to insure against injury to persons and property:

- a) A policy specified related to this building contract under the Accident Compensation Act 2017;
- b) A policy specified related to this building contract for its legal liability to the General Public to an amount not less than **five hundred thousand dollars (\$500,000.00)** and
- c) Insurance against the works. Minimum cover – Value of the Contract sum.

## **21.0 Duration of Works**

21.1 This should refer as calendar weeks with five (5) working days i.e., Monday to Friday with 45 hours of work per week. Any work beyond the aforementioned will be prerogative of the contractor.

## **22.0 Miscellaneous**

22.1 Tenderer to provide a Certificate of Ownership and individual shares in the company certified by a chartered accountant registered under the Fiji Institute of Accountants.

22.2 Tenderer to provide the following documents with tender submission:

- a. VAT Registration Certificate
- b. Tax Compliance Certificate
- c. Company Certificate (Registrar of Company)
- d. FNPF Compliance Certificate
- e. Compliance Letter (FNU Levy Payment)
- f. Experience in marine structural works
- g. Latest bank statements
- h. Latest financial statements

22.3 Tenderer may contact the following officers for technical queries:

Manager Safety Compliance & Response  
Maritime Safety Authority of Fiji  
Phone: +679 3315266 or Mobile: 7706331

## **SECTION 3: SPECIFICATION**

for the

# **Supply, Installation & Construction of Standard Lightbeacons between Natovi – Nabouwalu – Ovalau Waterways**

Notes:

- The Specifications are divided into sections as listed in the following index. Each section is complementary to the other Sections and all shall be constructed as mutually explanatory.
- Cross reference is given in the text to assist the Contractor. Cross referencing is not exhaustive and the absence of a cross reference shall not be taken as limiting the application of any clause.
- The Contractor shall notify the MSAF and DBGA in writing of any ambiguities or discrepancies in the specifications. The MSAF and DBGA will explain or adjust the specifications and will advise the Contractor in what manner the work is to be carried out.

# **General Structural Specifications**

## SECTION 1

### 1. GENERAL PRELIMINARIES

#### 1.1 PROJECT DESCRIPTION

- 1.1.1 The project is supply and construction standard light-beacons along **the waterways between Natovi – Nabouwalu – Natovi and between Natovi – Levuka – Natovi**. Refer to the nautical chart for locations & positions.

The beacons are to be installed with Self-Contained Solar LED Marine Lanterns and Top Marks in accordance with International Association of Lighthouse Authorities & Marine Aids to Navigation (IALA) Region A Standards.

#### 1.2 SCOPE OF WORKS

- 1.2.1 The work covered under this Contract is **Supply, Installation & Construction of Twenty (21) Marine Aids to Navigation (Lightbeacons)**. Refer to the structural drawings for more details.

- a. Demolition of the existing pile (where required)
- b. Pre-boring to depth of 6m with a auger/drilling machine
- c. Pile Driving of tubular steel piles 355.6 dia x 12.7mm WT into the existing sea bed as per the structural drawing.
- d. Supply, bend and fix reinforcing steel cage
- e. Concrete Filling 50Mpa.
- f. Supply and Install Stainless Steel Fittings rods, Mounting Plate, Top Mark Stand and Bracket.
- e. Install Top Mark (MSAF will nominate the supplier and provide specification).
- f. Install Self-Contained Solar LED Marine Lantern (MSAF will nominate the supplier and provide specification).
- g. Position fixing of all beacons using Global Positioning System (GPS).

#### 1.3 THE SITE

- 1.3.1 The location of the works in this contract and adjacent areas is shown on the attached drawings. The Contractor shall ensure that during the construction works there is minimal disturbance to marine/aquatic fauna in the area.

#### 1.4 ACCESS TO SITE

- 1.4.1 Access to the sites is by boat from Natovi Jetty or Nabouwalu Jetty or Levuka wharf. The Contractor is to obtain permission from MSAF to access the site.

#### 1.5 NON-INTERFERENCE WITH LOCAL OPERATION

- 1.5.1 The contractor is required to liaise closely with relevant authorities through the MSAF to ensure minimum disruption to the local operations (fishing boats, tourist boats, dive boats and passage boats) is achieved.

## **1.6 SECURITY**

1.6.1 The Contractor shall provide at all times such suitable and reliable security as maybe required to protect the works and to ensure the safety of personnel working in the project site. The Contractor will be entirely responsible for the security of his plant and materials and MSAF accepts no liability whatsoever for any loss or damage thereto.

## **1.7 CONTRACTOR'S SUPERINTENDENT**

1.7.1 In accordance with the Conditions of Contract, before commencement of any work on site, the Contractor shall inform the MSAF and DBGA in writing of his proposed arrangements for supervising the works and obtain the MSAF and DBGA approval thereto.

## **1.8 EXISTING SERVICES**

1.8.1 The Contractor shall prior to the commencement of work, the Contractor shall enquire of the relevant services within the project area, which do not form part of the Contract. The Contractor shall be responsible for taking all proper and reasonable precaution to protect these existing services and utilities from damage and shall make good any damage caused as a result of his own activities or his sub-contractor at his own cost.

## **1.9 WATER, ELECTRICITY AND TELEPHONE**

1.9.1 The Contractor shall make his own arrangements for all temporary electrical, water and telephone services required for the execution of the works and shall pay all costs incurred.

## **1.10 STAND DOWN**

1.10.1 The Contractor may allow for disruption to his programme in carrying out the works due to circumstances beyond his control.

## **1.11 CONSTRUCTION PROGRAMME**

1.11.1 The Contractor shall prepare a detailed Construction Programme as required by the Conditions of Contract. The Programme shall be in the form of a detailed gantt chart with interlinked activities and shall update and improve the programme submitted with the Contractor's Tender. Critical dates determined shall be clearly shown.

1.11.2 At the end of each week the Contractor shall furnish to the MSAF and DBGA the following information in writing:

- a) The actual starting dates of all activities started during the week;
- b) The actual dates of completion of activities completed during the week;
- c) The current status of all work underway at the time of the report; and
- d) The reasons for any discrepancy between the Construction Programme and the progress as achieved under parts (a) and (c) above, together with the Contractor's proposals for ensuring that all key and critical dates are achieved.



1.11.3 The Contractor shall fourteen (14) days prior to making major revisions in the Construction Programme, advise MSAF and DBGA for such revisions. Any such revision shall be subject to the MSAF and DBGA's approval.

1.11.4 The MSAF and BGA reserves the right to review the progress of the works from time to time and the Contractor shall assist with such reviews. MSAF and DBGA reserves the right to instruct the Contractor to modify and up-date the Construction Programme at any time during the progress of the Contract to ensure completion by the due dates and any such revisions shall be carried out at the Contractor's own cost but shall not relieve him of the responsibility for the sufficiency thereof. If any event occurs which delays the Contractor in his execution of any part of the works, it is the Contractor's responsibility to revise the programme in order to minimise the effect of any such delays.

## 1.12 METHOD OF WORK STATEMENT

1.12.1 The Contractor shall prepare and submit for approval by the MSAF and DBGA a method statement indicating how the Contractor proposes to carry out the works. The statement shall include:

- a) a list of equipment proposed to be used;
- b) a list of professional staff;
- c) a detailed description of the construction method and sequence, including setting out, survey and quality control methods;
- d) allowance made due to sea conditions, inclement weather, access restrictions, operation restrictions and other such factors;
- e) reference to the construction programme and temporary works as required; and
- f) a detailed site preparation and method for the disposal of the unwanted material.

1.12.2 Approval by the MSAF and DBGA of the method statement shall not relieve the Contractor of any of his responsibilities to complete the work in accordance with the requirements of the Contract.

## 1.13 PERMITS, CERTIFICATES AND OTHER CONSENTS

1.13.1 The Contractor shall obtain necessary permits, certificates and other like consents from Government and Local Authorities and shall submit all such permits to the MSAF and DBGA.

## 1.14 SURVEY OF THE WORKS

The Contractor shall be responsible for all surveying of the works to monitor the progress and for the provision of all necessary instruments, appliances and labour required in connection therewith.

The contractor will provide all necessary equipment to install beacons including the sufficient and accurate positioning.

Prior to beacon construction, positions are to be verified using the Global Positioning System (GPS) receivers with reference to positions provided by MSAF.

## **1.15 CONTRACTOR'S WORKS AND ESTABLISHMENT AREAS**

1.15.1 The Contractor is responsible for making all arrangements and meeting all costs of his area, sheds, offices, stores and the storage of plant and materials within the establishment areas.

1.15.2 The Contractor shall at all times maintain his establishment area, office amenities, etc., in a clean and tidy condition.

## **1.16 USE OF THE SITE**

1.16.1 The Contractor shall not use any portion of the Site for any purpose not directly connected with the Works unless written permission of MSAF is first obtained.

1.16.2 The site in its entirety shall be deemed as private property and the Contractor shall keep out all trespassers and all persons lacking authorization by the MSAF.

1.16.3 The Contractor shall confine his construction operations within the Site, or such other areas as maybe negotiated and provided by the MSAF and shall instruct his employees not to trespass.

1.16.4 Subject to any unavoidable disturbance, which maybe necessitated by the execution of the Contract, the Contractor shall not interfere with any environment sensitive areas, endangered species, areas of conservation fishing or other rights which may exist on or near the Site.

1.16.5 The Contractor shall not erect or allow to erect an advertisement in any form on the site or on adjoining grounds without the written approval of MSAF.

1.16.6 The Contractor shall not set up or cause or allow to be set up on the site any business or retail establishment of any sort without the approval of the MSAF.

1.16.7 The Contractor shall not establish on any portion of the site any living accommodation for his staff, employees, or sub-contractors without the written approval of MSAF.

## **1.17 CONFIDENTIAL INFORMATION**

1.17.1 All plans, drawings and specifications and the subject matter contained therein remain the property of MSAF and all other information given to or obtained by the Contractor in connection with the Work shall be held 'in confidence' by the

Contractor and shall not be used by the Contractor for any purpose other than for the performance of the Work or as authorised in writing by MSAF.

## **1.18 RECORDS**

- 1.18.1 Within one (1) week of commencing work on the site, the Contractor shall furnish to the MSAF and DBGA a fully detailed records of all plant and personnel employed on the Works, and additions or reductions shall thereafter be notified weekly within two (2) working days of the end of the weekly period.
- 1.18.2 The record shall differentiate between plant owned by the Contractor and that which is hired. In the case of hired plant, the record shall state from whom the plant has been hired, size, capacity, output and power rating of all plant shall be stated in the records.
- 1.18.3 The labour record shall show by trades the number of men employed, rates of pay, the work upon which they are engaged, and shall include employees of all subcontractors.
- 1.18.4 The Contractor shall, upon request, also supply to the MSAF and DBGA any other records relating to work under the Contract which the MSAF and DBGA may reasonably require.
- 1.18.5 The Contractor shall not destroy any of his records, timesheets, vouchers and the like on labour, constructional plant, materials and things before the end of the Contract and such records shall be available at any time for inspection by the MSAF and DBGA and/or by a competent Authority for compliance with the requirements of the Contract and of the local laws and regulations and in order to enable investigation by the MSAF and DBGA of any claim by the Contractor.

## **1.19 PUBLICITY**

- 1.19.1 The contractor shall not make media releases or publish or disclose anything pertaining to the works under this Contract, without obtaining the written approval of MSAF.
- 1.19.2 Except for the purposes specified in Clause 1.19.1, the taking of photographs on the Site by, or on behalf of the Contractor or his sub-contractors shall not be allowed unless prior consent in writing has been obtained from MSAF. Should such consent be given one copy of each photograph must be submitted to the MSAF for his retention as soon as available at no cost to MSAF.

## **1.20 PHOTOGRAPHY**

- 1.20.1 Prior to the commencement of the Works, the Contractor shall provide to MSAF in duplicate photographic record of each site and any adjacent offshore areas, identified disposal site, structures, roads, fields and crops.
- 1.20.1 The Contractor shall, at his expense, supply progress photographs 150mm by 100mm in size (including digital copies) at weekly intervals. All photographs shall be annotated with the date and location.

## **1.21.0 DAY WORK**

- 1.21.1 Further to the Conditions of Contract, the Contractor may be required to perform additional works not defined elsewhere in the Contract by Day work.

1.21.2 All labour, plant and materials used on Day work shall be as agreed in writing by MSAF and DBGA prior to the commencement of the work. Three (3) quotations for the supply of materials or externally hired plant shall be obtained by the Contractor unless otherwise agreed by MSAF and DBGA.

1.21.3 Changes in resources employed on any items of Day work shall only be made with the written permission of MSAF and DBGA.

1.21.4 Day work shall be performed in accordance with the following provisions:-

**a. Labour**

- All Day work shall be carried out during the Contractor's normal working hours or as otherwise notified to MSAF and DBGA and no increase in Day work rates shall apply to any overtime, unless such overtime is outside the Contractor's normal working hours and the Contractor has been ordered in writing by MSAF and DBGA to perform work by Day work outside his normal working hours.

**b. Material**

- Materials required for Day work shall be supplied by the Contractor, unless otherwise directed by MSAF and DBGA.

**c. Hire of Plant and Equipment**

- The Contractor shall make reasonably available for Day work any item of plant or equipment normally employed on the work site. If such plant is committed on other work under the Contract, externally hired plant may be utilised.
- Payment of Day work shall be made in accordance with following provisions:-

**i. Generally**

- Where plant or labour are employed on Day work the Contractor shall, not later than noon on the next working day after such plant or labour is utilised, deliver to the MSAF or its authorized representative, duplicate copies of daily time sheets recording the amount of plant and labour so utilised for verification.
- After verification, MSAF will sign and return one (1) copy of each time sheet, either approved or modified, acknowledging the supply of plant or labour. The Contractor shall forward a copy of this countersigned sheet with his claim for payment which shall be made within twenty-eight (28) days of the work being completed.

- Operations of plant which has been ordered to standby (and being paid under the relevant items in the Bill of Quantities) shall be paid for under the Schedule of Rates provided that they too are standing by and cannot be engaged in other work.
- ii. Labour**
- The Contractor's labour rates shall be deemed to cover all costs arising from the employment of labour including higher duties and mixed functions, overtime loading, night work, meals and meal money, holidays and annual leave, absence through sickness, shift work and overtime by shift works, food and accommodation allowances, walking and travelling time, travelling allowances and fares, tool allowances and special provisions.
  - The rates shall be deemed to allow for all other labour-connected costs and for his remuneration in executing Day work under the Contract, including site supervision and administrative staff (MSAF and DBGAs, foremen surveyors, draftsmen, time-keepers and clerks etc.), bonus or other additional emoluments, provision and maintenance of all hand tools and equipment, lamps, protective clothing and similar equipment, income tax, all insurances, inclement weather, cost of camps and cookhouse personnel, head office chargers and profit as applicable. The hours paid for will be those actually worked.

## **1.22 MEETING**

1.22.1 The Contractor shall make regular meetings with the MSAF and DBGA to discuss the progress of the Contract. Meetings shall be held once every two (2) weeks and additional meetings may be called by the MSAF and DBGA when required.

1.22.2 MSAF and DBGA or their representatives would chair the meeting and shall take and distribute the minutes of such meetings. The minutes of the meeting shall be endorsed all parties.

## **1.23 INSPECTION**

1.23.1 The Contractor shall be required:

- a) To furnish, on the request of MSAF and DBGA or his authorized representative any Government official, or authorized representative, the use of such boats, boatmen, labourers, and material forming a part of the ordinary and usual crew of the dredging plant as maybe reasonably necessary in inspecting and supervising the work; and
- b) To furnish, on the request of MSAF and DBGA or his authorised representative, suitable transportation from all points on shore designated by

MSAF and DBGA, to and from the various pieces of plant, and to and from the disposal site for the purposes of inspecting and supervising the work.

1.23.2 Should the Contractor refuse, neglect or delay compliance with these requirements, the specific facilities maybe furnished and maintained by MSAF and DBGA, and the cost thereof will be deducted from any amounts due or to become due to the Contractor.

## **1.24 REASONABLE SATISFACTION**

1.24.1 No expression of MSAF and DBGAs reasonable satisfaction or approval shall be deemed to be an acceptance of the defective materials or workmanship not complying with the terms of this Contract nor as authority for any variation except where such variation is authorized as provided in the contract in writing by MSAF and DBGA.

## **1.25 DELAYS**

### **1.25.1 DELAY OF WORKPLAN BY INCLEMENT WEATHER**

- a) Only those elements indicated in the Workplan of the programme of work as being able to be affected by inclement weather will be considered when claims for extension of times are presented.
- b) The claim must be backed by a certificate from the Fiji Meteorological Office indicating continuous inclement weather.
- c) Only delays occurring in the work week from Monday to Friday and during normal working hours will be considered. Any work done during the Saturday & Sunday is the prerogative of the contractor.
- d) The claim must be supported by the Clerk of Works weekly reports.

1.25.2 Delays due to unavailability/delivery of materials will be considered if procedures outlined in Clause 1.21 have been adhered to.

## **SECTION 2**

### **2. DEMOLITION**

2.1 The old beacons piles close to the site has to be cut from bottom end (at the sea bed level) and tilted over to rest on the sea bed once the new light-beacon is constructed.

## **SECTION 3**

### **3. PILE DRIVING**

#### **3.1 DRIVING**

3.1.1 Piles previously driven shall not be used, except with the approval of DBGA for any permanent work.

3.1.2 DBGA shall be notified 24 hours before the commencement of driving. Piles shall be driven to the approved set or prescribed depth and in the sequence of driving approved by DBGA. The set shall be taken in the presence of MSAF/DBGA or unless permission to the contrary has been obtained in writing.

3.1.3 Driving of bearing piles shall be continuous until the approved set or prescribed depth has been reached, except that DBGA may permit the suspension of driving if he is satisfied that the rate of penetration before the suspension will be substantially re-established on its resumption.

### 3.2 LENGTHENING OF PILES

3.2.1 Full penetration butt welds shall be used for all joining and lengthening in accordance or as per the details specified on the drawings. All piles shall be from the same rolling wherever practicable to facilitate welding. Sections to be jointed shall be maintained in true alignment and position. After welding, the affected areas shall be thoroughly cleaned and protected in the same way as adjacent surfaces.

3.2.2 Longitudinal seam welds and spiral seam welds of lengths of tubular piles shall wherever possible be evenly staggered, but if, in order to achieve a satisfactory match of the ends of piles or the specified straightness, the longitudinal seam or spiral seams are brought closely to one alignment at the joint then they shall be staggered by at least 100 mm.

### 3.3 WELDING

3.3.1 All welding shall conform to the requirements of 'Section 4: Metal Works 6 of the Specification.

3.3.2 The manufacturing shall be of sufficient accuracy to ensure that units may be welded together on the site without excessive trimming and propping. Adjacent sections of shells to be welded together shall mate within the tolerance necessary to produce an acceptable weld in terms of the welding Specification. If the casing is to be considered as contributing to the permanent strength of the cylinders all joints including filed joints shall be full strength butt welds.

3.3.3 If the casing is required only for the support during construction of the cylinder the welds shall be sufficient to carry the construction loads.

### 3.4 SURPLUS LENGTH OF PILES

3.4.1 Any length of piles surplus to that required in the Contract shall be cut off and removed.

### 3.5 TOLERANCES

3.5.1 Construction tolerances are given in the General Notes Drawing STR00. Where tolerances are not specified on the drawing the following tolerances shall apply. The following tolerances shall be the maximum permissible deviations from the specified dimensions, levels, alignment, positions, etc. as shown on the Drawings of the structures or structural elements.

#### Piles

Position	100 mm
Diameter or dimensions of sides: Prefabricated piles	+25 mm – 5 mm

**Pile Head Level:**

Average level of trimmed/cut pile head ±25 mm

Vertically or rake 1½%

**Straightness:**

For prefabricated piles the permissible maximum deviation from straight is 5mm for piles up to 3 m long and 1 mm more for each additional meter of pile length.

**3.6 PILE DRIVING AND METHOD**

- 3.6.1 The plants to be either diesel, compressed air or drop hammer. The hammer weight must be sufficient and be capable of achieving the required driving energy.
- 3.6.2 All driving method must be in accordance with AS 2159 and as per the requirements of this specification. Where required, pre-boring may be used to assist in maintaining the minimum boring depth.
- 3.6.3 Contractor to provide pile driving records of each of the pile driven. Information required: date, time, location, length of the pile, toe level at end of driving, hammer weight etc.

**SECTION 4**

**4. CONCRETE WORKS**

**4.1 GENERAL**

- 4.1 Material and workmanship shall conform to the relevant S.A.A Codes or equivalent Codes approved by the DBGA.
- 4.2 The strength of the concrete to be as per the specification of the structural Drawing. Unless or otherwise stated, all concrete to be ready mix concrete.

**4.2. MATERIALS**

- 4.2.1 CEMENT: Shall be standard Portland and cement of approved manufacture delivered to the site in sealed bags as provided by the manufacturer. No cement showing signs of lumping shall be used; no re-bagged cement shall be delivered to the site. Cement shall be stored off the ground in a clean, dry, weatherproof construction specifically constructed for and exclusively used for this purpose. Cement shall be used as nearly as practicable in the order in which it is delivered to the site.
- 4.2.2 SAND: Shall be clean coarse grained, free from silt, salt and deleterious or carbonaceous matter and where requested by the DBGA shall be washed in fresh water. Sources of sand shall be inspected and transportation to the site and sands shall be mixed if so required by the DBGA to obtain acceptable grading.



**4.2.3 COARSE AGGREGATE:** Shall be sieved to specified grades and stock-piled separately with samples of each grade taken from time to time by the DBGA and mix tested to suit quality and grading of these aggregates.

- a. Passing 38mm sieve and retained on 19mm sieve.
- b. Passing 19mm sieve and retained on 6mm sieve.
- c. Passing 6mm and retained on No.14 sieve.

**4.2.4 WATER:** Shall be potable (drinkable), clean and fresh, free from salt and other impurities.

**4.2.5 REINFORCEMENT:** Shall be round mild steel bars complying with AS1302 or the equivalent BSS, clean and free from dirt, grease or other foreign matter. Remove all loose scale before concrete is poured. Rods shall be cold bent to the correct shapes with all hooks as shown. Wire mesh reinforcement consisting of steel fabric composed of wires or bars welded into a mesh shape constructed from steel which before welding shall comply with the requirements of British Standard specification and shall be supplied in flat sheets. All bars over 12dia. shall be deformed complying with the BSS code for deformed bars. Unless otherwise shown or specified, the minimum clear cover to main reinforcement shall be as follows:-

Where concrete is in contact with ground -75mm:

- b) under-sides of beams and all columns - 40mm
- c) sides of beams - 25mm
- d) floor slabs - 20mm

**4.2.6** Secure alternate passing's with 16 gauge black binding wire to prevent movement while concreting. Splices of reinforcement shall be made only at the points shown on drawings except with the approval of the DBGA.

**4.2.7** Lapping reinforcement shall be of a length as to develop the full strength of the bars. In splices the length bars shall be placed at the minimum distance apart of 1 1/2 times the diameter of the bars provided that in no case the spacing between bars less than 1 1/2 times the maximum size of the coarse aggregate. Fabric reinforcement shall be lapped to develop the full strength of the bars in both directions.

### **4.3 MIXING**

**4.3.1 GENERAL:** Concrete shall be mixed only in the quantities required for immediate use. The use of partly hardened concrete or remixing of such without additional cement, aggregate or water, will not be permitted.

**4.3.2 MACHINE MIXING:** Concrete shall be mixed in batch mixes of an approved type or types which will ensure uniform distribution of the ingredients throughout the mass. During mixing, the drum shall be rotated at the manufacture or, where no such recommendation has been made, at the speed of not less than fourteen (14) or more than twenty (20) revolutions per minute.

The mixers shall be in good operating condition and the interior of the drums and the mixing blades shall be kept thoroughly clean and free of hardened concrete or mortar. Mixing shall be continued for a minimum of one and a half (1 1/2) minutes after all the ingredients are in the mixer before any portion of the batch is discharged.

4.3.3 **HAND MIXER:** Mixing by hand shall not be permitted except in an emergency and then only subject to the approval of the DBGA.

4.3.4 **PRE-MIXING:** Concrete which has been mixed in an approved central plant and transported to the site in a pre-mixed condition by means of specially constructed conveyance or transit mixers will be accepted, provided that it complies in all respects with the requirements of this specification and AS139 "Ready Mixed Concrete" or the equivalent British Standard Specifications.

The Contractor must notify the DBGA two (2) days in advance of his intention to use ready-mixed concrete to enable arrangements to be made for the DBGA or his representative to be present at the plant and/or the site during placing.

The Concrete shall be discharged at the site within 1 1/4 hours after the cement and water have been added to the mix in the factory and shall be placed in position within fifteen (15) minutes after discharges.

#### **4.4 TESTS**

4.4.1 **Compression Test:** The Contractor shall allow the taking of three concrete test cylinders, either (304.8) (152.4) per concrete pour, or, as may be directed by the DBGA. These cylinders may be taken from any random delivery by the DBGA and shall be cured on site in conditions as near as possible to those under which the pour were taken when being cured. The cylinders shall be prepared from a representative sample of the delivery.

4.4.2 **Concrete Strength:** Unless otherwise stated, the 50 MPa generally (Refer Structural drawings for confirmation). All concrete shall be ready mixed unless otherwise approved.

#### **4.5 CONSISTENCY**

4.5.1 Slump tests, in accordance with AS102 part 3 or relevant British Standard Specification shall be made by the Contractor at least once a day at the commencement of work and at such other times as the DBGA may require. The Contractor shall provide all materials, labour and facilities required for this purpose, including the necessary standard mould. The consistency of the concrete shall be such as to produce slump, under test within the following ranges:

- a.) footings, retaining and other walls - 50 to 70 mm
- b.) floor slabs - suspended & on ground -25 to 75 mm
- c.) Beams and columns - 50 to 75mm

#### **4.6 PLACING OF CONCRETE WITH PUMPING EQUIPMENT**

4.6.1 Placing of concrete using concrete pumps will only be permitted when the Contractor has submitted evidence of the suitability of the proposed mix proportions for a special

concrete pump mix in accordance with DBGAs satisfaction. Before concrete is pumped into the forms, an initial discharge of concrete shall be pumped to waste until a consistent workable mix is discharged. Aluminium pipes shall not be used for the delivery of pumped concrete. The Contractor shall ensure that a stand-by pump is available.

- 4.6.2 Concrete shall be placed in daylight or under such lighting conditions as may be approved by the DBGA.
- 4.6.3 No concrete shall be placed until reinforcement and formwork have been inspected and approved by the DBGA. Twenty four hours' notice shall be given to the DBGA of the intention to place concrete.
- 4.6.4 Prior to commence placing of concrete, the concrete surface of all appliances to be used for this work shall be thoroughly cleaned of all hardened concrete or foreign matter. Formwork shall be cleaned of debris and free of water.
- 4.6.5 Concrete shall not be deposited in wet trenches or in running water.
- 4.6.6 Concrete shall be conveyed from the mixers to the place of final deposit without delay and by methods which will not cause or permit segregation and/or loss of materials. It shall be transported on substantial gangways supported above the reinforcement by trestles resting on the formwork.
- 4.6.7. Each monolithic portion of the work shall, except where the use of construction joints is approved, be placed in one continuous operation. The order of placing shall be as required by the DBGA and shall be so arranged that new concrete is continually being placed against unset concrete so that a monolithic structure will result.
- 4.6.8 No concrete which has partially hardened or has contaminated by foreign materials shall be deposited in the work. Re-tempered concrete shall not be used.
- 4.6.9 Concrete shall not be placed at a rate greater than that which will permit satisfactory compaction or to a depth greater than 450mm before compaction thereof. The Contractor shall, at all times provide adequate labour to ensure that the concrete is compacted in the forms to the satisfaction of the DBGA.
- 4.6.10 If ready-mixed concrete is used, the Contractor must organize the delivery of concrete to the site in such quantities as can be efficiently handled by the labour available.
- 4.6.11 All vertical members including walls shall be placed and compacted at least twelve (12) hours before any horizontal members (including reinforcement) which they support, are placed.
- 4.6.12 **PLACING UNDER WATER:** Normally concrete shall only be placed in the dry. Placing underwater shall be allowed only in exceptional circumstances where in the opinion of the Supervisor it is not feasible to dewater before placing. No concrete shall be placed in flowing water.

Underwater concrete shall be placed by means of tremie. Full details of the method proposed shall be submitted in advance to the Supervisor for his approval. Placing by skip or pipeline will also be considered in certain circumstances.

During concreting by tremie, air and water must be excluded from the tremie by keeping the pipe filled with concrete at all times. In charging the tremie, a plug formed of suitable paper, sacking or vermiculite granules shall be first inserted in the top of the pipe. Once concreting has begun the discharge end of the tremie shall be kept well below the surface of the concrete. Should this seal be broken the tremie shall be lifted and plugged before concreting is recommenced. Distribution of concrete by lateral movement of the tremie will not be permitted.

During and after concreting under water, pumping or dewatering operations in the immediate vicinity shall be suspended until the Supervisor permits them to be continued.

The concrete mix used for under water placing shall be specifically designed and approved for this purpose to ensure good flow ability, plasticity and cohesion. Increased sand and cement contents over normal mixes will usually be required.

#### **4.7 COMPACTION BY HAND**

4.7.1 Where mechanical vibration cannot be used, as determined by the DBGA, the concrete shall be thoroughly compacted by means of continuous stamping, spading and slicing during and immediately after placing. Care shall be taken to fill every part of the forms, to work the concrete under and around the reinforcement without displacing it, to work coarse aggregate back from the faces and to remove all air bubbles and voids.

#### **4.8 COMPACTION BY MECHANICAL VIBRATION**

4.8.1 Mechanical vibration shall be used throughout for compacting the concrete.

4.8.2 Vibrators shall be of an approved type transmitting not less than 9,000 impulses per minute when under load.

4.8.3 Vibrators shall be operated to the satisfaction of the DBGA. They shall be uniformly spaced and not further apart from 600mm of the radius beyond which vibration is visibly effective. They shall be provided in sufficient number to ensure compaction at a rate satisfactory to the DBGA. In addition, at least one vibrator of each type shall be kept in reserve for emergency use. Vibrators shall be moved continuously throughout the wet concrete and shall not be allowed to remain in any one position for more than 10 seconds.

4.8.4 Vibration should achieve uniform density of the concrete but should not be continued to the extent that localized areas of void are formed. Particular care shall be exercised to avoid damage to partially set concrete.

#### **4.9 POOR COMPACTION**

4.9.1 If in the opinion of the DBGA the concrete when exposed by stripping the forms, is incompletely compacted, the Contractor shall immediately hack back, removing all laitance and make good the honeycombed areas with a 3:1 sand and cement mortar while the concrete is still green. The Contractor shall reconstruct at his own expense

any structural members or portions of the work which are shown to be faulty, either by tests or inspection.

#### **4.10 CONSTRUCTION JOINTS**

4.10.1 The location of construction joints shall be planned in advance and shall be approved by the DBGA prior to commencement of concreting.

#### **4.11 PROTECTION**

4.11.1 Freshly cast concrete shall be protected from premature drying and excessively hot or cold temperatures. In windy conditions, windbreaks shall be erected to shield the concrete surface during and after placing. The concrete shall be maintained at a reasonably constant temperature with minimum moisture loss for the curing period.

4.11.2 The responsibility for the curing and protection of the concrete shall rest entirely with the contractor. Curing methods which do not conform to this specification shall be rejected.

#### **4.12 CURING**

4.12.1 All exposed surfaces of concrete shall be cured by one of the following methods:

- (i) Pounding or continuous sprinkling with water;
- (ii) Covering with an impermeable membrane concrete that has taken its initial set and that has been moistened with a fine spray of water. The covering materials shall be held firmly against the concrete for the full length of all edges and laps and at frequent intervals between so that there shall be no air circulation at the concrete surface; and
- (iii) The use of an absorptive cover, kept continuously wet. The use of the curing compounds conforming to ASTM C309 are not permissible except with the DBGA's Approval in writing.

#### **4.13 CURING PERIOD**

4.13.1 Curing shall commence immediately after initial set of concrete and shall continue for 7 days.

#### **4.14 DAMAGE**

4.14.1 The concrete shall be protected from damage due to load over-stresses, heavy shocks and excessive vibration, particularly during the curing period.

4.14.2 All finished concrete surface shall be protected from damage due to any cause such as construction activities, rain and running water. Self-supporting structures shall not be loaded in any way which will overstress the concrete.

#### **4.15 TOLERANCES**

- a) sides of members and thickness of slabs: +6mm, - 0mm
- b) surfaces: 3mm, -3mm to 3m long straight edge
- c) surface déviation: +1.5mm, -1.5mm in 300m
- d) abutting surfaces at joint: 1.5mm, -1.5mm

#### **4.16 SCREED**

Screed strength shall be 50 MPa (Refer to structural drawings for confirmation).

#### **4.17 FORMWORK**

Formwork shall conform to with SAA Codes AS1082, AS1510 or equivalent BSS. The responsibility for the sufficiency of the whole of the formwork shall rest entirely with the Contractor. Formwork shall be constructed from sound materials properly supported and braced or tied to maintain position and shape during and after the placing of concrete. Formwork shall be supported in a manner which will prevent its settlement. Formwork shall be kept in place for 3 days at column and beam sides and 14 days for soffits generally and to the MSAF's approval and in accordance with SAA Codes AS1082, AS1510 or equivalent BSS.

#### **4.18 REINFORCING STEEL**

Supply and install the reinforcing steel as per the specification provided in the structural drawings. The pile shaft should be clean of all loose materials before placement of the reinforcing steel cage and concreting.

### **SECTION 5**

#### **5. STRUCTURAL STEEL**

##### **5.1 MATERIAL AND WELDING STANDARDS**

5.1.1 Structural steel and welding shall comply with the requirements of the following standards and referenced documents except if specified elsewhere in the documents;

AS 3678	Hot Rolled Structural Steel Plates, Floor plates and Slabs
AS 3679	Hot Rolled Structural Steel Bars and Sections
AS 1163	Structural Steel Hollow Sections
AS 1554	Structural Steel Welding Code
	Part 1 - Welding of Steel Structures
	Part 2 - Arc Stud Welding
	Part 5 - Welding of Steel Structures Subject to High Levels of Fatigue Loading.

##### **5.2 MATERIAL COMPLIANCE**

5.2.1 The Contractor shall submit to MSAF/DBGA a Certificate of Compliance and related test certificates. The test certificates shall be certified by a testing authority whose qualifications and registration are acceptable to the superintendent and shall be related to the steel by trademarks and heat number which shall be legibly marked on each piece.

##### **5.3 HANDLING AND STORAGE OF MATERIALS**

5.3.1 All steel whether fabricated or not, shall be stored above the ground and adequately protected against corrosion. Excessively rusted, bent or damaged steel shall be rejected.

5.3.2 Methods of handling, transporting and storing structural materials, components and finished structure shall be subject to review by the Supervisor.

5.3.3 When requested by the MSAF/DBGA the Contractor shall submit for review detailed drawings and structural computations certified by an engineer experienced in structural design and who has qualifications admitting to Corporate Membership of a recognized Supervising Institution, not less than 14 days prior to handling, transporting or fabrication of steelwork.

#### **5.4 STRAIGHTENING MATERIAL AND COMPONENTS**

5.4.1 The Contractor shall submit details of his proposed method of straightening materials and not conforming to the material and fabrication tolerances for review by the MSAF/DBGA.

## **SECTION 6**

### **6. WELDING**

#### **6.1 SAFETY PRECAUTIONS**

- 6.1.1 Suitable opaque welding screens shall be provided to protect other people in the vicinity of welding, against stray radiation from arc welding.
- 6.1.2 Where non-destructive tests employing industrial x-ray plant or radioactive isotopes are used, special precautions shall be observed to ensure that the personnel in the vicinity shall not be subjected to direct or scattered radiation. The relevant regulations governing the use of x-ray plant and equipment shall be observed.
- 6.1.3 The reinforcement of flange butt welds that are to be ultrasonically examined shall be ground smooth and flush.
- 6.1.4 The Contractor shall submit test certificates for all non-destructive inspections to the MSAF/DBGA.

#### **6.2 DELIVERY**

- 6.2.1 Each member shall be marked for identification and an erection diagram shall be furnished with the erection marks shown thereon.
- 6.2.2 All field splices in members shall be protected from damage in transit. All loose angles or gusset plates shall be packed in convenient bundles and temporarily bolted or bound together with heavy gauge wire. All small articles, such as bolts, shall be packed in secure containers adequately labelled, with the details and quantity of the contents clearly stated.
- 6.2.3 The Contractor shall furnish to the MSAF two copies of material lists, dispatch notes and erection diagrams. The mass of the individual members shall be shown on the dispatch notes. Members of mass greater than 2 ton shall have the mass marked thereon.
- 6.2.4 The Contractor shall submit sketches showing details of his proposed method of loading, transporting and unloading the structural members such that they are not excessively stressed, deformed or otherwise damaged during these operations. All packing and bracing required for satisfactory transport shall be provided by the Contractor.

#### **6.3 METHODS AND EQUIPMENT**

- 6.3.1 The Contractor shall provide all false work, erection equipment, tools, machinery and appliances, including pilot and driving nuts, drift pins and fitting up bolts, necessary for the work. These items will be considered as equipment and will remain the property of the Contractor.
- 6.3.2 Before commencing work the Contractor shall submit to the MSAF for approval, details of the proposed method of erection, including false work, together with the



type and size of the erection equipment to be used. The false work shall be properly designed and substantially constructed for the loads which will come upon it and shall

be adequately maintained while in use. Details of the proposed method of erection shall include calculations by a qualified structural engineer to demonstrate that the proposed method does not lead to overstressing or instability of the girders during erection. The calculations shall establish the temporary bracing required during erection and prior to connection to the permanent cross-frames and shall be accompanied by detailed drawings showing the type and location of bracing, the location of lifting points, and the necessary attachments to facilitate erection of the girders.

6.3.3 The approval of the MSAF shall not relieve the Contractor from the responsibility for the adequacy and safety of his methods and equipment, nor from his responsibility for carrying out the work in strict accordance with the drawings and specifications.

6.3.4 The written approval of the MSAF shall be obtained before erection commences.

#### **6.4 HANDLING AND STORAGE**

6.4.1 At all times structural steelwork shall be handled and stored so that the material and parts are kept clean and free from damage. Steelwork to be stored shall be placed on supports above the ground. Girders and beams shall be placed upright and shored. Long members shall be adequately supported at points sufficiently close together to prevent damage from deflection.

6.4.2 All small articles, such as bolts, gussets, etc., shall be sorted and stored above ground in a suitable shed. The methods of handling and storing structural materials shall be to the approval of the MSAF. Any damage to steelwork or protective coating shall be repaired to the MSAF's satisfaction or the member replaced. All costs of this work shall be borne by the Contractor.

#### **6.5 STRAIGHTENING BENT MATERIAL**

6.5.1 Straightening shall be done by methods which will not damage the material. Sharp kinks and bends shall be cause for rejection. Where hot bedding is permitted or directed by the MSAF the material shall be bent by approved methods within the temperature range 760°C to 820°C and, after bending, allowed to cool slowly in air to ambient temperature. While cooling the work shall be protected from draughts or other rapid movements of the air.

6.5.2 Steelwork which is bent subsequent to delivery shall be repaired or replaced, as directed by the MSAF, at the Contractor's expense.

#### **6.6 ERECTION PROCEDURE**

6.6.1 The structure shall be erected plumb and true to line and level. As erection progresses adequate temporary supports shall be provided, where necessary, to ensure that the structure is not overstressed during erection. Wherever necessary adequate temporary bracing shall be fixed to the steelwork to ensure that the parts that have been erected are stable and will not be overstressed. Such temporary bracing shall be left in position until sufficient permanent bracing has been installed. Temporary supports and bracing shall be to the approval of the Supervisor.

6.6.2 No permanent connections shall be made between the various parts of the structure until the alignment of all parts which will be affected has been checked and approved by the MSAF/DBGGA.

## **6.7 ASSEMBLY**

6.7.1 The parts shall be accurately assembled as shown on the drawings and in accordance with identification marks on the members. The material shall be carefully handled so that parts will not be bent, twisted or damaged in any way.

6.7.2 Hammering which will mark or distort the members will not be permitted. Bearing surfaces to be in permanent contact shall be cleaned to the approval of the MSAF/DBGGA, and treated as specified before the members are assembled.

## **6.8 MISFITS**

6.8.1 The correction of misfits involving minor amounts of reaming, cutting and grinding will be considered part of the erection and no additional payment will be made on this account.

6.8.2 Any error in the shop fabrication or deformation resulting from handling and transportation, which prevents the proper assembly and fitting up of the parts by the moderate use of drift pins, reaming, cutting and grinding, shall be reported to the MSAF/DBGGA. The method of correction shall be subject to the approval of MSAF. These corrections shall be made in the presence of MSAF representative.

## **6.9 FIELD CUTTING**

6.9.1 Field cutting of beams, girders or main members shall only be done with the written permission of MSAF and in the presence of the MSAF representative. Minor defects on the other members may be corrected by field cutting.

6.9.2 All field cutting shall be done in a neat and workmanlike manner, and where required by MSAF representative, the cut surface shall have striations and burrs removed by grinding. Cutting torches will not be permitted on the structures except when used in accordance with the above requirements.

## **6.10 BOLTED CONNECTIONS**

6.10.1 Bolted connections shall be used only where specified. Temporary bolted connections shall only be used where approved by MSAF/DBGGA. The type of bolt to be used shall be as specified or approved by the MSAF/DBGGA.

6.10.2 Bolted parts shall have effective contact without the interposition of gaskets or other flexible materials. Where bearing faces of bolted parts are not parallel, tapered washers shall be used to compensate for the lack of parallelism. The angle between the axis of the bolt and the surface under the bolt head or nut shall be  $90^\circ \pm 3^\circ$ . Tapered washers shall be placed under the non-rotating component where possible. The parts of a member shall be assembled, pinned, and firmly drawn together with temporary bolts and erection pins before reaming or permanent bolting is

commenced. At least 25% of the holes shall be filled with temporary bolts and 25% with cylindrical erection pins. Temporary bolts and erection pins shall be of nominal diameter 2 mm less than the diameter of the holes. Steel packing shall be provided where necessary to ensure that the surfaces are in effective contact. All packing shall have a surface condition similar to that of the adjacent material and shall be subject to the approval of the MSAF/DBGA.

6.10.3 Drifting during assembly shall not enlarge the holes or distort the metal. Holes which do not match shall be reamed or drilled, and if required by the MSAF/DBGA, bolts of a larger diameter shall be used.

6.10.4 The holes in the parts to be joined shall be sufficiently aligned to permit bolts to be positioned without damage.

6.10.5 Bolts and nuts shall always be tightened in accordance with a prescribed sequence. Where the sequence is not shown on the drawings a staggered pattern shall be adopted with tightening proceeding from the center of the joint outwards.

### **6.11 COMMERCIAL BOLTS**

6.11.1 Commercial bolts shall be in accordance with Australian Standard AS 1111. The diameter of holes for commercial bolts shall not exceed the nominal diameter of the bolt by more than 2 mm.

6.11.2 Bolts shall be assembled with washers under the heads and nuts.

6.11.3 Bolts shall be of such a length that they will extend entirely through the nuts, but not more than 12 mm beyond them. The shank shall be threaded to such a length that not less than one thread shall be within the grip of the bolt after tightening.

6.11.4 Bolt heads and nuts shall be tightened with a suitable wrench and the nuts shall be effectively locked where specified.

### **6.12 REMOVAL OF FALSEWORK**

6.12.1 Upon completion of the erection work and before final acceptance, the Contractor shall remove all false work and construction equipment. Excavated materials placed above the final ground levels shall be removed. Bed logs, temporary piles and trestles, temporary concrete bases, etc., used in the construction operation shall be removed, pulled out or cut off at least 300 mm below ground level or stream bed level.

6.12.2 Equipment for pulling piles will not be allowed to operate from the new structure. Equipment for removing false work shall not be operated upon or attached to any portion of the new structure except with the written approval of the MSAF/DBGA.

6.12.3 All the above work shall be done to the satisfaction of the MSAF/DBGA.

### **6.13 DEFECTIVE WORKMANSHIP**

6.13.1 The Contractor shall be fully responsible for the erection of the steelwork in accordance with the drawings and this specification. Approval of any completed work or methods by the MSAF shall not relieve the Contractor of this responsibility. Work which has not been completed in accordance with this specification or which in the

opinion of the MSAF/DBGA, is defective, and shall be completed or corrected within the limits assigned by the MSAF/DBGA at no additional cost to the Contracting Authority.

## **SECTION 7**

### **7. PAINTING AND FINISHING**

#### **7.1 PAINT AND SIMILAR PROTECTIVE COATINGS**

7.1.1 The term paint shall be deemed to refer also to similar protective coatings including specialist coatings such as grease paints.

7.1.2 The protective coating for the tubular steel pile is to be zinc rich epoxy primer or similar with the finishing coat. The piles also need to be painted with florescent paint as day mark.

7.1.3 The Contractor shall submit to the MSAF for approval, information as to the type, color, manufacture, trade name and service records of the coating which he is proposing to use together with the method of curing. The Supervisor's approval to the painting systems will not relieve the Contractor of his obligations under this contract.

7.1.4 All paints shall be supplied in sealed containers of not more than 5 liters capacity and these shall be used in order of delivery. Each container shall be clearly marked on the side to show the name of the manufacturer, registered description of the material (including purpose, e.g. whether primer, undercoat or finish), color, Item No. paint manufacturer's reference number, batch number and date of manufacture. Where date of manufacture is coded, the Contractor shall provide the Supervisor with the code key.

7.1.5 The Contractor shall ensure that the properties of the paints he has selected are suitable for the conditions in the shops and on site, including temperature and humidity, and that he is able to apply the paints satisfactorily to all parts of the structure in these conditions.

7.1.6 All paints forming any one protective system or overlapping systems, shall be obtained from the same manufacturer and shall be to the approval of the Supervisor.

#### **7.2 APPLICATION OF PAINT**

7.2.1 Within 4 hours after completion of the surface preparation, or within the time period specified by the manufacturer, the surface shall be completely and uniformly covered, with paint, in accordance with the requirements of Table 400-2.

7.2.2 The coatings shall be applied in accordance with the manufacturer's instructions and, if necessary, shall be protected from the weather until resistant to moisture. The coatings shall be applied under dry conditions and shall not be applied when atmospheric conditions are unsatisfactory or are likely to become unsatisfactory. Paint which has exceeded the pot or shelf life recommended by the manufacturer

shall not be used. The coating shall be smooth, uniform and without have an even and uniform appearance.

- 7.2.3 The thicknesses of the dry paint shall not be less than specified in Table 400-2.
- 7.2.4 If the paint coating is too thin, or shows evidence of having been applied under unfavorable conditions, or the workmanship is poor, or the specified requirements are not fulfilled, the surface shall be retreated to the extent required so as to conform to the requirements of this specification.
- 7.2.5 The paint systems shall be cured in accordance with the manufacturer's instructions.
- 7.2.6 Before commencing parting the Contractor shall furnish the Supervisor with details of the overall wet film thickness for each coat he proposes to apply. He shall also provide information as to the total amount of paint he expects to use for each coat of each system. The calculation of the amount of paint to be used shall be based on the volume of solids plus an allowance for waste.
- 7.2.7 The following requirements on paint film thickness shall apply:

Wet film thickness gauges shall be used where practicable to check that the wet film

thickness is not less than: 
$$\frac{\text{minimum dry film thickness (mdft)} \times 100}{\text{Volume solids \%}}$$

- 7.2.8 During the application of a paint system the Contractor shall ensure that the progressive total thickness of the applied coats will allow the specified minimum total dft of the system to be attained without exceeding, overall, the proposed wet film thicknesses referred to in this Clause by more than 20%.
- 7.2.9 In no case shall the total dry film thickness of a paint system or the mdft of the last undercoat and finish be less than that specified in Table.
- 7.2.10 The local dry film thickness for any primer shall not exceed the specified mdft by more than 30% and for other paints by more than 75%.
- 7.2.11 Each coat of paint of a specified system shall have satisfactory adhesion as demonstrated by the following adhesion test:

Using a straight edge and a hardened steel scribe which has been ground to a sharp 30 degrees point, two parallel lines shall be scribed at a distance apart equal to 10 times the average coating thickness. In scribing the two lines, enough pressure shall be applied on each occasion to cut through the coating to the base metal in a single stroke. If at the second cut any part of the coating between the lines breaks away from the base metal, the coating shall be deemed to have failed the test.

### 7.3 PAINTING OF PILES WITHIN THE SPLASH ZONE

7.3.1 The manufactured steel piles are to be protected from corrosion in the splash zone areas as defined on the drawings and within Section 1-7 of the specification.

The surface of steel piles, in the splash zone, shall be prepared and coated with zinc high rich epoxy primer, followed by layers of finishing paint as per the client's specification.

## TENDER EVALUATION CHECKLIST

CLAUSE	BRIEF REQUIREMENTS OF THE TENDER	Yes	No	N/A
1	Brief Background/History of Company including details of Parent Companies and subsidiaries.			
2	Certified Copy of Valid Company Registration Certificate (Local/Overseas).			
3	Local Bidders to provide quotes which include Duty, VAT and delivery-to-site on an "as and when required" basis. Overseas bidders to provide quote which include Cost, Freight & Insurance to the port of Suva.			
4	Certified Copy of Valid FRCS Compliance Letter			
5	Certified Copy of Valid FPNF Compliance Letter.			
6	Complete tender forms with relevant information and furnished with other tender documents.			
7a	Separate Quoting for each item and not on whole lot basis.			
7b	Price should be valid for a period of 90 days from the closing date of tender.			
8	Evidence of the business relationship: a. List all Partner(s)/Supplier(s)/Subcontractors. b. Attach letter(s) from each Partner/Supplier/Subcontractor to confirm the business relationship (for all applicable).			
9	The payment mode should be upon satisfactory execution of the order in compliance with the tendered prices, delivery time & full supply of quantity ordered.			
10	Submission of bids to be on official letterhead, clearly written or typed and signed with all relevant contact details clearly specified.			
11(a)	Currency used:			
11(b)	Back-up services			
12	Company Insurance			
12(a)	Delivery time /availability or Completion period / plan			
13	Product samples and technical literatures brochures/photos to be submitted.			
14	Warranty period for the item / Defects Liability Period to be stated.			
15	Financial Statement for 3 years			
16	MSAF Form (Company Particulars) to be fully completed.			



### Company Particulars

<b>Name</b>			
<b>Date of Reg<sup>n</sup></b>			
<b>Registered Office</b>	----- ----- -----		
<b>Postal Address</b>	----- ----- -----		
<b>Telephone</b>		<b>Facsimile</b>	
<b>Email</b>		<b>Website</b>	
<b>Principal Activities</b>	----- ----- -----		
<b>Directors</b>	----- ----- -----		
<b>Share Capital</b> Authorised Issued&Paid-Up	----- -----		
<b>Accountant</b>			

The undersigned attest that the above information is true and correct as of the date hereby given.

Name: .....

Name: .....

Signature: .....

Signature: .....

Designation: .....

Designation: .....

Date..

**Company  
Stamp/Seal**



## **SECTION 4: STRUCTURAL DRAWINGS**

for the

# **SUPPLY, INSTALLATION & CONSTRUCTION OF STANDARD LIGHTBEACONS BETWEEN NATOVI – NABOUWALU – OVALAU WATERWAYS**

# **SECTION 5: LIGHTBEACON LOCATIONS, POSITIONS AND TECHNICAL SPECIFICATION FOR MARINE LIGHTS**

## **TABLE OF CONTENTS**

Appendix 1:	Navigation Charts – Area 1 and 2
Appendix 2:	Proposed Lightbeacon Locations and Coordinates
Appendix 3:	Self-Contained Solar LED Marine Lantern Requirements & Technical Specifications

## **APPENDIX 1**

Navigation chart showing the locations of proposed lightbeacons – ***Refer to the Structural Drawings STR 1541– Page 01***

**APPENDIX 2****PROPOSED LIGHTBEACON LOCATIONS AND COORDINATES**

<b>No.</b>	<b>Proposed Locations</b>	<b>Latitude (South)</b>	<b>Longitude (East)</b>	<b>Type of Topmark required</b>	<b>Topmark Colour</b>	<b>Marine Light required</b>
1	Cakau Davui Reef	17° 29'.836	178° 35'.477	Isolated danger	Black/Red	White
2	Cakaulase Reef	17° 36'.107	178° 35'.695	Starboard Lateral	Green	Green
3	Cakaulala Reef	17° 36'.958	178° 36'.840	Port Lateral	Red	Red
4	Qoma Lailai Reef	17° 38'.531	178° 35'.973	Starboard Lateral	Green	Green
5	Natovi Reef	17° 40'.357	178° 35'.367	Starboard Lateral	Green	Green
6	Cokota Reef	17° 40'.310	178° 35'.600	Port Lateral	Red	Red
7	Reef - SW of Ramsay Reef	17° 40'.401	178° 36'.986	Starboard Lateral	Green	Green
8	Reef - NE of Nukulevu Is	17° 40'.036	178° 36'.631	Port Lateral	Red	Red
9	Nodrakoroiwai Reef	17° 40'.226	178° 39'.126	Isolated Danger	Black	White
10	Clifton Reefs - south side	17° 41'.527	178° 41'.721	South Cardinal	White	White
11	Reef - W of Vunisinu Pt	17° 38'.702	178° 43'.992	West Cardinal	White	White
12	Reef – N of Vatu-i-ra Channel	17° 12'.635	178° 31'.250	Starboard Lateral	Green	Green
13	Reef – Far N of Vatu-i-ra Channel	17° 10'.611	178° 31'.103	Port Lateral	Red	Red
14	Isolated Patch	17° 10'.123	178° 35'.077	Isolated Danger	White	White
15	Isolated Patch	17° 07'.372	178° 38'.005	Isolated Danger	White	White
16	Underwater Rocks	17° 05'.421	178° 38'.483	Port Lateral	Red	Red
17	Shallow Water Rocks	17° 03'.242	178° 39'.262	Port Lateral	Red	Red
18	Reef – Far SW of Coconut Pt	17° 01'.304	178° 38'.402	Port Lateral	Red	Red
19	Reef off Nabouwalu wharf	17° 00'.012	178° 41'.004	Starboard Lateral	Green	Green
20	Reef off Nabouwalu wharf	16° 59'.965	178° 40'.843	Starboard Lateral	Green	Green
21	Reef off Nabouwalu wharf	16° 59'.757	178° 40'.808	Starboard Lateral	Green	Green

**APPENDIX 3****SELF-CONTAINED SOLAR LED MARINE LANTERNS  
TO BE INSTALLED ON LIGHTBEACONS****REQUIREMENTS AND TECHNICAL SPECIFICATIONS**

<i>AtoN means Aid to Navigation</i>
<i>Range is in Nautical Miles (NM)</i>
<i>Transmission Connectivity is to be 0.80</i>

No.	Location/Description	Application	Colour	Range of Light (NM)	Lantern Model
1	Cakau Davui Reef	Fixed AtoN	White	5 NM	M850
2	Cakaulase Reef	Fixed AtoN	Green	5 NM	M850
3	Cakaulala Reef	Fixed AtoN	Red	5 NM	M850
4	Qoma Lilai Reef	Fixed AtoN	Green	5 NM	M850
5	Natovi Reef	Fixed AtoN	Green	5 NM	M850
6	Cokota Reef	Fixed AtoN	Red	5 NM	M850
7	Reef - SW of Ramsay Reef	Fixed AtoN	Green	5 NM	M850
8	Reef - NE of Nukulevu Is	Fixed AtoN	Red	5 NM	M850
9	Nodrakoroiwai Reef	Fixed AtoN	White	5NM	M850
10	Clifton Reefs - south side	Fixed AtoN	White	5 NM	M850
11	Reef - W of Vunisinu Pt	Fixed AtoN	White	5 NM	M850
12	Reef – N of Vatu-i-ra Channel	Fixed AtoN	Green	5 NM	M850
13	Reef – Far N of Vatu-i-ra Channel	Fixed AtoN	Red	5 NM	M850
14	Isolated Patch	Fixed AtoN	White	5 NM	M850
15	Isolated Patch	Fixed AtoN	White	5 NM	M850
16	Underwater Rocks	Fixed AtoN	Red	5 NM	M850
17	Shallow Water Rocks	Fixed AtoN	Red	5 NM	M850
18	Reef – Far SW of Coconut Pt	Fixed AtoN	Red	5 NM	M850
19	Reef off Nabouwalu Wharf	Fixed AtoN	Green	5 NM	M850
20	Reef off Nabouwalu Wharf	Fixed AtoN	Green	5 NM	M850
21	Reef off Nabouwalu Wharf	Fixed AtoN	Green	5 NM	M850

**Technical Specification:**

The products should:

- be made of rugged injection moulded aluminium housing and body of UV resistant polyethylene
- have integrated flasher with day-light switch and solar charger
- have standard maintenance free battery and ventilated battery compartment with minimum lifetime of 5 years
- be adjustable intensity & range
- be programmable with Bluetooth Control mobile application
- be wireless easy programmable
- have auxiliary connector for external charger
- offer excellent value and extremely reliable operation

- be fully waterproof
- be vibration proof
- be vandal resistant
- be bird deterrent

### **Other Requirements**

The vendor should provide:

- full support and timely backup service
- training and advice specific to installation, maintenance and replacements.
- the manufacturer/supplier should be an Industrial Member of the International Association of Lighthouses Authorities & Marine Aids to Navigation (IALA).

# MARITIME SAFETY AUTHORITY OF FIJI

## PROPOSED CONSTRUCTION AND INSTALLATION OF LIGHT-BEACONS BETWEEN NATOVI - NABOUWALU - OVALAU WATERWAYS

drawing schedule

### STRUCTURAL DRAWINGS :

- 01 - BEACON LAYOUT PLAN - AREA 1 - NATOVI JETTY TO CAKAU DAVUI & OVALU
- 02 - BEACON LAYOUT PLAN - AREA 2 - VATU - i - RA CHANNEL TO NABOUWALU WHARF
- 03 - LIGHT BEACON LOCATIONS, CO-ORDINATES & TOPMARK COLOURS
- 04 - GENERAL ELEVATION
- 05 - STEEL LUG FIXING, SPLICING & TOE DETAILS
- 06 - REINFORCEMENT DETAILS
- 07 - LANTERN & TOPMARK DETAILS
- 08 - STANDARD TOPMARK SYSTEM IN FIJI

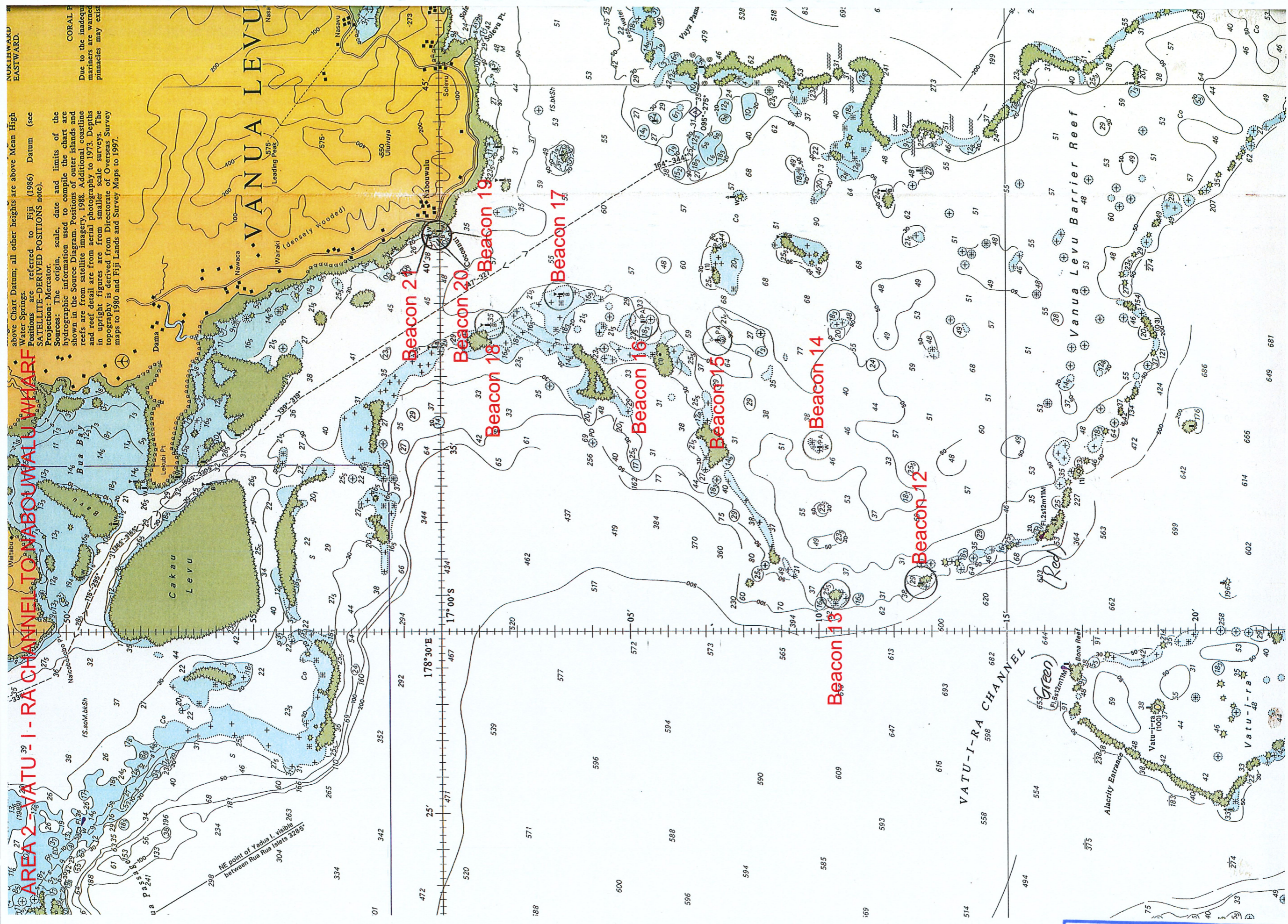
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above Chart Datum; all other heights are above Mean High Water Springs. POSITIONS are referred to Fiji (1986) Datum (see SATELLITE-DERIVED POSITIONS note). Projection: Mercator. Sources: The origin, scale, date and limits of the hydrographic information used to compile the chart are shown in the Source Diagram. Positions of outer islands and reef detail are from aerial photography to 1973. Depths in upright figures are from smaller scale surveys. The topography is derived from Directorate of Overseas Survey maps to 1980 and Fiji Lands and Survey Maps to 1997.

CORAL REEF  
Due to the inadequate information available, mariners are warned that pinnacles may exist.

MINISTRY OF PUBLIC WORKS TRANSPORT & METEOROLOGICAL SERVICES  
PROPOSED CONSTRUCTION & INSTALLATION OF LIGHT BEACONS  
NATUVI - NABOUWALU - OVALAU WATERWAYS

Client: MARITIME SAFETY AUTHORITY OF FIJI

Project No.	T. Vakdravuyaca
Project Name	A. Pene
Project Authority	K.M. Zahidul
Drawn	Zahidul
TD	TD
Check Date	Sept 23
Check Name	

Scale: NTS  
Project No. STR 1541  
Sheet No. 02  
BEACON LAYOUT PLAN ON NAVIGATION CHART AREA 2  
VATU-I-RA CHANNEL TO NABUWALU WHARF

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**LIGHT BEACON LOCATIONS & COORDINATES AREA 1  
NATOVI TO CAKAU DAVUI & OVALAU**

No.	PROPOSED LOCATIONS	LATITUDE (SOUTH)	LONGITUDE (SOUTH)	TYPE OF TOPMARK REQUIRED	TOPMARK COLOUR	MARINE LIGHT REQUIRED
1	CAKAU DAVUI REEF	17° 29'.836	178° 35'.477	ISOLATED DANGER	BLACK / RED	WHITE
2	CAKAULASE REEF	17° 36'.107	178° 35'.695	STARBOARD LATERAL	GREEN	GREEN
3	CAKAULALA REEF	17° 36'.958	178° 36'.840	PORT LATERAL	RED	RED
4	QOMA LAILAI REEF	17° 38'.531	178° 35'.973	STARBOARD LATERAL	GREEN	GREEN
5	NATOVI REEF	17° 40'.357	178° 35'.367	STARBOARD LATERAL	GREEN	GREEN
6	COKOTA REEF	17° 40'.310	178° 35'.600	PORT LATERAL	RED	RED
7	REEF-SW OF RAMSAY REEF	17° 40'.401	178° 35'.986	STARBOARD LATERAL	GREEN	GREEN
8	REEF-NE OF NUKULEVU ISLAND	17° 40'.036	178° 35'.631	PORT LATERAL	RED	RED
9	NODRAKOROIWAI REEF	17° 40'.226	178° 39'.126	ISOLATED DANGER	BLACK	WHITE
10	CLIFTON REEFS-SOUTH SIDE	17° 41'.527	178° 41'.721	SOUTH CARDINAL	WHITE	WHITE
11	REEF-W OF VUNISINU Pt	17° 38'.702	178° 43'.992	WEST CARDINAL	WHITE	WHITE

**LIGHT BEACON LOCATIONS & COORDINATES AREA 2  
VATU -i- RA CHANNEL TO NABOUWALU WHARF**

No.	PROPOSED LOCATIONS	LATITUDE (SOUTH)	LONGITUDE (SOUTH)	TYPE OF TOPMARK REQUIRED	TOPMARK COLOUR	MARINE LIGHT REQUIRED
12	REEF-N OF VATU-I-RA CHANNEL	17° 12'.635	178° 31'.250	STARBOARD LATERAL	GREEN	GREEN
13	REEF-FAR N OF VATU-I-RA CHANNEL	17° 10'.611	178° 31'.103	PORT LATERAL	RED	RED
14	ISOLATED PATCH	17° 10'.123	178° 35'.077	ISOLATED DANGER	WHITE	WHITE
15	ISOLATED PATCH	17° 07'.372	178° 38'.005	ISOLATED DANGER	WHITE	WHITE
16	UNDERWATER ROCKS	17° 05'.421	178° 38'.483	PORT LATERAL	RED	RED
17	SHALLOW WATER ROCKS	17° 03'.242	178° 39'.262	PORT LATERAL	RED	RED
18	REEF-FAR SW OF COCOANUT PT	17° 01'.304	178° 38'.402	PORT LATERAL	RED	RED
19	REEF OFF NABOUWALU WHARF	17° 00'.012	178° 41'.004	STARBOARD LATERAL	GREEN	GREEN
20	REEF OFF NABOUWALU WHARF	16° 59'.965	178° 40'.843	STARBOARD LATERAL	GREEN	GREEN
21	REEF OFF NABOUWALU WHARF	16° 59'.757	178° 40'.808	STARBOARD LATERAL	GREEN	GREEN

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Project  
PROPOSED CONSTRUCTION & INSTALLATION OF LIGHT BEACONS  
NATOVI - NABOUWALU - OVALAU WATERWAYS

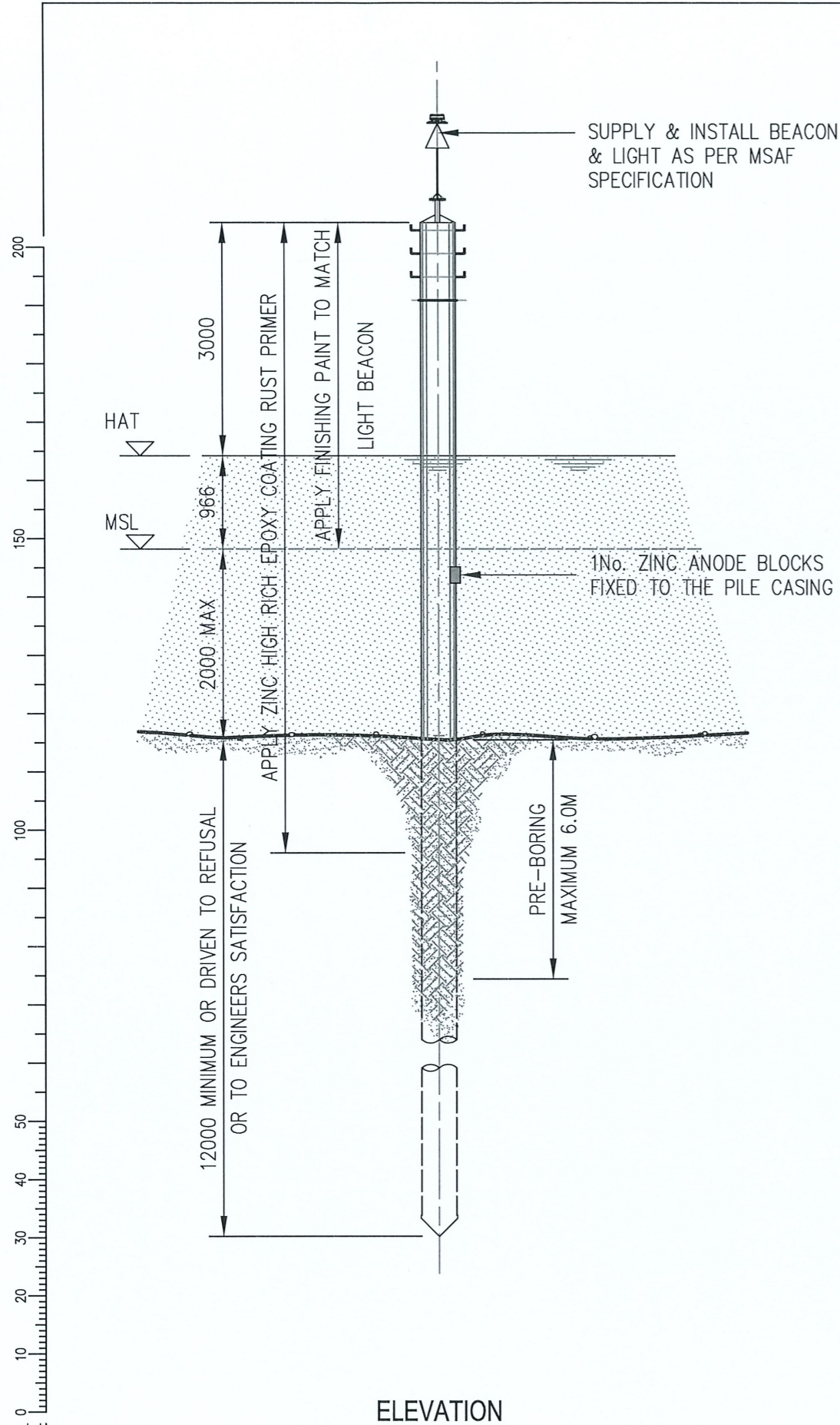
Client  
MARITIME SAFETY AUTHORITY OF FIJI

perm. sec. for Infrastructure	section head		
T. Vakadravuyaca	A. Pene		
principle arch/eng	project arch/eng		
K.M. Zahidul			
surveyed	designed	drawn	amend
	Zahidul	TD	
checked	date	head subhead	check date
	Sept 23		

Title  
**LIGHT BEACON LOCATIONS,  
COORDINATES & TOPMARK COLORS**

Scale  
NTS  
Project No  
**STR 1541**  
Sheet No  
03  
Rev.

No.	Date	Revision	By



ELEVATION

NOTE:

1. IF THE MSL TO SEA BED DEPTH IS IN EXCESS OF 2000mm, MOVE LOCATION WITHIN REEF ZONE AS PER THE ALLOWABLE DEPTH OF 2000mm.
2. PRE-BORING USE PILE DRILLING MACHINE  $\phi$ 360MM. DRILLING MACHINE TO BE EQUIPPED WITH DIAMOND CUTTING HEAD.
3. SUPPLY AND INSTALL BEACON TOPMARKS AND SOLAR LED MARINE LANTERN AS PER THE MSAF SPECIFICATION ATTACHED REFER TO SHT 08.
4. APPLY 2 COATS PRIMER TO STEEL PILE CASING, AT LEAST 9.0M FROM TOP OF THE PILE FOR RUST PROTECTION. HIGH ZINC EPOXY OR SIMILAR PRIMER MARINE GRADE AND APPLIED AS PER THE MANUFACTURERS SPECIFICATION.
5. APPLY 2 COATS FINISHING PAINT FROM THE LOW WATER MARK LEVEL TO THE TOP OF PILE AS DAYMARK. THE PAINT COLOR TO MATCH WITH THE COLOR OF THE BEACONS AND LIGHTS. (HIGH ZINC EPOXY OR SIMILAR MARINE GRADE).
6. SUPPLY AND INSTALL 1NO. OF ZINC ANODE TO THE STEEL PILE UNDER WATER

Notes

1. CONCRETE TO HAVE A CYLINDER STRENGTH OF 50MPa AT 28 DAYS.
2. PILES USED: CIRCULAR HOLLOW PILE.
3. FOR SINGLE ACTING PILE DRIVER WITH 4.0 TONNE HAMMER AND 6FT (1828MM) STROKE AND PILE HEAD FITTED WITH TIMBER DOLLY SET'S TO BE 30MM FOR LAST 10 BLOWS. IF ANY DIFFERENCES TO SPECIFICATION THE DESIGN ENGINEER SHOULD BE CONTACTED.

4. IN THE PROCESS OF DRIVING WHEN THE PILE HAS REACHED THE ROCK LEVEL WHICH IS INDICATED BY THE SUDDEN REDUCTION IN SET BLOWS, THE STROKE SHOULD BE REDUCED IN THE NEXT FEW BLOWS TO ALLOW THE PILE TO BE EMBEDDED INTO ROCK.

no. date details

amendments

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approval

approval

client

MARITIME SAFETY AUTHORITY  
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perm. sec. for MPWTMS section head

T.Vakadravuyada A.Pene

principle architect project architect

K.M.Zahidul

surveyed designed drawn amend

K.M.Z MA

checked date head subhead

Sept 23

MINISTRY OF PUBLIC WORKS TRANSPORT & METEOROLOGICAL SERVICES

project

PROPOSED CONSTRUCTION & INSTALLATION OF LIGHT BEACONS

block/sub proj.

NATOLI - NABOUWALU - OVALAU WATERWAYS

drawing title

GENERAL ELEVATION

scale

1:75

connected drawings

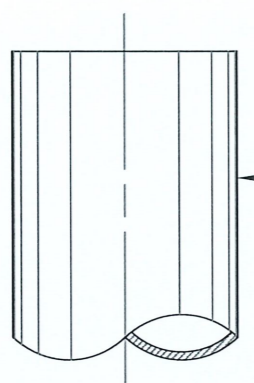
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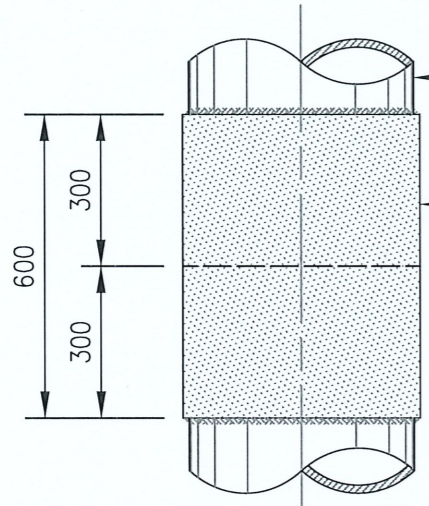
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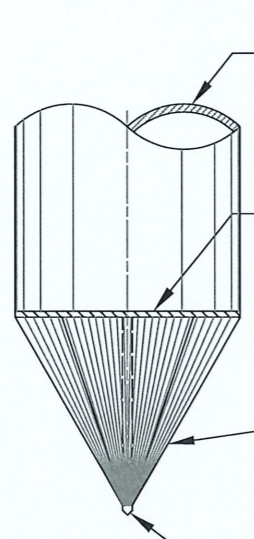


Ø355.6x12.7mm SPIRAL SEAM OR SEAMLESS TUBULAR PIPE



Ø355.6x12.7mm SPIRAL SEAM OR SEAMLESS TUBULAR STEEL PIPE  
12mm THICK STEEL PLATE WRAPPED AROUND STEEL TUBE, WELDED ALL AROUND

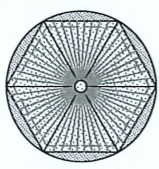
**SPLICE DETAILS**



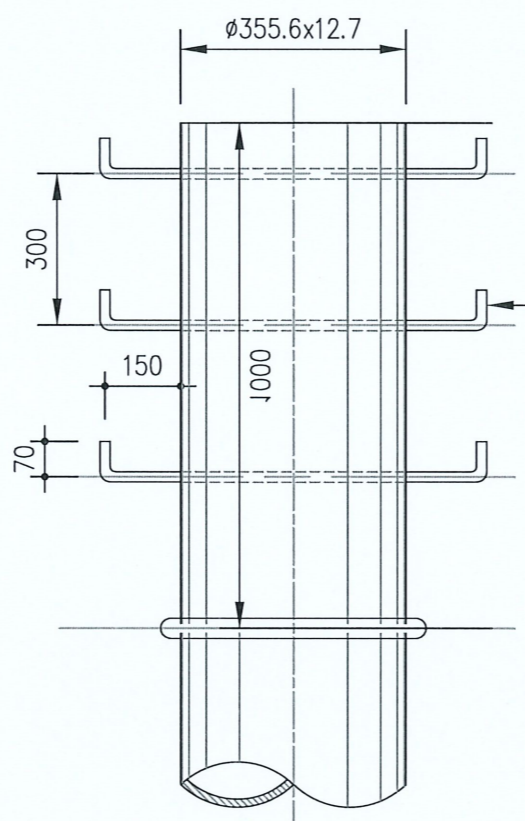
Ø355.6x12.7mm SPIRAL SEAM OR SEAMLESS TUBULAR STEEL PIPE  
12mm THICK STEEL PLATE WELDED TO STEEL TUBE, WELD ALL AROUND  
12mm THICK STEEL PLATE WELDED TO BASE PLATE AND ROD WITH HEXAGONAL PYRAMID SHAPE, WELD ALL AROUND  
ROCK BREAKER WELDED TO BASE PLATE



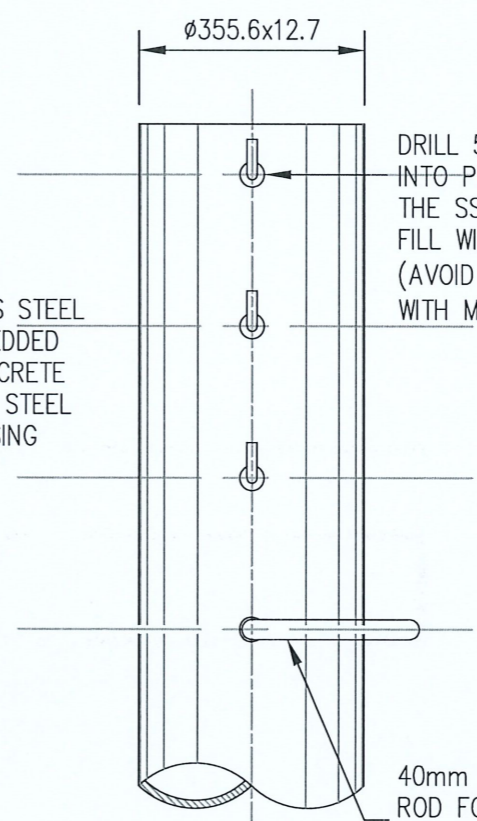
**STEEL TUBE TOE DETAILS**



**VIEW 'A'**



**FRONT VIEW**



**END VIEW**

**STAINLESS STEEL LUG BAR DETAILS**

3No. R20 STAINLESS STEEL LUG EMBEDDED INTO CONCRETE THROUGH STEEL TUBE CASING

DRILL 50mm DIA HOLE INTO PILE CASING FOR THE SS LADDER RUNG. FILL WITH SIKA ADHESIVE (AVOID CONTACT OF SS WITH MS)

40mm STAINLESS STEEL ROD FOR THE PORTABLE/REMOVAL LADDER SUPPORT

**Notes**

- STEEL PILE GRADE TO BE 350MPa.
- ALL WELD TO BE STRUCTURAL GRADE AND CONTINUOUS FILLET WELD.
- ALLOW FOR SEALING WITH SIKA ADHESIVE TO PREVENT THE CONNECTION BETWEEN THE STAINLESS STEEL AND TUBULAR STEEL PILE.
- ALL REINFORCING STEEL GRADE TO BE HIGH TENSILE 500MPa
- CONCRETE STRENGTH TO BE 40MPa. SELF COMPACTING READY MIX.
- SS DENOTED "STAINLESS STEEL"

no.	date	details

**amendments**

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surveyed	designed	drawn	amend
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checked	date	head subhead	
	Sept 23		

MINISTRY OF PUBLIC WORKS TRANSPORT & METEOROLOGICAL SERVICES

project: PROPOSED CONSTRUCTION & INSTALLATION OF LIGHT BEACONS

block/sub proj: NATOVI - NABOUWALU - OVALAU WATERWAYS

drawing title: **STEEL LUG FIXING, SPLICING & TOE DETAIL**

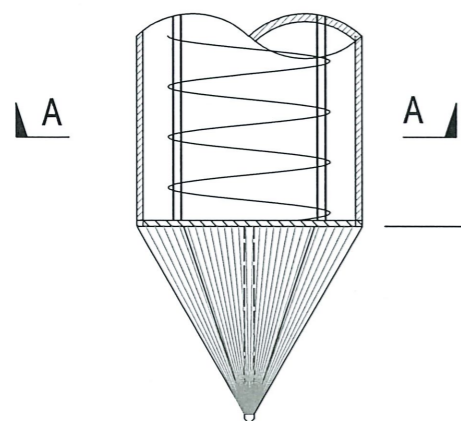
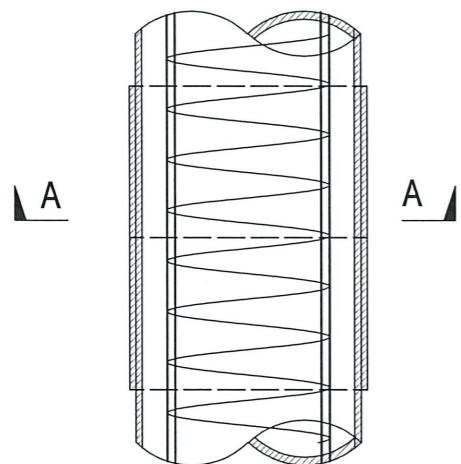
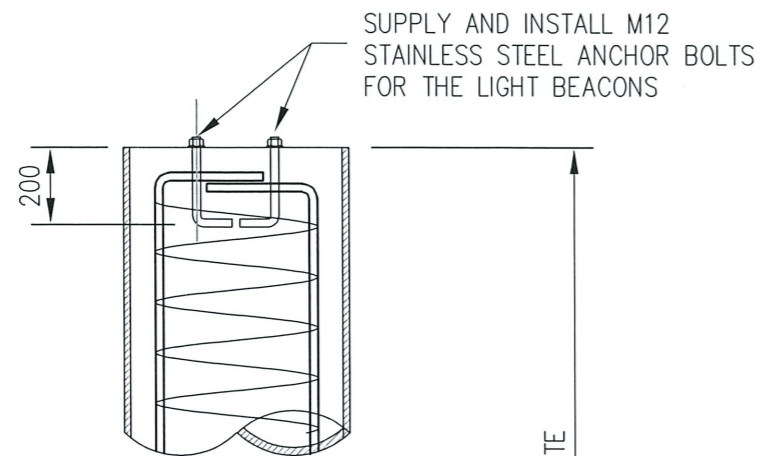
scale: 1:5 1:15

connected drawings:  

location no.	building no.	file no.
project no.	sheet no.	amend
STR 1541	05	

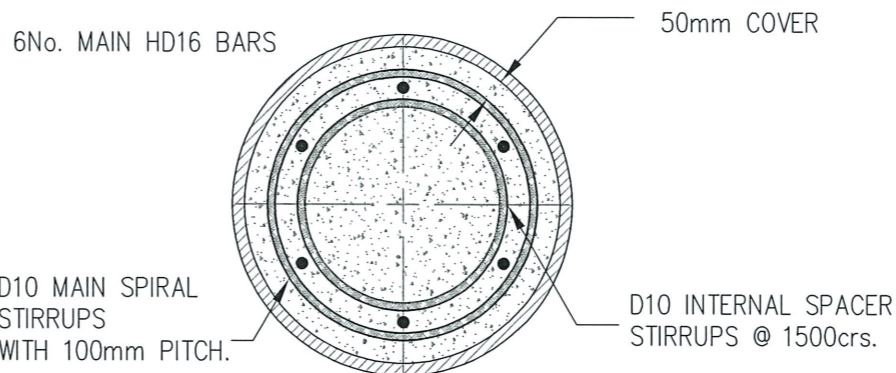
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A3 ORIGINAL PAPER SIZE



CONTINUOUS REINFORCING STEEL CAGE WITH 50MPa CONCRETE

**STEEL TUBE REINFORCEMENT DETAILS**



**TYPICAL CROSS - SECTION THROUGH STEEL TUBE SHOWING REINFORCEMENT**

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**Notes**

10. ALL STAINLESS STEEL TO BE GRADE 316 OR SIMILAR.

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	<b>Sept 23</b>		

MINISTRY OF PUBLIC WORKS TRANSPORT & METEOROLOGICAL SERVICES

project  
**PROPOSED CONSTRUCTION & INSTALLATION OF LIGHT BEACONS**

block/sub project  
**NATOVI - NABOUWALU - OVALAU WATERWAYS**

drawing title  
**REINFORCEMENT DETAILS**

scale  
**1:5 1:15**

connected drawings

location no.	building no.	file no.

project no.	sheet no.	amend
<b>STR 1541</b>	<b>06</b>	

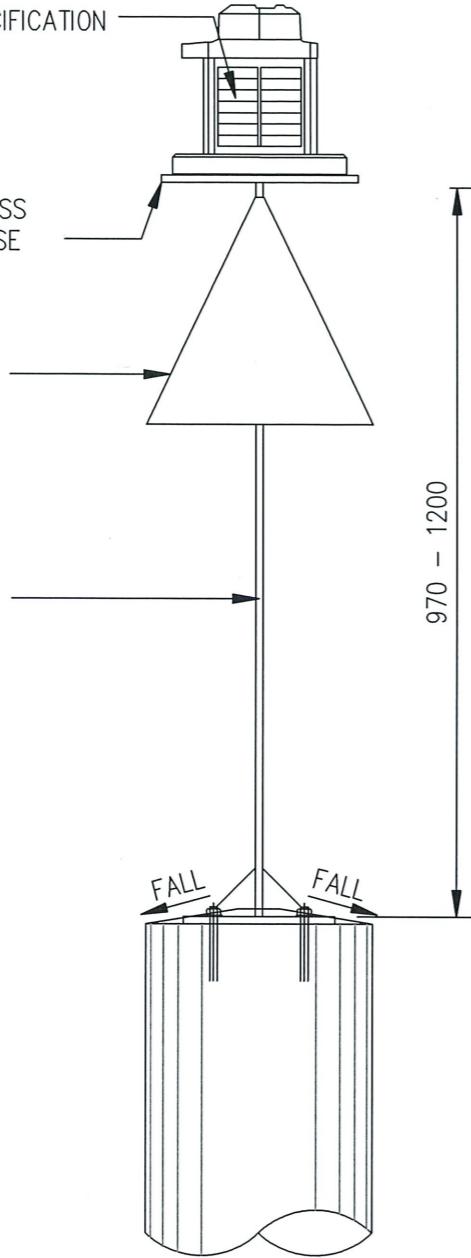
A3 ORIGINAL PAPER SIZE

LANTERN  
AS PER MSAF SPECIFICATION

5MM THICK STAINLESS  
STEEL LANTERN BASE  
PLATE

TOP MARK  
AS REQUIRED  
(EITHER CAN, CONE  
etc - REFER MSAF  
TOP MARK  
SPECIFICATION

30mm x 3mm WT  
STAINLESS STEEL  
TOP MARK STAND  
AS PER  
MANUFACTURERS  
DETAILS



**LANTERN**

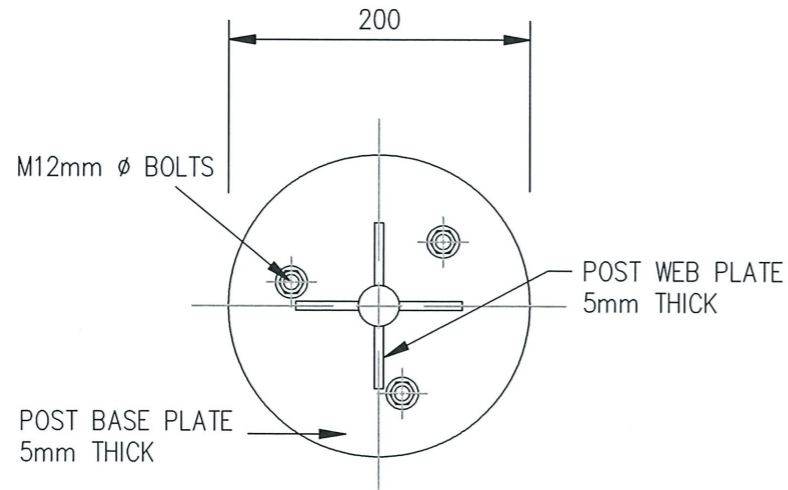
1. ALL LANTERNS TO BE SELF CONTAINED LED MARINE LANTERN , HIGH PERFORMANCE AND LOW MAINTENANCE
2. THE LANTERNS SHOULD HAVE PROVISIONS FOR BATTERY REPLACEMENT AND SHOULD HAVE SERVICE LIFE BEYOND 5 YEARS
3. THE COLORS TO BE STANDARD IALA COLORS AS PER PAGE 08

**TOP MARK**

1. THE TOP MARK SHOULD BE UV-STABILIZED POLYETHYLENE

**TOP MARK CONNECTION**

SCALE: 1-10



**POST BASE DETAIL**

SCALE: 1-5

**Notes**

no. date details

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	K.M.Z	MA	
checked	date	head subhead	
	Sept 23		

MINISTRY OF PUBLIC WORKS TRANSPORT  
& METEOROLOGICAL SERVICES

project  
**PROPOSED CONSTRUCTION &  
INSTALLATION OF LIGHT BEACONS**

block/sub proj  
**NATIVI - NABOUWALU - OVALAU  
WATERWAYS**

drawing title  
**LANTERN & TOPMARK  
DETAILS**

scale  
1:40, 1:20

connected drawings

location no.  
building no. File no.

project no. sheet no. amend



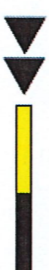

STR 1541 07

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# SYSTEM OF BEACONAGE IN FIJI WATERS

## USING THE INTERNATIONAL ASSOCIATION OF MARINE AIDS TO NAVIGATION & LIGHTHOUSE AUTHORITIES (IALA) REGION A SYSTEM


### CARDINAL MARKS

<p><i>NORTH CARDINAL MARK</i></p> <p><b>Colour:</b> Black above yellow</p> <p><b>Shape:</b> Spar</p> <p><b>Topmark:</b> 2 black cones, one above the other, points upward</p>	
<p><i>EAST CARDINAL MARK</i></p> <p><b>Colour:</b> Black with a single broad horizontal yellow band</p> <p><b>Shape:</b> Spar</p> <p><b>Topmark:</b> 2 Black cones, one above the other, base to base</p>	
<p><i>SOUTH CARDINAL MARK</i></p> <p><b>Colour:</b> Yellow above black</p> <p><b>Shape:</b> Spar</p> <p><b>Topmark:</b> 2 Black cones, one above the other, points downward</p>	
<p><i>WEST CARDINAL MARK</i></p> <p><b>Colour:</b> Yellow with a single broad horizontal black band</p> <p><b>Shape:</b> Spar</p> <p><b>Topmark:</b> 2 Black cones, one above the other, point to point</p>	

### LATERAL MARKS

<p><i>PORT HAND MARKS</i></p> <p><b>Colour:</b> Red</p> <p><b>Shape:</b> Spar</p> <p><b>Topmark:</b> Single red cylinder (can)</p>	
<p><i>STARBOARD HAND MARKS</i></p> <p><b>Colour:</b> Green</p> <p><b>Shape:</b> Spar</p> <p><b>Topmark:</b> Single green cone, point upward</p>	

### ISOLATED DANGER MARK

<p><i>ISOLATED DANGER MARK</i></p> <p><b>Colour:</b> Black with one or more horizontal red bands</p> <p><b>Shape:</b> Spar</p> <p><b>Topmark:</b> 2 Black spheres, one above the other</p>	
--	---

### Notes

MARINE GRADE PAINTS IS TO BE APPLIED ON BEACON AS PER TOP MARK COLOR:

	TOPMARK COLOR	BEACON COLOR
I	RED	RED
II	GREEN	GREEN
III	BLACK (SPHERES)	BLACK
IV	BLACK (CONE)	BLACK

A3 ORIGINAL PAPER SIZE

no.	date	details
<b>amendments</b>		
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checked	date	head subhead
	Sept 23	
MINISTRY OF PUBLIC WORKS TRANSPORT & METEOROLOGICAL SERVICES		
project		
PROPOSED CONSTRUCTION & INSTALLATION OF LIGHT BEACONS		
book/sub part		
NATOVI - NABOUWALU - OVALAU WATERWAYS		
drawing title		
STANDARD TOPMARK SYSTEM IN FIJI		
scale		
connected drawings		
location no.		
building no.	file no.	
project no.		
STR 1541		sheet no.
		08
amend		

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