



Request for Tender

MSAF Tender No.02/2022

for the

CONSTRUCTION OF SUVA HARBOUR – NORTH EAST END LIGHTHOUSE

Date of Issue	18 August 2022
Closing Date	12 September 2022
Lodgment Address	MSAF Tender Box Level 4, Kadavu House, 414 Victoria Parade, Suva, Fiji.

REQUEST FOR TENDER

PROJECT: CONSTRUCTION OF SUVA HARBOUR – NORTH EAST END LIGHTHOUSE

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for the

Construction of Suva Harbour – North East End Lighthouse

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FORM OF TENDER

(To be submitted with the Tender Submission)

Tender for:

CONSTRUCTION OF SUVA HARBOUR – NORTH EAST END LIGHTHOUSE

Name of Tenderer.....

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

(in words and numbers)

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

TOTAL TENDER PRICE (F\$VIP)

The above fixed Lump Sum must include VAT (9%) and with no provision for fluctuations in the cost of Labour and Materials.

As witness our hands this day of, 2022.

Tenderer's Name:

Signature:

Office Stamp

Address:

Witness (Name in Capitals).....

Signature:

Address

Occupation

APPENDIX 1**PROJECT DURATION AND COMPLETION DETAILS****Tender for:****CONSTRUCTION OF SUVA HARBOUR – NORTH EAST END LIGHTHOUSE**

- a) Duration : 15 Calendar Weeks
- b) Defects Liability Period (Clause 15, 16 & 30) * : 12 months
- c) Retention : 10% at 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

All prices to be in Fijian 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**

	Trade Description	Total Cost
A		
1.0	Preliminaries & General	
2.0	Demolition	
3.0	Mobilization & Setting out	
4.0	Piling Works	
5.0	Pre boring	
6.0	Pile sleeve and concreting	
7.0	Reinforcing steel	
8.0	Concrete Pylon	
9.0	Concrete Platform	
10.0	Stainless Steel Works	
11.0	Painting	
12.0	Contingency 10%	
	Sub Total	
	plus VAT (9%)	
	TOTAL TENDERED SUM	

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 applicable 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 it in the spaces provided.

3.2 Labour Rates Summary

Item	Job Classification (Trades)	Hourly Rate (\$)
01	Supervisor	
02	Foreman	
03	Welder	
04	Carpenter	
05	Leading Hand	
06	Painter	
07	Labour	
08	Diver	
09	Machinery operator	
10	<i>(Please enter other Trades as required for this project)</i>	
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		

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 it in the spaces provided.

Item	Plant/Equipment Classification	Hourly Rate (\$)
01	Concrete Mixer	
02	Welding Plant	
03	Barge	
04	Vibro/Drop Hammer	
05	Rotary Hammer Drill	
06	Electrical Saw	
07	Pile driver	
08	Auger	
09	<i>(Please enter other Plants & Equipment required for this project)</i>	
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

APPENDIX 5

ADDITIONAL INFORMATION REQUIRED FROM ALL TENDERERS

Project:

CONSTRUCTION OF SUVA HARBOUR – NORTH EAST END LIGHTHOUSE

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 the spaces provided below.*
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:

Fax 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 the spaces provided below.*
- 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.

2020	2021

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

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, financial status and overdraft facilities.

Notes to Tenderers

1. Please fill-in clearly and neatly the spaces provided below.
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:
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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, will be purchased or hired.

Notes to Tenderers

1. Please fill-in clearly and neatly the spaces provided below.
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.

D RESOURCES: OTHER

1. State any part of the works to be undertaken by subcontractor(s), if any, and give name(s) and address of the subcontractor(s).

2. Provide details of ‘off-site’ fabrication available to the Tenderer.

3. Provide Tentative Work Program (Bar Chart).

Notes to Tenderers

1. *Please fill-in clearly and neatly the spaces provided below.*
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

Construction of Suva Harbour – North East End Lighthouse

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- 16.0 Liquidated and Ascertained Damages
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- 18.0 Retention
- 19.0 Defects Liability Period
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1.0 General Description of the Scope of Works

The scope of work entails all necessary works for the **CONSTRUCTION OF SUVA HARBOUR – NORTH EAST END LIGHTHOUSE**.

2.0 Tenderer to Inform Himself

- 2.1 The tenderer shall inspect and examine the structural drawings including the 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. This shall be satisfied before the submission of the tender. The tenderer should also have a clear understanding of the quantity of the 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 an arrangement with MSAF before submitting the tender.

3.0 Detailed Description of the Work

The extent of this Contract includes supply of all materials, labour and plant for the execution of the said complete project and be in accordance with the specifications and structural drawings.

4.0 Tenders

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

Request for Tender – MSAF Tender 02/2022
“CONSTRUCTION OF SUVA HARBOUR – NORTH EAST END LIGHTHOUSE”

and addressed to:

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

The Tender shall arrive no later than **12 September 2022 at 1500 hours**. (Late tenders will not be accepted).

- 4.2 Any tender need not necessarily be accepted.
- 4.3 Maritime Safety Authority of Fiji reserves the right to REDUCE THE SCOPE OF WORKS to suit budgetary requirements. This will be decided prior to the contract signing.
- 4.4 All clarification/discrepancies on tender documents must be made and resolved before closing of tenders either 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 render the tender invalid.

6.0 Tender Documents

- 6.1 The documents for this Tender (inclusive in the contract) shall comprise the following:
 - a) Tender Letter
 - b) Conditions of Tender
 - c) Form of Tender
 - d) Specification
 - e) Structural Drawing

If there are discrepancies or a divergence between two or more of the documents including a divergence between parts of anyone 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 Main 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/DBGA 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 Bar Charts

- 8.1 The tenderer shall within 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 to indicate the progress throughout the construction period.

9.0 Site Meetings

- 9.1 MSAF/DBGA shall arrange meetings with the contractor and sub-contractors (as necessary). Minutes of the meetings shall be recorded by MSAF/DBGA.
- 9.2 The Minutes of the meeting shall be written by a member of the technical team and circulated to all concerned.

10.0 Inspection of Works

10.1 MSAF/DBGGA 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 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 equivalent of 10% of the Contract Sum. 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 Valuation

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

14.0 Delays / Time Extensions

14.1 Period of delay and extension of time shall be allowed for a maximum of 1 month.

15.0 Completion

15.1 At completion, remove from the work site all plant, equipment, surplus materials, wastes and clean up the work site. Make good where necessary (checked and determined by MSAF/DBGGA) 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 **\$200.00 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 **10%** at the end of Defect Liability Period.

19.0 Defects Liability Period

19.1 The period shall be twelve (12) months.

20.0 Insurance

20.1 The following shall be complied by the Contractor to insure against injury to persons and property:

- a) A policy indemnifying the Contractor against his legal liability under the Accidents Compensation Act 2017;
- b) A policy Specified related to this building contract and indemnifying the Contractor against his legal liability to the General Public to an amount not less than \$2,000,000.00; 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 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: 3315266 or Mobile: 9906331

Or

Director Buildings & Government Architect
Ministry of Infrastructure & Meteorological Services
Phone: 3384111

SECTION 3: GENERAL SPECIFICATION

for the

Construction of Suva Harbour – North East End Lighthouse

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/DBGA in writing of any ambiguities or discrepancies in the specifications. The MSAF/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. Definitions

“MSAF” means Maritime Safety Authority of Fiji

“DBGA” means Department of Buildings & Government Architect, Ministry of Infrastructure & Transport

“BSS” means British Standard Specification

“AS” means Australian Standard

“NZS” means New Zealand Standard

“Standard Contract” means Fiji Standard Form of Building Contract

1.2. Project Description

- 1.2.1. The document is for the Construction of Suva Harbour – North East End Lighthouse to replace the existing light-beacon. The light-beacon is situated on the north east edge of Nukusaga Reef at Latitude 18° 08'.027 South, 178° 23'.728 East. Refer to the locality diagram on Sheet 01 of the Structural Drawing and navigation chart extract.

1.3. Scope of Work

- 1.3.1. The work covered under this Contract is the demolition of the existing light beacon and Construction of Single Pile Light Tower. The proposed new structure is to be built in shallower depth, 100 metres west of existing light-beacon towards the reef edge.

1.4. The Site

- 1.4.1. The location of the work 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.

1.5. Access to Site

- 1.5.1. Access to the site is by boat from Suva wharves or Lami. Distance is approximately 1.7 nautical miles from the Fiji Industries Jetty, Lami. The Contractor is to obtain permission from MSAF to access the site.

1.6. Non-Interference with Local Operation

- 1.6.1. 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.

1.7. Security

- 1.7.1. 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.

1.8. Contractor's Superintendent

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

1.9. Existing Services

- 1.9.1. The Contractor shall, prior to the commencement of work on site, 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.

1.10. Water, Electricity and Telephone

- 1.10.1. 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.

1.11. Stand-Down

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

1.12. Construction Programme

- 1.12.1. 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 bar chart with interlinked activities and shall update and improve the programme submitted with the Contractor's Tender. Critical dates determined shall clearly be shown.
- 1.12.2. At the end of each month the Contractor shall furnish MSAF/DBGA with the following information in writing:
- a) The actual starting dates of all activities commence during the month;
 - b) The actual dates of completion of activities concluded during the month;
 - c) The current status of all work underway at the time of the report; and
 - d) The reasons for any discrepancies between the Construction Programme and the progress as achieved under Sections (a) and (c) above, together with the Contractor's proposals for ensuring that all key and critical dates are achieved.
- 1.12.3. The Contractor shall fourteen (14) days prior to making major revisions in the Construction Programme, advise MSAF/DBGA of such revisions. Any such revision shall be subject to MSAF/DBGA's approval.
- 1.12.4. MSAF/DBGA reserves the right to review the progress of the works from time to time and the Contractor shall assist with such reviews. MSAF/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 the execution of any part of his/her works, it is the Contractor's responsibility to revise the programme in order to minimise the effect of any such delays.

1.13. Method of Work Statement

- 1.13.1. The Contractor shall prepare and submit for approval by MSAF/DBGGA 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;
 - f) a detailed site preparation and method for the disposal of the unwanted material; and
 - g) approval by MSAF/DBGGA 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.

1.14. Permits, Certificates and other Consents

- 1.14.1. The Contractor shall obtain necessary permits, certificates and other like consents from Government and Local Authorities and shall submit all such permits to MSAF/DBGGA.

1.15. Contractor's Works and Establishment Areas

- 1.15.1. The Contractor is responsible for making all arrangements and meeting all costs for 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 and until the Contractor obtains written permission from MSAF.
- 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 MSAF.
- 1.16.3. The Contractor shall confine his construction operations within the site, or such other areas as maybe negotiated and provided by 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 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 MSAF/DBGGA with a fully detailed return of all plant and personnel employed on the Works. Any additions or reductions shall thereafter be notified weekly within two (2) working days of the end of the weekly period.
- 1.18.2. The return shall differentiate between plant owned by the Contractor and that which is hired. In the case of hired plant, the return shall state from whom the plant has been hired, the size, capacity, output and the power rating of all plant.
- 1.18.3. The labour return shall show by trades the number of workers 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 MSAF/DBGGA any other records relating to work under the Contract which MSAF/DBGGA 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 MSAF/DBGGA 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 MSAF/DBGGA 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. 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 (1) copy of each photograph must be submitted to MSAF for its 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 a duplicate photographic record of each Site and any adjacent offshore areas, identified disposal site, structures, roads, fields and crops and at his expense shall supply progress photographs 150mm by 100mm in size (including digital copies) at monthly intervals. All photographs shall be annotated with the date and location.

1.21. 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/DBGGA 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/DBGGA.
- 1.21.3 Changes in resources employed on any items of Day work shall only be made with the written permission of MSAF/DBGGA.
- 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 the DBGGA 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 the DBGGA 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/DBGGA.
 - c) **Hire of Plant and Equipment**
 - i) 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.
- 1.21.5 Payment of Day work shall be made in accordance with following provisions:-
- a) **Generally**
 - i) 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 DBGGA or his authorized representative, duplicate copies of daily time sheets recording the amount of plant and labour so utilised for verification.

- ii) After verification, DBGA 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 28 days of the work being completed.
- iii) 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 on other work.

b) Labour

- i) 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.
- ii) 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/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 meeting with MSAF/DBGAs to discuss the progress of the Contract. Meetings shall be held once every month and additional meetings may be called by MSAF/DBGAs when required.
- 1.22.2 MSAF/DBGAs 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 by all parties.

1.23 Inspection

- 1.23.1 The Contractor shall be required:
 - a) To furnish, upon the request of MSAF/DBGAs or his authorized representative, any Government official, or authorized representative, with the use of such boats, boatmen and labourers reasonably necessary for the purposes of inspecting and supervising the work.
 - b) To furnish, upon the request of MSAF/DBGAs or his authorised representative, suitable transportation from all points on shore designated by MSAF/DBGAs, 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/DBGA, and the cost thereof will be deducted from any amounts due or to become due to the Contractor.

1.24 DBGA's Reasonable Satisfaction

- 1.24.1 No expression of MSAF/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 this contract in writing by MSAF/DBGA.

1.25 Delays

1.25.1 DELAY BY INCLEMENT WEATHER AND CRITICAL PATH

- a) Only those elements indicated on the Critical Path 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 moderate to heavy rainfall.
 - 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 20 have been adhered to.

SECTION 2

2. DEMOLITION

- 2.1 The existing single concrete pile light-beacon has to be cut from bottom end (at the sea bed level) and tilted over to rest on the sea bed.

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 with 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' 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 tomming 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 STR 1647. 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 +25mm - 5mm

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 metre of pile length.

3.6 Material and Welding Standards

3.6.1 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.

3.7 Material Compliance

3.7.1 The Contractor shall submit to the 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.

3.8 Handling and Storage of Materials

3.8.1 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.

3.8.2 Methods of handling, transporting and storing structural materials, components and finished structure shall be subject to review by MSAF/DBGA.

3.8.3 When requested by 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 recognised Supervising Institution, not less than 14 days prior to handling, transporting or fabrication of steelwork.

3.9 Welding Procedure Qualification

3.9.1 Scope - Welding

All welding consumables shall be stored, handled and used in accordance with AS 1554.

Electrodes shall be used in accordance with the recommendation of the manufacturer.

Welding shall be carried out in strict accordance with the relevant sections of AS 1554, and in accordance with the following additional requirements.

1. Low hydrogen electrodes shall be used for all manual metal arc butt welds.
2. Minimum length of tack weld shall be 50 mm for a 5 mm fillet weld or 80 mm for a 4 mm fillet weld.
3. Suitable run-on and run-off tabs should be used for all butt welds and web to flange fillet welds. Each weld pass should be terminated on the run-on/run-off tabs at least 20 mm beyond the edge of the parts to be joined.

4. Root runs of butt welds shall be back-gouged sufficient to ensure full penetration.
5. The maximum size of electrode for down hand position welding, excepting root runs of multiple pass welds, shall be 6 mm unless the work is in the first (natural-vee) position where 8 mm electrodes may be used. For welds made in all other positions and the root runs of multiple pass welds, the maximum size shall be 5 mm.
6. The maximum size of fillet weld which may be made in one pass shall be 8 mm, except that 10 mm fillet welds may be made in the flat (natural-vee) position.
7. A single layer of weld metal, whether deposited in one pass or made up of several parallel beads, shall not exceed 3 mm in thickness except that the bead at the root may be 6 mm in thickness if the position of welding and viscosity of the weld metal is such that it does not overflow onto unfused parent metal.
8. When welding in the vertical position the direction of welding for all passes shall be upward.
9. Exposed faces of weld shall be made reasonably smooth and regular, shall conform as closely as practicable to specified dimensions and shall not at any place be less than the specified dimensions.
10. Butt weld run-on and run-off tabs shall be removed after the joint has cooled and the ends of the weld shall be finished smooth and flush with the faces of the abutting parts. Butt welds shall be finished smooth and flush with abutting surfaces where required for assembly, where specified in the drawings, where the welds are to be non-destructively inspected and on the exterior faces of exterior girders.
11. All weld spatter shall be removed from the surfaces of the weld and the parent metal.

3.9.2 Safety Precautions

Welding shall be carried out under conditions in accordance with the following standards.

AS 1336	Recommended Practices for Eye Protection in the Industrial Environment
AS 1337	Eye Protection for Industrial Applications
AS 1338	Part I Filters for Protection against Radiation Generated in Welding and Allied Operations
AS 1674	Fire Precautions in Cutting, Heating and Welding Operations
AS 2745	Electrical Welding Safety
AS 1470	Code of General Principles for Safe Working in Industry.

Suitable opaque welding screens shall be provided to protect other people in the vicinity of welding, against stray radiation from arc welding.

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.

The reinforcement of flange butt welds that are to be ultrasonically examined shall be ground smooth and flush.

The Contractor shall submit test certificates for all non-destructive inspections to DBGA.

3.10 Delivery

Each member shall be marked for identification and an erection diagram shall be furnished with the erection marks shown thereon.

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.

The Contractor shall furnish to DBGA 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 2t shall have the mass marked thereon.

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.

3.11 Methods and Equipment

The Contractor shall provide all falsework, 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.

Before commencing work the Contractor shall submit to the Supervisor for approval, details of the proposed method of erection, including falsework, together with the type and size of the erection equipment to be used. The falsework 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.

The approval of DBGA 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.

The written approval of DBGA shall be obtained before erection commences.

3.12 Handling and Storage

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. Long members shall be adequately supported at points sufficiently close together to prevent damage from deflection.

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 DBGA. Any damage to steelwork or protective coating shall be repaired to DBGA's satisfaction or the member replaced. All costs of this work shall be borne by the Contractor.

3.13 Field Cutting

Field cutting of main members shall only be done with the written permission of the Supervisor and in the presence of DBGA his representative. Minor defects on the other members may be corrected by field cutting.

All field cutting shall be done in a neat and workmanlike manner, and where required by DBGA's 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.

3.14 Defective Workmanship

The Contractor shall be fully responsible for the driving of the piles in accordance with the drawings and this specification. Approval of any completed work or methods by DBGA 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 MSAF/DBGA is defective, shall be completed or corrected within the limits assigned by MSAF/DBGA at no additional cost to the Contractor.

3.15 Protection of Steelwork Against Corrosion - General

Surface preparation and protection against corrosion of steelwork shall be carried out in compliance to the design and method of fabrication of the components.

Table 400-2 Details of general corrosion protection requirements

System Ref.	Location	Min. total dft (microns)	Preparation	Primer	Undercoat	Finishing Coat
A	Exterior main surfaces	325	Blast clean to clean steel, Class 2.5 blast finish	Inorganic Zinc Silicate (75 microns) to AS2105	High Build, High solids epoxy MIO (175 microns)	High Build, High solids epoxy MIO (75 microns) site applied

B	Contact surfaces at HSFG joints	25	Blast clean to clean steel, Class 2.5 blast finish	Epoxy blast primer (25 microns)	N/A	N/A
C	Handrails, expansion joints, scuppers and Lighting poles	85 plus 175 (site)	Pickling	Galvanised and then coated on site with MIO High Build Epoxy Mastic (175 microns)		
D	Pile Splash Zone	500	Blast clean to clean steel. Class 2.5 blast finish	High Build, High Solids catalysed epoxy or 2 coats of approved bituminous paint		

* Class blast finish to Australian Standard AS 1627, Part 4.

3.16 Surface Preparation

Oil and grease shall be removed by the use of solvent in accordance with relevant Part(s) of Australian Standard AS 1627. After cleaning, the metal shall be free from moisture, oil, grease, wax, dirt, perspiration and other soluble or loosely adherent matter to such a degree that it will be in a condition suitable for the subsequent treatment.

Steelwork shall be sand or grit blasted to achieve the Class of finish specified in Table 400-2 and in accordance with Australian Standard AS 1627, Part 4.

The maximum profile height shall be 0.08 mm.

3.17 Procedures for Treatment of Local Failure in Protective Coating

In the shop, failed paint coating shall be restored. Abrading down to sound paint only, is permissible.

On site, failed paint coatings shall be restored except that:

Abrading down to sound paint or to bright steel, or blast cleaning to a Class 2.5 finish are permissible methods of surface preparation when restoring paint systems over a steel substrate.

In all cases of local failure, the extent of the failure and the required surface preparation, including extent of initial wet or dry cleaning down, shall be agreed with MSAF/DBGA.

Restoration of protective coatings shall not be started until the standard of surface preparation, including the cleanliness of the surface, has been passed as satisfactory by DBGA or his representative.

3.18 Paint and Similar Protective Coatings

The Contractor shall submit to MSAF/DBGA for approval, information as to the type, colour, manufacture, trade name and service records of the coating which he is

proposing to use together with the method of curing. MSAF/DBGAs approval to the painting systems will not relieve the Contractor of his obligations under this contract.

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), colour, 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.

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.

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.

3.19 Shop Painting

Unless otherwise specified, all steelwork shall be painted under workshop conditions after completion of the fabrication.

Contact surfaces between parts to be fixed together shall be painted in accordance with Table 400-2.

Surfaces of steelwork against which concrete is to be cast, shall be left unpainted except for a strip approximately 25 mm wide along the boundary of the contact surfaces.

3.20 Field Painting

Field painting of steelwork shall be in accordance with Table 400-2.

The Contractor shall protect adjoining property, pedestrian, vehicular and other traffic upon or in the vicinity of the bridge, and other portions of the bridge against disfigurement or damage by paint.

Where parts are to be joined by field welding, surfaces within 50 mm of the weld location shall be stripped of paint prior to welding. Any paint scarred or damaged by the welding shall be removed. All uncoated areas shall then be sandblasted and coated in accordance with this specification. Special precautions shall be taken to ensure that surfaces previously coated are not damaged by the sandblasting operations.

Field welds, the heads of bolts and all other areas where the shop paint has been damaged or has been omitted for field connections, shall be cleaned in accordance with the relevant part(s) of AS 1627 to produce a clean metallic surface for the application of paint.

3.21 Painting of Piles Within the Splash Zone

The manufactured steel piles are to be protected from corrosion in the splash zone areas as defined on the drawings and within the specification.

The surface of the steel piles, in the splash zone, shall be prepared and coated as specified in Table 400-2 of this specification.

SECTION 4

4. CONCRETE WORKS

4.1 General

- 4.1.1 This shall be the Technical Specification for reinforced Concrete pile Construction for the site.
- 4.1.2 The work to be executed under this specification consists of the supply and placement of concrete and ancillary requirements like site preparation.
- 4.1.3 Material and workmanship shall conform to the relevant S.A.A Codes or equivalent Codes approved by DBGA.
- 4.1.4 Refer to NOTES on Structural Drawings.

4.2 Reference Documents

- 4.2.1 Documents reference in this Specification are listed in full below whilst being cited in the text in the abbreviated form or code indicated.
- 4.2.2 Australian Standards:-
 - AS 1012.1-Sampling fresh concrete
 - AS 1012.3.1-Determination of properties related to the consistency of concrete Slump Test
 - AS 1012.8-Making and curing concrete compression, indirect tensile and flexure test specimens in the laboratory or in the field.
 - AS 1012.9-Determination of the compressive strength of concrete specimens
 - AS 1012.14-Securing and testing cores from hardened concrete for Compressive strength
 - AS 1141.14-Particle shape by proportional calliper
 - AS 1141.21-Aggregate crushing value
 - AS 1302-Steel reinforcing bars for concrete
 - AS 1303-Steel reinforcing wire for concrete
 - AS 1304-Welded wire reinforcing fabric for concrete
 - AS 1379-The specification and manufacture of concrete
 - AS 1478-Chemical admixtures for concrete
 - AS 2271-Plywood and blackboard for exterior use
 - AS 2758.1-Concrete aggregates
 - AS 3600-Concrete structures
 - AS 3610-Formwork for concrete
 - AS 3972-Portland and blended cements

4.3 Alignment

- 4.3.1 The Contractor shall be responsible for setting out the concrete works accurately to line and level in accordance with the instruction supplied, and arrangements must be made with DBGA to have the setting out checked prior to the work commencing. All spalling of concrete and fragments of previous concrete beams shall be removed and disposed properly. No stockpiling of demolished material shall be left on shores. Unless otherwise directed by MSAF/DBGA. The level of beam shall be such as that the finish level is in line with the other older beam height.

4.4 Dimensions

- 4.4.1 Beam: The confirmed size of the beam is to be as per the structural drawing, all relevant specification on the drawings related to the concreting of this beam is to be followed or as per the instruction provided by MSAF/DBGA.

4.5 Materials

- 4.5.1 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.
- 4.5.2 SAND: Shall be clean coarse grained, free from silt, salt and deleterious or carbonaceous matter and where requested by DBGA shall be washed in fresh water. Sources of sand shall be inspected prior to transportation to the site. Sands shall be mixed if so required by DBGA to obtain acceptable grading.
- 4.5.3 COARSE AGGREGATE: Shall be sieved to specified grades and stock-piled separately with samples of each grade taken from time to time by DBGA and mix tested to suit quality and grading of these aggregates.
- Passing 38mm sieve and retained on 19mm sieve.
 - Passing 19mm sieve and retained on 6mm sieve.
 - Passing 6mm and retained on No.14 sieve.
- 4.5.4 WATER: Shall be potable (drinkable), clean and fresh, free from salt and other impurities.
- 4.5.5 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.
- 4.5.6 Unless otherwise shown or specified, the minimum clear cover to main reinforcement shall be as follows:-
- a) 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
- Or else refer to the structural notes on the structural drawing.
- 4.5.7 Secure alternate passing 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 DBGA.
- 4.5.8 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.

4.6 Mixing

- 4.6.1 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.
- 4.6.2 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.
- 4.6.3 HAND MIXER: Mixing by hand shall not be permitted except in an emergency and then only subject to the approval of DBGA.
- 4.6.4 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.
- 4.6.5 The Contractor must notify MSAF/DBGA two (2) days in advance of his intention to use ready-mixed concrete to enable arrangements to be made for MSAF/DBGA to be present at the plant and/or the site during placing.
- 4.6.6 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.

4.7 Tests

- 4.7.1 Compression Test: The Contractor shall allow the taking of three (3) concrete test cylinders, either (304.8) (152.4) per concrete pour, or, as may be directed by DBGA. These cylinders may be taken from any random delivery by 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.
- Concrete Strength: Unless otherwise stated, the characteristic strength of the concrete shall be as follows:
- MPa generally
- All concrete shall be ready mixed unless otherwise approved.

4.8 Consistency

- 4.8.1 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 MSAF/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:

- 4.8.2 footings, retaining and other walls - 50 to 70mm
- 4.8.3 floor slabs - suspended & on ground - 25 to 75mm
- 4.8.4 beams and columns - 50 to 75mm

4.9 Placing

- 4.9.1 All concrete shall be finally placed in position within 30minutes of leaving the mixer. It shall be minimum handling between the mixer and the final position and shall not be allowed to drop freely more than 180mm. Placing should be in uniform layers, well vibrated by approved mechanical electrical vibrator to consolidate concrete without segregation.
- 4.9.2 Concrete shall be placed in daylight or under such lighting conditions as may be approved by DBGA.
- 4.9.3 No concrete shall be placed until reinforcement and formwork have been inspected and approved by DBGA. Twenty four (24) hours notice shall be given to DBGA of the intention to place concrete.
- 4.9.4 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.
- 4.9.5 Concrete shall not be deposited in wet trenches or in running water.
- 4.9.6 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.
- 4.9.7 Each monolithic portion of the work shall, except where the use of construction joints as approved, be placed in one continuous operation. The order of placing shall be as required by DBGA and shall be so arranged that new concrete is continually being placed against unset concrete so that a monolithic structure will result.
- 4.9.8 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.
- 4.9.9 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 DBGA.
- 4.9.10 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.
- 4.9.11 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.

4.10 Compaction By Hand

- 4.10.1 Where mechanical vibration cannot be used, as determined by 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.

4.11 Compaction By Mechanical Vibration

- 4.11.1 Mechanical vibration shall be used throughout for compacting the concrete.
- 4.11.2 Vibrators shall be of an approved type transmitting not less than 9,000 impulses per minute when under load.
- 4.11.3 Vibrators shall be operated to the satisfaction of 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 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.
- 4.11.4 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.

4.12 Poor Compaction

- 4.12.1 If in the opinion of 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.

4.13 Construction Joints

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

4.14 Protection

- 4.14.1 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.
- 4.14.2 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.

4.15 Curing

- 4.15.1 All exposed surfaces of concrete shall be cured by one of the following methods:
- 4.15.2 Ponding or continuous sprinkling with water.
- 4.15.3 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.

- 4.15.4 The use of an absorptive cover, kept continuously wet. The use of the curing compounds conforming to ASTM C309 are not permissible except with DBGA's approval in writing.

4.16 Curing Period

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

4.17 Damage

- 4.17.1 The concrete shall be protected from damage due sea swells, heavy shocks and excessive vibration, particularly during the curing period.
- 4.17.2 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.

4.18 Tolerances

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

4.19 Building-In

- 4.19.1 Allow for all sub-contractor's work. Building in all metal work etc.
- 4.19.2 Form all openings; set-downs etc. keep all exposed bolt threads clean.
- 4.19.3 Build in all under floor pipeworks, leave sleeve for drains, pipes etc., as necessary.

4.20 Formwork

- 4.20.1 Formwork shall conform to 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 DBGA's approval and in accordance with SAA Codes AS1082, AS1509 and AS1510 or equivalent BSS.

4.21 Concrete Paving to Receive Special Finish

- 4.21.1 All exterior concrete paving surfaces to receive special finish of applied aggregate by Nominated Applicator must comply with the following requirements.
- 4.21.2 Surfaces must be rough-broomed with hard bristle broom and must be free of all laitance to form key and bond with applied finish.
- 4.21.3 All surfaces must be roughened to the satisfaction of the Special Finish Applicator.
- 4.21.4 All surfaces not accepted by the Special Finish Applicator must be fixed at the Contractors own expense.

SECTION 5

5 METAL WORKS

5.1 General

This Technical Specification applies to the fabrication of the railing, ladder and supports for the lighthouse.

Stainless steelwork shall be fabricated only by a fabricator which is registered and licenced under the relevant authority.

Refer to NOTES in the Structural Drawings

5.2 Materials

5.2.1 All stainless steel shall be Grade 316 (UNS S31600) or Grade 316L (UNS S31603). When specified on the engineering drawings, material manufactured to other standards will be accepted provided the material comply with the appropriate ASTM standards.

5.2.2 The quality of all materials used in the execution of this contract shall comply with the requirements of the following Standard Specification:

AS/NZS 1167.2	Welding and Brazing – Filler Metals – Filler Metal for Welding
AS/NZS 1554.6	Structural Steel Welding – Welding Stainless Steels for Structural Purposes
AS/NZS 4854	Welding Consumables – Covered Electrodes for Manual Metal Arc Welding of Stainless and Heat-Resisting Steels - Classification
AS/NZS ISO 9001	Quality Management Systems – Requirements
ASTM A276	Standard Specification for Stainless Steel Bars and Shapes
ASTM A312	Standard Specification for Seamless, Welded and Heavily Cold Worked Austenitic Stainless Steel Pipes
ASTM A380	Standard Practice for Cleaning, Descaling and Passivation of Stainless Steel Parts, Equipment and Systems
ASTM A554	Standard Specification for Welded Stainless Steel Mechanical Tubing
ASTM A789	Standard Specification for Seamless and Welded Ferritic/Austenitic Stainless Steel Tubing for General Service
ISO 3506	Mechanical Properties of Corrosion-Resistant Stainless Steel Fasteners
ISO 3834	Quality requirements for fusion welding of metallic materials - Comprehensive quality requirements

- 5.2.3 The Contractor shall supply to MSAF/DBGA prior to the commencement of fabrication copies of the stainless steel material test certificate and showing the chemical properties.
- 5.2.4 MSAF/DBGA may at any time require any materials to be tested in accordance with the requirements of the listed specifications.
- 5.2.5 The Contractor shall, if required, promptly supply at his expense, test pieces as required by MSAF/DBGA.

5.3 Shop Drawings

- 5.3.1 Before fabrication is commenced, the Contractor shall prepare shop drawings. These drawings shall clearly show all sizes, markings and corrections and set out the positions, sizes, and lengths of all welds as necessary for the complete fabrication, assembly and erection of the steelwork. Contractor to allow for onsite measurement prior to shop drawing and fabrications.
- 5.3.2 No fabrication shall be commenced for any variation or substitutions made in the shop drawings unless these have been approved in writing by MSAF/DBGA.

5.4 Fabrication

5.4.1 CUTTING AND BENDING

All members, plates, brackets etc. shall be neatly and accurately sheared, sawn or profited to the required shape as shown on the drawings. After cutting, all rough edges shall be ground off.

5.4.2 PUNCHING AND BORING

All holes for bolts must be punched with holes 1.5mm larger in diameter than the bolts used. Holes for bolts in material thicker than 16mm must be drilled or sub-punched and reamed.

5.4.3 BOLTING

All bolts used shall be of such lengths that at least one full thread is exposed beyond the nut after the nut has been tightened.

Where a nut or bolt-head would bear on an inclined surface a bevelled washer of the correct size shall be interposed between the two surfaces. Bevelled washers shall not be allowed to get out of position during fabrication and erection for this purpose may be spotted to the steel surface.

5.5 Welding Consumables

- 5.5.1 Welding consumables shall be compatible with the parent metal and shall be classified and identified in accordance with the provisions of AS/NZS 1167.2 and / or AS/NZS 4854.

5.6 Electric Welding

- 5.6.1 Welding shall be carried out in accordance with the provisions of AS/NZS 1554.6 except as amended by Clauses 8.7.2, 8.7.3 and 8.7.4.
- 5.6.2 All manual welding shall be carried out in accordance with AS1544 or the equipment B.S.S. If the Contractor is desirous of using semi or fully automatic welding equipment,

he shall submit to DBGA a complete specification of equipment, electrodes, and fluxes. In addition, details of joint preparation, welding, procedures and preheat. The Contractor shall be required to demonstrate to MSAF/DBGA his procedures and shall have his written approval before commencement of fabrication.

- a. Joint preparation shall be executed in accordance with the above mentioned code and as detailed on the drawings. Preparation shall be carried out by planning or machine flame cutting the prepared surfaces shall be free from loose scale, slag, rust, grease, tears, and fins.
- b. Before commencing welding, sections to be butt welded shall be aligned with 1.5mm of their gap at the roof of the weld shall not exceed 0.75mm.
- c. All welds shall be of the finished sizes specified and but in such sequence as will cause the minimum distortion of the parts welded.
- d. Multiple run welds shall be carried out with each run closely following the previous run but allowing sufficient time for the proper removal of slag. Each run will be inspected and unsatisfactory weld must be cut out and remade to approval.
- e. Welds shall on completion present a reasonably smooth and regular finish free from defects.
- f. Unless otherwise shown, the minimum size of fillet shall be 6mm.
- g. Not less than three (3) working days prior to any welding commencing on any butt weld joint, the Fabricator shall notify DBGA for the butt weld preparations that are available for inspection. Welding shall not start until DBGA has reviewed the butt weld preparations.

5.7 Inspection of Completed Product

- 5.7.1 Not less than three (3) working days after the completion of the fabrication of the stainless steel component, the contractor shall notify MSAF/DBGA the product is available for inspection.
- 5.7.2 MSAF/DBGA shall ensure for all stainless steel fabricated product, the following inspections are undertaken:
- a. 100% of all products shall be visually examined, and
 - b. Any welding defects found during the inspection shall be repaired prior to the application of the protective coating.

5.8 Stainless Steel Bolts, Nuts and Washers

- 5.8.2 Stainless steel bolts shall be Grade 316 (UNS S31600), nuts shall be Grade 304 (UNS S30400) A2-70 and washers shall be Grade 316 (UNS S31600) unless noted otherwise on the structural drawings. All stainless steel bolts and nuts shall conform to the requirements of ISO 3506. Materials manufactured to other standards will be accepted provided the material comply with the appropriate ISO standard.
- 5.8.3 The bolt supplier shall supply the fabricator with a certified material test certificate outlining the chemical composition and mechanical properties of all bolts supplied. The test certificate shall be able to be traced back to the batch of bolts.

5.9 Handling and Storage of Stainless Steel Components

- 5.9.2 All stainless steelwork shall be undertaken in a separate building to carbon steel unless approved by DBGA.
- 5.9.3 Stainless steel material shall not be stored in contact with carbon steel.
- 5.9.4 Tools used to fabricate or assemble stainless steel components shall be dedicated tools for stainless steelwork. Tools previously used on carbon steel shall not be used for stainless steelwork.
- 5.9.5 Stainless steel material shall be wrapped or otherwise protected during transport to avoid contamination. If an adhesive plastic film is used all traces of adhesive shall be removed from the steel with a suitable solvent.
- 5.9.6 Webbing slings shall be used in lifting stainless steel components and not chains. Grinding, cutting and welding shall not be carried out over open bundles of stainless steel components.

5.10 Delivery

- 5.10.1 Take delivery of steelwork ex-factory and transport to the site in good condition and replace any members bent or twisted in transit.

5.11 Erection

- 5.11.1 All erection shall be carried out by competent and experienced men and the contractor shall take every care to safeguard the public, workmen and adjoining property.
- 5.11.2 All gear used shall be adequate strength and shall comply with all regulations current at the time and all steelwork shall be adequately bolted, guyed and braced to make the structure secure. The Contractor shall be held responsible for all damage caused to the structure, works or buildings during erection.
- 5.11.3 Minor details not shown on drawings shall conform to the requirements of AS1250-1975 or the equivalent B.S.S.
- 5.11.4 In making corrections, drifting of unfair holes will not be permitted and holes not matching properly shall be reamed or drilled out and a larger bolt inserted with DBGA's approval.
- 5.11.5 No member or part of member which has bent or distorted shall be erected in that condition, all straightening shall be done on the ground and checked by DBGA.
- 5.11.6 All bolts shall be left tight and all bevelled washers and plates properly positioned.
- 5.11.7 Column shall be wedged to line and level on steel or cast iron wedges and checked by DBGA. After acceptance column bases shall be caulked to approval before wedges are removed.
- 5.11.8 Unless shown on the drawings, all columns shall be left truly vertical and correct to line and level.

5.12 Minor Parts

- 5.12.1 If neither the Specification, drawings nor schedule of quantities contains any particulars of minor parts which are obviously necessary for proper complement of the work, all such parts shall be supplied and executed by the Contractor without extra charge.

5.13 Protection

- 5.13.1 All mill scale, rust, dirt/or other deleterious substances shall be removed by the use of chipping hammer and then wire brushing back to clean metal.
- 5.13.2 All surfaces shall be thoroughly dry before coating applied.

5.14 Coating

- 5.14.1 Immediately after preparation work has been completed, apply type of primer as specified in Schedule of paint. Finishes strictly to manufacturer's instructions.
- 5.14.2 The primer shall be spray applied except where written approval is given by DBGA to substitute brushing for spraying.
- 5.14.3 After erection, all damaged portions shall be cleaned back to the satisfaction of DBGA and made good to match original coating in thickness, texture and colour.

SECTION 6

6. PAINTING

6.1 General

- 6.1.1 This Technical Specification applies for the painting of the existing structure and the new day mark wall. REFER TO DRAWINGS FOR THE PAINT SPECIFICATION.
- 6.1.2 All coatings to be carried out other than those specially provided for in other parts.
- 6.1.3 In any case, finishing coats of the works covered by other part will be executed in conjunction with painting and surface treatments provided for in this part.
- 6.1.4 Work shall be pre-planned and executed to meet the needs of trade and services.
- 6.1.5 While work shall follow completed work sections, premature finishing coatings shall be avoided.

6.2 Materials Generally Manufactured

- 6.2.1 ALL PAINTS MUST BE ANTI- MOULD, ANTI- FUNGAL, EPOXY/ZINC BASE MARINE GRADE PAINT
All paints and coatings shall be of the same manufacture specific and as approved by the MSAF/DBGGA and comply by current S.A.A requirements for their respective kinds. All paints, primers, undercoats and finishing's coats are to be lead-free. All paint undercoat, primer, etch primer etc. shall be obtained from ONE Manufacturer.
- 6.2.2 APPLY STRICTLY TO MANUFACTURER'S INSTRUCTIONS CONTAINERS
All materials shall be delivered in sealed labelled containers of the manufacturer of the paint.
PRIMING
(a) ALL SURFACES MUST BE INSPECTED BY DBGGA BEFORE PRIMING AND BETWEEN COATS.

(b) Priming for metalwork shall be a.b.s Metalwork and as allowed for in that section.
- 6.2.3 UNDERCOATS
(a) To all finishes shall be those recommended by the manufacturer of the relative coat finishes.

6.3 Delivery and Storage of Materials

- 6.3.1 Deliveries shall be made well in advance of application and shall be stored undercover or in sheds on timber platform.

6.4 Workmanship

All surfaces must be inspected by MSAF/DBGGA before painting and between coats.

All surfaces must be mould-free, fungus free before painting.

All timber and plywood with mould shall be rejected and removed from site immediately.

All other surfaces shall be free treated with anti-mould solution strictly to manufacturer's instruction before painting if found to have mould.

Coating shall not be applied to any surface which is not thoroughly dry except where recommended by the manufacturer or acceptable.

All surfaces shall be inspected and where defective, made good before work proceeds.

Applications of paint or stains or clear finish will be considered as acceptance of surface conditions for reception of materials by both contractor and respective paint manufacturer.

6.5 Cleaning Up Before Painting

Prior to commencement of painting, the area to be painted plus the surrounding area shall have all debris removed and then swept clean and left for a period of 4 hours after which all dust shall be removed.

6.6 Commencement

- 6.6.1 Generally no painting shall commence until; such time as the work of all other trades has been completed within the area to be painted.
- 6.6.2 Where it is necessary to lay a floor covering after the painting has been completed, the best coat shall be applied after the laying of the floor covering.
- 6.6.3 All adjacent finishes shall be adequately protected and any paint splashes removed without injury to the affected area immediately.
- 6.6.4 All work shall be performed by skilled tradesman in a neat and workman like manner, cutting in and finished edges shall be clean and straight.
- 6.6.5 All materials shall be mixed and applied in strict accordance with the manufacturer's printed recommendations.
- 6.6.6 Concrete and Grano pavings which have been splashed with paint shall be taken up and re-laid and all costs involved shall be borne by the Contractor. If walls are damaged in effecting any relaying, they shall repainted at the contractor's expense.
- 6.6.7 Concrete and plaster surfaces shall be ground down before painting.
- 6.6.8 Surfaces shall be rubbed down before painting. Each shall be well rubbed down and/or washed down as required prior to the application of the following coat. The exception is stain coating which is not rubbed back between coats.
- 6.6.9 Application of paint shall not be carried out in wet and/or windy weather. The latter is to be at the discretion of DBGA.
- 6.6.10 Galvanized or rustproof surfaces shall be left until last for painting.
- 6.6.11 Timber shall be primed before fixing on all faces required to build in and at all joint before fabrication.
- 6.6.12 All open grained timber work shall be filled with an approved filler. Knots that have been accepted, shall be given a coat of knotting before painting.
- 6.6.13 Undercoats shall be tinted differently from the preceding coat and each approved before the next coat is applied.
- 6.6.14 Except where otherwise specified or approved, all paint shall be applied with first quality brush ware.
- 6.6.15 Paint shall be brushed on thoroughly and laid off so that no brush marks show on the finished area.
- 6.6.16 Samples of each colour and finish shall be prepared on selected surfaces for approval by DBGA before painting commences. A sample shall not be less than 0.4sq.m.
- 6.6.17 Where certain colours may require tinting and/or intermixing shall only be done with paints of the same manufacturer.

6.7 Finishes

- 6.7.1 Opaque Finishes: Full Gloss paint shall be approved quality, high gloss opaque alkyd paint. It shall be non-toxic, lead free, having high resistance to abrasives, fair resistance to chemicals and solvents.

- 6.7.2 Full Gloss Enamel: shall be an approved first quality, high gloss opaque alkyd enamel. It shall be non-toxic, lead free, having high resistance to abrasive, fair resistance to chemical and solvents.
- 6.7.3 Semi-Gloss Acrylic: shall be an approved semi-gloss opaque, water borne, acrylic paint. It shall be non-toxic, lead free, having very good resistance to abrasive, high resistance to chemicals and solvents.
- 6.7.4 Flat Acrylic: shall be approved flat, opaque water based acrylic paint. It shall be nontoxic lead free having good resistance to abrasives, chemicals and solvents.
- 6.7.5 Polyurethane finish shall be an approved oil rich timber stain containing a combination of natural oils, preservatives and water proofing compounds. Clear Stain finish shall be an approved oil rich timber stain containing a combination of natural oils, preservatives and water proofing compounds. Natural Timber Finish External shall be as for clear Stain Finish with the addition of permanent pigments.
- 6.7.6 Special waterproof coating (if applicable) shall be supplied and applied by a specialist sub-contractor or obtained from a specialist supplier and applied in accordance with AS/NZS.
- 1 coat enamel undercoat
 - 2 coats high gloss enamel or
 - 2 coats industrial enamel.

6.8 Making Good

Make good a.b.s. 'Preliminaries' in addition by cracks appearing in paintwork before expiration of maintenance period shall be made good and the surface on which the cracks occur, repainted to the satisfaction of the DBGA.

6.9 Paint Type

All clear finish, stain and paint, undercoat, primer, equipment, filler, sealer anti-mould solution etc. shall be obtained from ONE Manufacturer.

SECTION 4: STRUCTURAL DRAWINGS

for the

Construction of Suva Harbour – North East End Lighthouse