Supply, Installation & Commissioning of 3.3kV Switchboard & Electronic Soft Starters at Waimanu Pumping Station

Issued on: 01st July, 2016
Tender No.: WAF 16/07/01/PMU/SSEW
Employer: Water Authority of Fiji
Country: Fiji Islands

Proposals Close 2:00pm 29th July, 2016
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<td>10</td>
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</tr>
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1 PROJECT BACKGROUND & PURPOSE

The Water Authority of Fiji has embarked on a programme to upgrade the water supply system in the Suva Nausori area.

The system is being progressively upgraded to improve the reliability of the system in the Capital City, Suva and surrounding urban areas due to increase in demand for water.

The Waimanu Water Pumping Station electrical reticulation is being upgraded due to the demand for additional number of water pumps to suffice the increased demand for water. The existing Ramsay switchboard current carrying capacity is limited by the power supply input of the proposed 2000kVA standby generator set to be connected to it.

The existing Ramsay Switchboard with the proposed generation can accommodate for 3 no. of 525kW pumps. Hence a new switchboard is proposed to cater for the increased electrical demand in the form of additional water pumps. For an efficient and reliable electrical power supply system, stand- by generators, power factor correction unit, latest soft starters have been incorporated in the design.
2 INSTRUCTIONS TO BIDDERS

2.1 Introduction

2.1.1 Water Authority of Fiji (WAF), invites proposal for ‘Supplying, Installation & Commissioning of 3.3kV Switchboard & Electronic Soft Starters at Waimanu Pumping Station’.

2.1.2 Refer to Section 6 for the full Scope of Services

In summary, the services will include, but are not limited to:
- Contract Specification
- General Technical Requirements
- High Voltage Switchboard
- Motor Starting Equipment
- Uninterruptible Power Supply
- DC Power Supply
- Wiring Practices
- Cable Containment Systems
- Cable Installation
- Earthing
- Instrumentation
- SCADA I/O
- Instrumentation Commissioning
- Electrical System Commissioning

2.1.3 Evaluation of Proposals will be carried out in accordance with Section 3 of this Request for Proposals.

2.2 General Information

2.2.1 For further information on the Tender Process Contact:

Tevita Balenivalu
Acting Procurement Manager
Water Authority of Fiji
Email: tevita.balenivalu@waf.com.fj
Ph: +679 9104019

For further information on the Scope, Basis of Payment & Schedule of Rates & Prices or other general information, contact:

Vicky Vishal Sahayam
Project Manager
Water Authority of Fiji
Email: vsahayamwaf.com.fj
Phone:+679 9126588
2.2.2 Site Visit
A pre-tender meeting will be held on 12th July, 2016 at 10.00am Fiji Time. All bidders are invited to attend. No other arrangements shall be entertained.

2.2.3 This Proposal document includes:
(i) Instructions to Bidders, Evaluation Criteria and Method of Evaluation
(ii) Forms for Letters of Proposal, Schedule of Key Personnel, Schedules of Compliance & Departures and Schedule of Rates and Prices
(iii) Agreement, General Conditions, Particular Conditions Parts A & B
(iv) Scope of Services
(v) Personnel, Equipment, Facilities and Services to be Provided by Others
(vi) Remuneration and Payment
(vii) Appendices

2.2.4 The Bidder shall bear all costs incurred in the preparation and submission of its Proposal, including any visits, interviews, meetings of clarifications and other actions mentioned in or implied by these Instructions. The Employer will not be responsible or liable for such costs, regardless of the conduct or outcome of the proposal process.

2.2.5 The Employer reserves the right to withdraw or cancel the request for proposals by notice, at any time and at its own discretion due to any reason, without incurring liability to any Bidder and without the Bidders being entitled to claim any compensation. Such reasons may be, but are not limited to, changes in terms of reference requiring a re-tender, collusion or improper tender practices, extended tender period (after proposals close) that may affect fairness or impartiality, inadequate or unacceptable proposals, or in the event of any other occurrence deemed to to have had, or likely to have, a significant impact on the tender process.

2.2.6 Proposal procedures are subject to the law of the Fiji Islands and the rules applicable hereunder.

2.2.7 No offer, payment, consideration, or benefit of any kind, which constitutes illegal or corrupt practice, shall be made, either directly or indirectly, including bribery of public officials, as an inducement or reward in relation to:
(i) the proposal process,
(ii) the award of the assignment, or
(iii) the implementation of the Agreement.
Any such practice will be grounds for the immediate cancellation of the Agreement and for such additional actions (civil and/or criminal) as may be appropriate. At the discretion of the Water Authority of Fiji, a further consequence of any such practice can be the definite exclusion from any further tendering for Water Authority of Fiji.

2.3 Eligibility of the Bidder
2.3.1 For a joint venture of two or more legal persons to be eligible, the following shall apply:
(i) The joint venture shall have nominated a leader with authority to bind the joint venture and this leader shall be authorised to incur liabilities and receive instructions for and on behalf of the joint venture:
(ii) Evidence of this authorisation shall be provided with the proposal in the form of a power of attorney signed by legally authorised signatories of all persons in the joint venture;

(iii) The Proposal Form, and (if accepted) the Agreement, shall be signed as to be legally binding on the joint venture;

(iv) The proposal shall include a copy of the joint venture agreement entered into by all persons;

(v) The proposal shall describe the organisational arrangements of the joint venture and how the roles and responsibilities will be divided between its members.

2.3.2 Any entity may be proposed as a prospective sub-Contractor by more than one respondent in addition to being either a sole respondent or a participant in one joint venture offer.

2.3.3 Apart from the specific exceptions stated above, no legal person or entity shall participate in the preparation of another’s offer for the same contract.

2.3.4 Joint venture proposals which fail to satisfy the eligibility requirements in this clause or which fail to convince the evaluators that the joint entity will be capable of performing the Services may be rejected.

2.3.5 Any legal entity may only submit one Proposal.

2.4 Proposal Document

2.4.1 The Bidder shall be responsive to the complete Proposal document which comprises the documents listed in Clause 2.2.2 above and any Addenda/Notices to the Proposal document which may be issued as described in this Clause 2.4.

2.4.2 At any time prior to the deadline for submission of proposals, the Employer may amend the Proposal Document by issuing addenda / notices.

2.4.3 The Bidder must carefully examine the proposal document. Failure to comply with these Instructions or with any other tendering requirements will be at the Bidders risk and may result in the Proposal being rejected.

2.4.4 If the Bidder finds any discrepancy, error or omission in the Proposal Documents, the Bidder shall notify the Contact Officer immediately, in writing, giving details of the ambiguity, discrepancy, error or omission and in any case before the date and time for closing of proposals.

2.4.5 If the Bidder requires any clarification of the Proposal document, he/she shall notify the Contact Officer in writing. Requests for clarification must be received not later than 14 days before the Proposal closing date.

2.4.6 The Employer will respond to the notices by issuing addenda/notices:

(i) the text of the question or request for clarification (the authoring Bidder will not be identified) and

(ii) the clarification.
2.4.7 Any addenda / notices issued shall be part of the Proposal Document and shall be communicated in writing to all who have obtained the Proposal Document where WAF has been advised accordingly.

2.4.8 These addenda / notices will also be posted on the WAF website under http://www.waterauthority.com.fj/en/tenders.

2.4.9 To give prospective Bidders reasonable time in which to take an addendum/notice into account in preparing their proposals, the Employer may, at its discretion, extend the deadline for the submission of proposals.

2.4.10 Individual meetings or communications (except for requests for clarifications) by the Bidders with the Employer are not allowed.

2.5 Preparation of Proposals

2.5.1 The proposal price shall, except where otherwise provided, allow for all the Contractor’s obligations including all costs, overhead and profit for carrying out and successfully completing the Services in accordance with the Agreement and other documents referenced therein.

2.5.2 The Proposal and all communication between the Bidder and the Employer shall be in English. Supporting documentation may be in another language provided an appropriate translation of all the relevant parts into English is also provided. If such translation is not provided, that information will not be considered in the evaluation.

2.5.3 The Proposal Documents to be submitted by each Bidder shall comprise a technical submission and a price submission as detailed in Clause 2.6.1.

2.5.4 The bidder shall take all necessary due diligence with regards to inspecting the site and fully account for the extent of work required as per the scope and the corresponding costs that would be finalized and quoted for. Hence, WAF would take this as the final, fixed and conclusive figure and the presumption that the bidder has fully investigated and inspected the site in question.

2.5.5 Technical Proposal

To enable Proposals to be evaluated the Bidder shall supply information on the following non-price attributes and as further detailed in Section 3.3:

- Relevant Experience and Track Record
- Technical / Personnel Skills
- Management
- Methodology

Failure to supply any of the information required under Section 3.3 may result in the Tender not being evaluated and excluded from any further consideration.

The Technical Tender shall be limited in total to no more than 25 A4 size pages of reasonable font size, excluding cover letter (no price information to be included), cover page, contents/index page, schedules, CVs and other supplementary information required.
2.5.6 Price Submission

The Proposal price shall, except where otherwise provided, allow for the entire bidders obligations including all costs, overhead and profit for carrying out and successfully completing the Services in accordance with the Agreement and other documents referenced therein. If a bidder wishes to make a Departure, such Departure shall be listed on the Schedule of Compliance and Departures. The Proposal Price is deemed to be inclusive of all Departures listed.

2.5.7 Duties, Taxes and Levies

All duties, taxes, VAT, and other levies applicable for the contract in question payable by the Contractor in relation to the performance of the Agreement, or for any other cause, shall be included in the rates, prices and total Proposal Price submitted by the Bidder, and the evaluation and comparison of Proposals by the Employer shall be made accordingly. The duties, taxes, and other levies shall be those prevailing 28 days prior to the Proposal Submission Deadline.

2.5.8 Payment of Statutory Taxes

WAF has an absolute discretion and has the final say during payment of statutory taxes by the bidder. The deduction of taxes and direct payment shall be at WAF’s absolute discretion. WAF would also not consider the fact that it somehow affects the bidders cash flow.

2.5.9 It is the responsibility of the Bidder to acquaint himself fully with the tax and excise laws in force in Fiji prior to the submission of the Proposal.

Bidders not resident or registered in Fiji for tax purposes or who are procuring sub-Contractor services from outside Fiji may be liable to pay Non Resident Withholding Tax (NRWT) on payments they receive under the Agreement. Bidders must ascertain for themselves any such exposure to NRWT prior to submitting their proposals as per the Fiji Revenue and Customs Authority (FRCA) requirements. The FRCA website is http://www.frca.org.fj/withholding-tax/. Bidders will be deemed to have made full allowance for NRWT in their proposed VEP (i.e. VAT exclusive) prices.

For Value Added Tax (VAT) implications, Bidders shall refer to Section 8.1.5.

2.5.10 All prices and unit rates quoted in the Schedule of Prices shall be in Fiji Dollars (FJD).

2.6 Submission of Proposals

2.6.1 The Contractor’s proposal must be submitted in two sealed envelopes which shall be sealed inside a third envelope:

- **Envelope 1 (marked ‘Technical Proposal’)** must contain all non-price information as clause 2.6.2 below
- **Envelope 2 (marked ‘Price Proposal’)** must contain all pricing information as clause 2.6.2 below

Both Envelopes should then be submitted inside a third outer envelope clearly marked ‘Supply, Installation & Commissioning of 3.3kV Switchboard & Electronic Soft Starters at Waimanu Pumping Station’

2.6.2 The contents of each envelope shall be:
| **Technical Submission** | Cover letter (no price information) - optional  
Form of Technical Proposal |
|-------------------------|-------------------------------------------------|
| **Envelope 1** | Technical Proposal (in accordance with 2.5.4) including:  
- Relevant Experience and Track Record  
- Personnel / Technical Skills  
- Management  
- Methodology  
Schedule 1 - List of Key Personnel including brief CV’s  
Schedule 2A - Schedule of Compliance and departures – non-price |
| **Price Submission** | Form of Price Proposal |
| **Envelope 2** | Schedule of Prices  
Schedule 2B - Schedule of Compliance and Departures – Price |

Failure to comply with this Section 2.6.2 may lead to rejection of the proposal where it is considered that an unfair advantage would be gained through this non-compliance. Decisions on this matter will be at the sole discretion of the Employer.

### 2.6.3 Address for Submissions

Supply, Installation & Commissioning of 3.3kV Switchboard & Electronic Soft Starters at Waimanu Pumping Station  
Chief Executive Officer  
Water Authority of Fiji  
Wailoku Depot, Tamavua  
Fiji Islands

The Proposal shall be delivered to the Tender Box at the above address, or uploaded to Tenderlink in accordance with the relevant instructions, before the closing time, and at the Bidders risk. On what basis / when do we allow proposals to be submitted to waftender@waf.com.fj

The Tenderlink website for instructions and uploading proposals is [https://www.tenderlink.com](https://www.tenderlink.com)

### 2.6.4 Closing time and date for Submissions shall be 2.00 pm Fiji time on 29th July, 2016.

### 2.6.5 Proposals submitted by fax or email and any late proposals will not be considered. After the proposal closing deadline, no bidder shall be permitted to alter its proposal. Exceptions to these rules will only be permitted at the sole discretion of the Employer.

### 2.6.6 Unless submitting via Tenderlink, proposals shall be submitted as one signed and bound original paper copy and one further loose leaf paper copy, plus separate electronic copies of the price and non-price content (as single .doc documents on CD, DVD or USB memory stick). In the event of any discrepancy, the original paper copies shall prevail.
2.6.7 **Alternative Proposals will not be accepted**

An Alternative Proposal will be considered if its price is certain and it conforms in all other respects with the Proposal Document. Any alternative proposal must be accompanied by a fully compliant proposal.

2.6.8 The Employer reserves the right to reject any proposal that contains non-compliances or departures which it deems unacceptable and which the bidder declines to remove or amend. Departures acceptable to the Employer may result in adjustment to the proposal price for the purposes of comparison of proposals.

2.6.9 If a Proposal is misplaced or opened prematurely because an envelope was not sealed and marked as instructed above, the Employer shall not be responsible and the Proposal may be rejected.

2.6.10 The Bidder may modify or withdraw its Proposal after submitting it, provided the modification or notice of withdrawal is received in writing before the closing time for Proposals. The Bidders modification or notice of withdrawal shall be prepared, sealed, marked and delivered in accordance with the provisions of this Clause 2.6, with the inner and outer envelopes additionally marked “MODIFICATION” or “WITHDRAWAL”, as appropriate. The modification or notice of withdrawal shall be signed by a person or persons duly authorized to bind the Bidder, and proof of authorization shall be annexed.

2.6.11 A Proposal submitted other than as described in this Clause 2.6 may be rejected by the Employer and returned to the Bidder.

2.6.12 The Bidder shall notify the Employer, as soon as practicable, of any change in the information submitted, including changes in the composition of the Bidder or the legal status and place of establishment, potential conflicts of interest, economic and financial situation, and technical capability/capacity of the Bidder or its members. Any change in the composition & key personnel of the Bidder may, at the discretion of the Employer, lead to disqualification of the Bidder from participation in the Proposal and award of contract.

2.6.13 The validity period of all Proposals shall be 120 days from the closing date of the Proposal.

2.6.14 If an agreement has not been executed within this validity period and the Employer still wishes to continue with the proposal process, each bidder will be contacted thereafter in order to ascertain their intention to remain under consideration for a further defined period or to withdraw from the proposal process.

2.6.15 The lowest or any Proposal may not be necessarily accepted.

2.7 **Opening of Proposals**

2.7.1 Proposals submitted in accordance with Clause 2.6 above, will be opened by the Tender Committee or nominated person immediately after the Proposal Closing time and date. The Bidders’ representatives may be present at the opening.

2.7.2 The envelopes with the price proposals shall not be opened until the evaluation of the technical proposals has been completed.
2.7.3 Proposals for which the Employer has received a valid notice of withdrawal in accordance with Clause 2.6.9 of these Instructions shall be returned unopened.

2.7.4 Second, outer envelopes marked ‘Substitution’ shall be opened next with the inner envelopes being exchanged for the corresponding envelopes being substituted, provided the appropriate notice (clause 2.6.9) is included. The substituted envelopes shall be returned unopened.

2.7.5 Next, outer envelopes marked ‘Modification’ shall be opened next with the inner envelopes being exchanged for the corresponding envelopes being modified, provided the appropriate notice (clause 2.6.9) is included. The substituted envelopes shall be returned unopened.

2.7.6 All other Tenders shall then be opened.
3 EVALUATION OF PROPOSALS AND AWARD

3.1 General

3.1.1 All Proposals will be evaluated in accordance with Section 3.2 below.

3.1.2 The technical evaluation will be undertaken prior to opening the Pricing Envelope.

3.1.3 To assist in the examination, evaluation and comparison of Proposals, the Employer may ask any Bidder for clarification of its Proposal, including breakdowns of unit rates and sums. The request for clarification and the response shall be in writing. No change in the price or substance of the Proposal shall be sought, offered or permitted except as required to confirm the correction of arithmetic errors discovered by the Employer during the evaluation of the Proposals.

3.2 Proposal Evaluation

3.2.1 The Proposal Evaluation Team (PET) appointed by the Employer will consider technical (non-price) and price information submitted by each Bidder in order to identify the most advantageous proposal. The Employer may supplement this with any additional information about any bidder which the evaluators deem fit to obtain.

3.2.2 Proposals shall be evaluated using the principle of:

**Quality Cost Based Selection** with a weight of 80% given to the technical part and a weight of 20% given to the financial part.

3.2.3 The method of evaluation is detailed below:

**Step 1: Completeness & Suitability**

Open Envelope 1 (Technical Proposal)

Proposals will be screened on an initial eligibility and competence screening, based on:

a. completeness of each proposal (non-price information) to ensure that all documentation requested in the RFP has been correctly submitted

b. appropriateness of the material submitted – is it within scope

c. the organisation is eligible to submit a proposal

d. no conflict of interest exists.

Should the Proposal be incomplete or deemed inappropriate or non-responsive, the PET may exclude it from further evaluation or, if the omission is relatively minor or clarification is required, request the missing information or clarification from the Bidder.

**Step 2: Mandatory Criteria**

Determine that the Bidder meets the following minimum requirements to qualify for further technical evaluation
a. Include project / skills requirements (some reference to scale, complexity, $ value useful)
b. Exclude from further consideration any proposal that does not meet the minimum requirements of the Mandatory Criteria.

Step 3: Technical Evaluation (Non-Price Information)

- Grade each attribute of the non-price information for each proposal against the Scoring Sheets provided below in Section 3.3.
- Exclude from further consideration any proposal that fails against an attribute (scores of 4 or less).

The weighting to be applied to the technical attributes is as follows:

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Attribute Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevant Experience &amp; Track Record</td>
<td>15</td>
</tr>
<tr>
<td>Technical /Personnel Skills</td>
<td>15</td>
</tr>
<tr>
<td>Resources</td>
<td>15</td>
</tr>
<tr>
<td>Management Skills</td>
<td>15</td>
</tr>
<tr>
<td>Methodology</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>80%</td>
</tr>
</tbody>
</table>

Scoring of these criteria will use a scale of 1 to 10, as per the following definitions:

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>Exceeds requirements in all ways, with very little, or no risk.</td>
<td>10</td>
</tr>
<tr>
<td>Excellent / Very Good</td>
<td>Exceeds requirements in most ways, with very little, or no risk.</td>
<td>9</td>
</tr>
<tr>
<td>Very Good</td>
<td>Meets requirements in all ways, exceeds it in some, little risk involved.</td>
<td>8</td>
</tr>
<tr>
<td>Very Good / Good</td>
<td>Meets the requirement, little risk involved.</td>
<td>7</td>
</tr>
<tr>
<td>Good</td>
<td>Meets the requirement and is workable, acceptable risk</td>
<td>6</td>
</tr>
<tr>
<td>Good / Marginal</td>
<td>Meets the requirement, may require work in some areas, some element of risk.</td>
<td>5</td>
</tr>
<tr>
<td>Marginal</td>
<td>Nearly meets the requirement, may be deficient or limited in some areas, element of risk.</td>
<td>4 (Fail)</td>
</tr>
<tr>
<td>Marginal / Poor</td>
<td>Deficient or limited in most areas, high element of risk.</td>
<td>3 (Fail)</td>
</tr>
<tr>
<td>Poor</td>
<td>Information provided does not meet the requirement, is not workable and is deficient, high element of risk.</td>
<td>2 (Fail)</td>
</tr>
<tr>
<td>Poor / Non-compliant</td>
<td>Information provided does not meet the requirement, is not workable and is deficient, high element of risk.</td>
<td>1 (Fail)</td>
</tr>
</tbody>
</table>

The remaining proposals will be evaluated to determine their total weighted scores, being the sum of the products of each proposal’s individual attribute score multiplied by the attribute weighting.
Step 4: Financial Evaluation (Price Information)
Proposals that pass the technical evaluation will have their financial proposal opened and points awarded in accordance with the following formula:

\[ S_f = \left( \frac{F_m}{F} \right) \times 100 \]

Where
- \( S_f \) = points to be awarded
- \( F_m \) = lowest financial proposal
- \( F \) = amount proposed by individual firm

Step 5: Final Evaluation
Proposals will be ranked and the Preferred Bidder identified according to their combined technical and financial scores using the following weights:

- Technical: 80%
- Financial: 20%
- TOTAL SCORE: 100%

3.3 Technical / Non-Price Evaluation
The non-price evaluations shall be completed prior to opening the price envelopes. The evaluation criteria that will be applied for the Technical Proposal are as identified below:

RELEVANT EXPERIENCE / TRACK RECORD

Each Bidder shall submit a record of their company’s relevant experience, in particular technical experience, which shows its suitability for the work described in the Scope of Services and demonstrates their ability to complete technically similar projects to required standards on schedule and within budget.

Information should be limited to projects undertaken / completed within the last five (5) years. Similar information shall be provided for any proposed sub-Contractor. Bidders shall nominate three (3) referees to verify experience and performance and shall provide their contact details – name, company, phone and email.

In particular, the following criteria will be assessed:

<table>
<thead>
<tr>
<th>Relevant Experience &amp; Track Record (Weighting = 20%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation Criteria</td>
</tr>
<tr>
<td>Experience in projects to similar scale, specifications and complexity in similar environment</td>
</tr>
<tr>
<td>Understanding of the objectives</td>
</tr>
<tr>
<td>Provide three (3) referees for whom the Contractor has completed a project within the last five (5) years</td>
</tr>
<tr>
<td>Timeliness - adherence to project program</td>
</tr>
<tr>
<td>Information should include relevant experience and track record of any sub-contractors</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>
TECHNICAL / PERSONNEL SKILLS

In addition to the information on Schedule 1 - Key Personnel, each Bidder shall submit supplementary details of the key personnel to be employed on the project, indicating each person's proposed involvement in the project.

The submission should demonstrate that their experience and skills are compatible with the project requirements and their nominated role.

In particular, the following criteria will be assessed:

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Manager</td>
<td>4</td>
</tr>
<tr>
<td>Senior Electrical Engineer</td>
<td>4</td>
</tr>
<tr>
<td>Controls Engineer</td>
<td>4</td>
</tr>
<tr>
<td>Electricians</td>
<td>4</td>
</tr>
<tr>
<td>Electrical Tradesman</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>20%</strong></td>
</tr>
</tbody>
</table>

RESOURCES

Each Bidder shall submit details of the key resources to be used on the project, indicating availability and suitability for its intended purpose.

In particular, the following criteria will be assessed:

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>All plant, machinery and equipment required for the supply and installation works</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td><strong>10%</strong></td>
</tr>
</tbody>
</table>

MANAGEMENT

Each Bidder shall describe the management methods and skills which will be applied to ensure successful implementation of the Contract.
Information given should include but not be limited to:
Bidders should include with their submission, an organisation chart demonstrating key internal and external relationships for the project.

In particular, the following criteria will be assessed:

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organisation structure (include organisation chart showing internal and external relationships)</td>
<td>3</td>
</tr>
<tr>
<td>Organisation’s Management Structure and Internal Systems including programming, reporting, invoicing, QA and Health &amp; Safety</td>
<td>3</td>
</tr>
<tr>
<td>Employer / Stakeholder liaison / communication</td>
<td>3</td>
</tr>
<tr>
<td>Mobilization</td>
<td>3</td>
</tr>
<tr>
<td>Management of Sub-contractors</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15%</strong></td>
</tr>
</tbody>
</table>

**METHODOLOGY**

Each Bidder shall describe the methodology proposed to achieve the successful implementation of this contract.

In particular, the following criteria will be assessed:

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobilization, demobilization, testing and arranging other safety aspects prior to work commencement</td>
<td>3</td>
</tr>
<tr>
<td>Dismantling and removal of existing 3.3kV switchboard and resistor banks</td>
<td>3</td>
</tr>
<tr>
<td>Connection of transformer, generators, black start generator and power factor correction unit to the switchboards</td>
<td>3</td>
</tr>
<tr>
<td>Supply and install of partial type tested Form 4 3.3kV Switchboard complete with switchgear, soft starters, motorized transfer switch, provision for power factor correction unit, surge arrester and bus coupler and other accessories</td>
<td>3</td>
</tr>
<tr>
<td>Supply and install of 3.3kV Electronic Soft Starters</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15%</strong></td>
</tr>
</tbody>
</table>
3.4 Price Evaluation

The Price Evaluation will be undertaken after completion of the technical evaluation Errors and Omissions in Price Proposals

After opening of Envelope 2 (Price Information), the pricing information will be checked by the Employer for any omissions or arithmetic errors in computation and summation. Any errors will be corrected as follows:

i. If there is any discrepancy between amount in figures and in words, the amount in words will take precedence.

ii. If there is a discrepancy between the Total Price entered and the equivalent sum computed on the basis of the breakdowns, the Total Price shall be adjusted to the sum computed on the basis of the breakdowns.

iii. If there is a discrepancy between a stated amount and the correct amount calculated by multiplying the stated unit rate by the quantity, the stated amount shall be adjusted to the correct amount and the Total Price adjusted correspondingly.

The Bidder may be notified of these corrections and if the Bidder does not accept these adjustments as notified, its Proposal may be rejected.

For the purpose of evaluating Proposals, the Employer will determine for each Proposal the evaluated price by making any correction for errors as described above.

To permit a fair comparison, proposal prices may also be adjusted to take account of the effect on the Employer of a bidders exceptions to the risks and responsibilities defined in these Instructions to Bidders.

3.5 Award of Contract

- The preferred Bidder may be invited to participate in meeting(s) with the Employer to clarify outstanding issues and finalize an Agreement, and the Employer will arrange for minutes of such meetings to be prepared and agreed with the Bidder. The minutes of the meeting will be part of the basis upon which the agreement is to be concluded.

- The agreed minutes shall be binding on the successful Bidder as an acceptable clarification of its Proposal until its validity expires, and shall be wholly subject to the formal Agreement, and shall not bind the Employer nor commit him to entering into any agreement under any terms.

- Subject to approval of the funding by the relevant authority, the Employer and the Contractor shall sign the formal Agreement. The Contract shall not be concluded until the expiry of a stand-still period of 10 calendar-days following the Employer’s electronic notification of all Bidders of the award of the contract, or 15 calendar days following the Employer’s notification of the award by letter.

- Prior to the expiration of the period of proposal validity, the Employer shall notify the successful Bidder, in writing, that its proposal has been accepted.

- Unsuccessful bidders will be notified, in writing, by the Employer of its decision within seven (7) days from the date of the letter of acceptance to the successful proposal.
4 PROPOSAL FORMS AND SCHEDULES

The following forms are included for submission with the proposal:

**Envelope 1 (Technical Proposal)**
- Form of Technical Proposal
- Proposal Schedule 1 - Key Personnel
- Proposal Schedule 2A - Compliance and Departures – Non-Price / Technical

**Envelope 2 (Price Proposal)**
- Form of Price Proposal
- Proposal Schedule 2B - Compliance and Departures – Price
FORM OF TECHNICAL PROPOSAL

Date: ______________________

Invitation for Proposal No.: __________________

To: CEO, Water Authority of Fiji

We, the undersigned, declare that:

a. We have examined and have no reservations to the Proposal Document, including Addenda No.: ________ issued in accordance with Instructions to Bidders Clause 2.4.6 of the Instructions to Bidders (ITB)

b. We offer to execute in conformity with the Proposal Document the following Works:

   Supply, Installation & Commissioning of 3.3kV Switchboard & Electronic Soft Starters at Waimanu Pumping Station

   Duly authoris

c. Our Proposal consisting of the Technical Proposal and the Price Proposal shall be valid for a period of one hundred and twenty (120) days from the Proposal submission deadline in accordance with the Proposal Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period;

d. We, including any subcontractors for any part of the contract, have eligibility to submit this Proposal, in accordance with Clause 2.3 of the ITB;

e. We, including any subcontractors for any part of the contract, do not have any conflict of interest in accordance with Clause 2.6.12 of the ITB;

f. We are not participating, as a Bidder or as a subcontractor, in more than one Proposal in this Proposal process in accordance with Clause 2.3 of the ITB.

   Name ____________________  In the capacity of ____________________

   Signed ____________________

   Duty authorised to sign the Proposal for and on behalf of ____________________

   Dated ____________________
FORM OF PRICE PROPOSAL

Date: __________________________

Invitation for Proposal No.: ________________

To: CEO, Water Authority of Fiji

We, the undersigned, declare that:

a. We have examined and have no reservations to the Proposal Document, including Addenda No.: __________ issued in accordance with Instructions to Bidders (ITB) Clause 2.4.6

b. We offer to execute in conformity with the Proposal Document the following Works:
   Supply, Installation & Commissioning of 3.3kV Switchboard & Electronic Soft Starters at Waimanu Pumping Station

c. The total price of our proposal is:

   (VEP) (words)

   (VEP) (numbers)

d. Our Proposal shall be valid for a period of one hundred and twenty (120) days from the date fixed for the Proposal submission deadline in accordance with the Proposal Document, and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

e. We understand that this Proposal, together with your written acceptance thereof included in your notification of award, shall constitute a binding contract between us, until a formal contract is prepared and executed; and;

f. We understand that you are not bound to accept the lowest evaluated Proposal or any other Proposal that you may receive;

   Name __________________________   In the capacity of __________________________

   Signed __________________________

   Duly authorised to sign the bid for and on behalf of __________________________

   Dated __________________________
## PROPOSAL SCHEDULE 1

### KEY PERSONNEL

<table>
<thead>
<tr>
<th>Position / Role</th>
<th>Name</th>
<th>Current Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Manager</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senior Electrical Engineer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controls Engineer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electricians</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical Tradesman</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others (to be listed by Bidder)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Name ______________________  Position ______________________

Signed ______________________

Dated ______________________
PROPOSAL SCHEDULE 2A

SCHEDULE OF COMPLIANCE AND DEPARTURES – NON-PRICE

This criterion will not be scored but may affect the evaluation of proposal conformance and the scoring of other non-price attributes.

(to be included in Non-Price / Technical Envelope)

Using the schedule below, bidders shall provide details of any non-compliances or departures from the requirements of this Request for Proposals and any Addenda / Notices to Bidders. The Employer reserves the right to reject any proposal that contains non-compliances or departures which it deems unacceptable and which the bidder declines to remove or amend. Departures acceptable to the Employer may result in adjustment to the proposal price for the purposes of comparison of proposals. 

Price information must not be included on this form.

Any price adjustments that the Bidder may wish to offer to remove a non-compliance must be shown in the Schedule of Compliance and Departures - Price and be included in the Price Envelope.

<table>
<thead>
<tr>
<th>Item</th>
<th>Clause reference in RFP</th>
<th>Detailed description of the departure or non-compliance</th>
<th>Perceived benefit to Employer (If any)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
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<td></td>
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<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td></td>
<td>Position</td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>---------------------</td>
<td>----------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Signed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dated</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PROPOSAL SCHEDULE 2B

SCHEDULE OF COMPLIANCE AND DEPARTURES – PRICE

With reference to any non-compliance items the bidder may have included in Schedule 2A, and using the format below, bidders shall provide details of the adjustment to their proposed price (if any) that they would require in order to remove a non-compliance which the Employer deems to be unacceptable.

Prices to remove departures must be included in the price envelope.

### Schedule of Compliance and Departures – PRICE

We, the Bidder, confirm that we are willing to remove the non-compliances listed in Schedule 2A of our proposal (technical / non-price envelope) in return for adjustment to our proposed price by the amount(s) below:

We accept that failure by us to provide a price for removal of any departure will entitle the Employer to make its own assessment of the diminished value to it of our proposal and compare our proposal price with those of other bidders accordingly.

<table>
<thead>
<tr>
<th>Item No. in Schedule 2A</th>
<th>Price to remove non-compliance (FJ$) VEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

Name

________________________

Position

________________________

Signed

________________________

Dated

________________________
5 CONDITIONS OF CONTRACT

The General Conditions of Contract applicable to the Agreement shall be the FIDIC “Conditions of Contract for Plant and Design Build, First Edition 1999” published by the International Federation of Consulting Employer’s Representatives (FIDIC), also known as the “FIDIC Yellow Book”, which shall be subject to the following Particular Conditions.

Electronic and hard copies of this document can be purchased on the following website, www.fidic.org

5.1 Particular Conditions - Reference to Clauses in General Conditions

The numbering of the Clauses and Sub-Clauses of the Particular Conditions follows the numbering of the Clauses and Sub-Clauses of the General Conditions

<table>
<thead>
<tr>
<th>GENERAL PROVISIONS</th>
<th>Clause 1.1: Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub Clause 1.1.1 - The Contract</td>
<td>In this contract, the following terms shall be interpreted as indicated:</td>
</tr>
<tr>
<td>1.1.1.1</td>
<td>“Contract” means the agreement entered between the Employer and the Contractor as recorded in the Contract Form signed by the parties, including all attachments and appendices thereto and all documents incorporated by reference therein.</td>
</tr>
<tr>
<td>Sub Clause 1.1.2 - Parties and Persons</td>
<td>In this contract, the following terms shall be interpreted as indicated:</td>
</tr>
<tr>
<td>1.1.2.3</td>
<td>“Contractor” means the individual or firm carrying out works as defined under Scope of Works.</td>
</tr>
<tr>
<td>Sub Clause 1.1.3 - Dates, Tests, Periods and Completion</td>
<td>In this contract, the following terms shall be interpreted as indicated:</td>
</tr>
<tr>
<td>1.1.3.7</td>
<td>&quot;Defects Notification Period&quot; means the period for notifying defects in the Works or a Section (as the case may be) under Sub-Clause 11.1 [Completion of Outstanding Work and Remedying Defects], calculated from the date on which the Works or Section is completed as certified under Sub-Clause 10.1 [Taking Over of the Works and Sections] and expired for the expiration of period (with any extension under Sub-Clause 11.3 [Extension of Defects Notification Period]) calculated from the date of Total work is taken over. Defects Notification Period shall be 12 months after successful completion of the project.</td>
</tr>
</tbody>
</table>

Supply, Installation & Commissioning of 3.3kV Switchboard & Electronic Soft Starters at Waimanu Pumping Station
The percentage of retention shall be 5% of the Contract Price which will be released at the date of completion of the Defects Notification Period subject to Clause 11.9 of the GCC.

| 1.1.3.9 | "day" means Calendar Day |
| Sub Clause 1.1.4 - Money and Payment | In this contract, the following terms shall be interpreted as indicated: |
| 1.1.4.2 | "Contract Price" means the price payable to the Contractor under the Contract for the full and proper performance of its contractual obligations. |
| 1.1.4.8 | "Local Currency" means the Currency of the Country (Fiji). |
| Sub Clause 1.1.5 - Works and Goods | In this contract, the following terms shall be interpreted as indicated: |
| 1.1.5.2 | "Goods" means Contractor's Equipment, Materials, Plant and Temporary Works, and all the equipment, which the Contractor is required to supply to the Authority under the Contract. |

**Clause 1.4: Law and Language**

Add the following:

| Sub Clause 1.4.1 | Law shall be the **Laws of Fiji** |
| Sub Clause 1.4.2 | Language Shall be **ENGLISH** |

**Clause 1.5: Priority of Documents**

Delete the priority order given and substitute the following. The Order of priority of contracts documents is as follows:

1. The Contract Agreement.
2. The Letter of Acceptance and Letter of Acknowledgement
3. Agreed Minutes of Contract Negotiations
4. The Letter of Bid.
5. Any addenda or amendments issued.
6. The General Conditions.
7. The Particular Conditions.
8. The Employer’s Requirements.
9. Specifications
10. Drawings
11. The completed schedules
12. The Contractor’s Proposal. (Technical/ Financial)
13. Any other documents forming part of the contract.

| Sub Clause 1.1.4 - Money and | In this contract, the following terms shall be interpreted as indicated: |
1.1.4.2 "Contract Price" means the price payable to the Contractor under the Contract for the full and proper performance of its contractual obligations.

1.1.4.8 "Local Currency" means the Currency of the Country (Fiji).

Sub Clause 1.1.5 - Works and Goods

In this contract, the following terms shall be interpreted as indicated:

1.1.5.2 "Goods" means Contractor’s Equipment, Materials, Plant and Temporary Works, and all the equipment, which the Contractor is required to supply to the Authority under the Contract.

**Clause 1.4: Law and Language**

Add the following:

Sub Clause 1.4.1 Law shall be the Laws of Fiji

Sub Clause 1.4.2 Language Shall be ENGLISH

**Clause 1.5: Priority of Documents**

Delete the priority order given and substitute the following.

The Order of priority of contracts documents is as follows:

15. The Letter of Acceptance and Letter of Acknowledgement
16. Agreed Minutes of Contract Negotiations
17. The Letter of Bid.
18. Any addenda or amendments issued.
19. The General Conditions.
20. The Particular Conditions.
21. The Employer’s Requirements.
22. Specifications
23. Drawings
24. The completed schedules
25. The Contractor’s Proposal. (Technical/ Financial)
26. Any other documents forming part of the contract.

**Clause 1.9: Errors in the Employer’s Requirement**
Before submission of Bid by the Bidders the bidder, at their own cost shall conduct a thorough site inspection and measurement. In the event that there is an error or defect of a technical nature in the Employers Requirement as per the Bidders site inspection and measurement, subject to clause 5.1 of the General Conditions, the Bidder shall promptly give notice to the Employer of such error or defect.

Subject to the above clause, the Contract Price shall be taken as final and inclusive of all the above necessary due diligence by the Bidder. Should the Bidder be awarded the contract, WAF will not revise any costs or increase price or consider any increase in price or time extension because the contractor was not in a position to ascertain all proper investigations before quoting for the price.

THE EMPLOYER

Clause 2.1: Right of Access to the Site

Replace Paragraph 3 with the following:

Contractor shall provide in written two (2) weeks prior notice for access to site. In order for the Employer to make arrangements for the Contractor to access site. If no written notice is given by the Contractor to the Employer within the time frame mentioned above Employer shall not take any responsibilities in the delay of works.

Clause 2.2: Permits, Licences or Approvals

Delete Entirely and Replace with the following:

The Employer shall provide assistance to the Contractor at the request of the Contractor in the following ways:

(a) Directing the Contractor to relevant Authorities
(b) Providing Support letters if needed

THE ENGINEER

Clause 3.1: Engineer’s Duties and Authorities

Add the following after the Clause

Notwithstanding the provisions stated above if, in the opinion of the Engineer, an emergency occurs affecting the safety of life or of the Works or of third party’s property, he may instruct the Contractor to execute all such work or to do all such things necessary to mitigate the damage.

The Contractor shall forthwith comply, despite the absence of approval of the Employer, with any such instructions of the Engineer at the Contractors Cost.
The Engineer to the Works shall be the General Manager Construction of WAF.

**Clause 3.4: Replacement of the Engineer**

Delete Entirely and Replace with the following:

If the Employer intends to replace the Engineer, the Employer shall, not less than 15 days before the intended date of replacement, give notice to the Contractor of the name and address of the replacement Engineer.

**THE CONTRACTOR**

**Clause 4.2: Performance Security**

Delete Entirely the First Paragraph and replace with the following:

Replace the text of 1st paragraph of Sub-Clause 4.2 with the following:

The Contractor shall provide security for its proper performance of the Contract to the Employer within 21 days after the receipt of the Letter of Acceptance. The performance security shall be valued at 10% of the Contract Price provided in the form of a bank guarantee and in the form included in the Bidding document, issued either

(a) by a bank located in Fiji Islands approved by the Reserve Bank of Fiji or a foreign bank through a correspondent bank approved by the Reserve Bank of Fiji located in Fiji Islands.

(b) Directly by a foreign bank but security shall be confirmed by a bank operating in Fiji Islands; approved by the Reserve Bank of Fiji acceptable to the Employer.

Add the following after the last paragraph:

Without limitation to the provisions of this Sub-Clause, whenever the Engineer determines an addition or a reduction to the Contract Price as a result of a change in cost or legislative changes affecting the cost or as a result of a Variation amounting to more than 25 percent of the Contract Price payable in a specific currency, the Contractor shall at the Engineer’s request promptly increase, or may decrease, as the case may be, the value of the Performance Security in that currency by an equal percentage.

**Clause 4.3: Contractor’s Representative**

Add the following after the last paragraph

The Contractors representative shall be the only person responsible for chairing the meetings with the Employer.

Any change to the Contractors Representative shall be notified to the Employer 28 days prior to the intended date of replacement and shall be signed off by the Employer as approved and
received.

**Clause 4.4: Subcontractor’s**

Add the following after the last paragraph

If the Contractor proposes to sub contract a part of the works, he shall give reasonable opportunity for qualified contractors from the Fiji Islands to be appointed as sub contractors.

The Employer shall not make payment directly to any sub contractor for sub contracted works.

**Clause 4.18: Protection of the Environment**

Add the following after the last paragraph

The Contractor shall take steps to ensure that vibration and noise levels from plant and equipment, particularly during night work and for pile driving, do not raise public complaints, and that noise levels do not exceed levels stipulated in the relevant regulations and legislation enactments of the Fiji Islands.

That water from operations lowering ground water levels (well points etc) and draining excavations shall not cause subsidence of surrounding ground and should not affect residential wells. Should residential wells be emptied during dewatering, residents affected shall be entitled to and provided with sufficient provision of an alternative water supply for the duration of the Works until the effect of such dewatering is reversed back to previous conditions.

Water from dewatering shall have acceptable turbidity prior to discharge to any water course. All practical means shall be taken to prevent the discharge (accidental or otherwise) of sewage to surface water courses or storm sewer systems.

The Contractor shall take reasonable care and sufficient measures to reduce dust nuisance by frequent wetting down and sweeping road surfaces, and wetting excavated materials.

The Contractor shall adequately instruct his staff and his sub-Contractors about the environmentally sound discharge of potentially hazardous materials used on site, and shall ensure his staffs comply with these instructions. The measures he adopts on this shall be transparent.

**Clause 4.21: Progress Report**

Add the following after the first paragraph

Contractor shall provide weekly and monthly reports to Employer.

**Clause 4.22: Security of the Site**

Add item (c)

The Contractor shall take additional security precautions when working in designated “high
security” areas. Work sites for pumping stations and trenching shall be secured at night and if necessary a security guard shall be posted on such stations.

**Clause 4.24: Fossils**

Add the following:

Excavation in areas designated as archeologically sensitive will be carried out following the archaeological guidelines given by the Relevant Government Authorities and the Contractors are to obtain these guidelines by themselves and consult the Employer.

**DESIGN**

**Clause 5.5: Training**

Add the following after the last paragraph

All training costs shall be at contractors cost and the number of people to be trained shall be decided by the Employer.

**Clause 5.7: Operation and Maintenance Manuals**

Add the following after the last paragraph

Number of copies shall be in accordance to the Employer's Requirement.

The contractor shall arrange the warranties from the manufacturers or vendors of all elements of the project to the name of the Employer. Unless otherwise agreed between the Employer and the contractor, the period(s) of warranties shall be no shorter than listed herein below from the date of Taking Over Certificate.

<table>
<thead>
<tr>
<th>Category</th>
<th>Period</th>
<th>Object Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5 years, except consumable parts</td>
<td>- Measuring and instrumentation system</td>
</tr>
<tr>
<td>11</td>
<td>10 years, except consumable parts</td>
<td>- Pumps and all Electrical Works</td>
</tr>
</tbody>
</table>

**STAFF AND LABOUR**

**Clause 6.4: Labour Laws**

At the end of the second paragraph insert the following:

The Contractor shall indemnify and keep indemnified the Employer against all claims made under all labour laws of the Republic of Fiji Islands and any statutory amendments thereto or modification thereof.
The Contractor shall comply with local labour laws and any amendments in force at the time of execution including the following, but not limited to:

i. Wages Board Ordinance
ii. Shop and Office Act as may be relevant

**Clause 6.5: Working Hours**

Delete Entirely and replace with the following:

Normal working hours shall be 8.00am - 5.00pm from Monday to Friday excluding Public Holidays. Works outside these hours shall be carried out following the following procedure:

1. Written request from the Contractor to the Engineer explaining the reason for the request and importance.
2. Written approval by the Engineer given.

**Clause 6.6: Facilities for Staff and Labour**

Replace the first paragraph with the following:

The Contractor shall provide and maintain such accommodation and amenities as he may consider necessary for all his staff and labour, employed for the purposes of or in connection with the Contract, including all fencing around working site, water supply (both for drinking and other purposes), electricity supply, sanitation, cookhouses, fire prevention and fire-fighting. On completion of the Contract, unless otherwise agreed with the Employer, the temporary camps/housing provided by the Contractor shall be removed and the site reinstated to its original condition on the contractors own responsibility all to the approval of the Engineer.

**Clause 6.7: Health and Safety**

Add the end of third paragraph insert the following:

In the event of any outbreak of illness of an epidemic nature, the Contractor shall comply with and carry out such regulations, orders and requirements as may be made by the Government or local health authorities, for the purpose of dealing with, and overcoming the same.

The Contractor shall be conversant with the requirements of the Medical Officer of Health (MOH) office requirements on health and the requirement of the Labour Ministry on safety, and comply with all such requirements and regulations and procedures.

The Contractor has to provide training on safety to the Employer's and on site have all safety signs installed that is needed for construction works. Contractor shall have a site register.

**Clause 6.9: Contractor's Personnel**

Add the following paragraph at the end
The Contractor shall cooperate with security operations by providing bio data of all Contractor personnel including his subcontractors and other personal information if and when requested by police, military and other relevant security authorities.

**PLANT, MATERIALS AND WORKMANSHIP**

**Clause 7.3: Inspection**

Add the following after the last paragraph

The Employer requires the Plant and Materials to be supplied under this contract shall conform to the requirements of the Relevant Government Authorities. The Contractor shall obtain the approval upon inspection for the specific requirement of this contract document carried out by Employer. All cost of such inspection should be included in the total contract price.

The Contractor shall obtain the approval of the Employer to ship the Plant and Materials to be imported for the Works or to deliver such materials and plant to the site. Applications for such approval to ship shall be accompanied by manufacturer’s test certificates and certificates of inspection prescribed in the Contract or agreed with the Employer. Application shall be made so as to give the Employer a reasonable time to deal with such applications.

**Clause 7.4: Testing**

Add the following after the last paragraph

The Employer’s right to inspect, test and, where necessary, reject the Plant and Materials after the arrival in the Employer’s country shall in no way be limited or waived by reason of the Plant and Materials having previously been inspected, tested and passed prior to the shipment from the country of origin.

In the case of the imported Plant and Materials, the tests should be carried out by an inspection agency approved by the Employer and the copy of the certificate issued by the inspection agency with respect to quantity, quality and loading including all items given in the TOR for the pre-shipment inspection for the Approved Inspection Agency should be forwarded to the Employer. The cost of inspection will be borne by the Contractor.

**Clause 7.5: Rejection**

Add the following after the last paragraph

The survey works and survey data/information in as built drawings or other documents shall be acceptable only if these conform to current professional survey standards applied Fiji and in accordance to Fiji Map Grid. If survey data/information provided by the CONTRACTOR are found to be inaccurate or erroneous the CONTRACTOR shall at his expense promptly make necessary corrections. All costs of checking of such data/information by the EMPLOYER shall be paid by the CONTRACTOR to the EMPLOYER subject to Sub Clause 2.5 [EMPLOYER’s Claims].
## Commencement, Delays and Suspension

### Clause 8.1: Commencement of Works

Delete Entirely and replace with the following:

The commencement date shall be that of the signing date of the contract.

### Clause 8.3: Programme

Add the following after the last paragraph:

The Contractor to provide the Work Programme for the Works highlighting milestone achievement dates.

### Clause 8.5: Delays Caused by Authorities

Add the following after the last paragraph:

The Contractor should carefully study the procedures for which sufficient allowance should be kept in the time programmes for obtaining permit from the Fiji Electricity Authority for permanent power supply.

### Clause 8.7: Delay Damages

Add the following after the last paragraph:

The contractor shall finish all works including testing and hand-over to Employer within the dates provided in the work schedule. If there is a delay in the completion than the Employer will charge the contractor FJD 1000 per day.

## Tests on Completion

### Clause 9.1: Contractor’s Obligation

Add the following after the last paragraph:

All materials, labour, electricity, water, chemicals, fuel, Testing equipment and any other required materials, skilled and other labourer and etc. for the proper completion of tests shall be provided by the contractor at Contractor’s cost and shall be included in the lump sum contract price.

### Clause 9.2: Delayed Tests

Delete Entirely the first paragraph and replace with the following:

If the Tests on Completion are being delayed by the Employer due to works that are WAF’s responsibility, the Contractor will be required to complete these tests once WAF works are
completed at no additional cost to WAF.

VARIATIONS AND ADJUSTMENTS

Clause 13.3: Variation Procedure

Add the following after the last paragraph

Variations during the contract that involve a reduction in the CONTRACTOR’s scope of work or a reduction in the cost shall result in a reduction to the Contract Price.

Clause 13.8: Adjustments for Changes in Cost

Delete Entirely and replace with the following

The amount available for variations (as per clauses 13.1 to 13.7) and adjustments for changes in cost (clause 13.8) is limited to the contingencies which is 15% of the Contract value. Hence up to a maximum of 5% of the Contract value from the contingencies can be used for the adjustments for changes in computing value for total work done as per the additional cost involved due to increase of unit items mentioned in “Schedule for unit price for Variation” and the remaining amount available in the contingencies shall be used for other variations. In the event of adjustments for changes in cost lesser than 5%, the balance amount shall be utilized for the other.

The claim for the adjustment for changes in cost shall be submitted periodically. However, this shall be reconciled and certified in the final payment certificate subject to above.

CONTRACT PRICE AND PAYMENT

Clause 14.2: Advance Payment

Delete Entirely the fifth paragraph and replace with the following:

The advance payment will be 5% of the contract sum which will be paid upon successful submission of the performance security and other relevant documents and shall be repaid through percentage deducted in payment certificates as mentioned below:

(a) Deductions shall commence in the Payment Certificate in which the total of all certified interim payments (excluding the advance payment and deductions and repayments of retention) exceeds thirty per cent (30%) of the Accepted Contract Amount
(b) Deductions shall be made at the amortization rate of forty per cent (40%) of the amount of each Payment Certificate (excluding the advance payment and deductions and repayments of retention) in the currencies and proportions of the advance payment, until such time as the advance payment has been repaid.

Clause 14.3: Application of Interim Payment Certificate

In the second paragraph (a) after the words “the Contractor’s Document produced” insert the
Supply, Installation & Commissioning of 3.3kV Switchboard & Electronic Soft Starters at Waimanu Pumping Station

following:

‘based on the Price Schedules and respective price breakdowns Agreed

Clause 14.4: Schedule of Payments

Delete Entirely and replace with the following:

The payment will be made as per the Schedules of Payment based on the achievement of milestone as mentioned in Schedule of Payments. The Contractor shall submit detailed formula for each milestone achieved with weight age for different major project deliverables which will be agreed by the Employer before awarding of the Contract. However Contractor is not entitled for any interim payment until successful completion of the first milestone to the entire satisfaction of the Engineer. Accordingly monthly interim payments will be paid to the Contractor based on percentage achievements of deliverables under each milestone. Schedule of payments would be as follows:

- 50% on shipment of switchboard and other equipment to Suva. This would be released upon successful production of bill of lading documents.
- 40% upon practical completion
- 5% upon satisfactory completion of the 12 months maintenance and inspection period
- 5% retention upon completion of the 12 months defects notification period

Clause 14.5: Plant and Materials intended for the Works

Delete Entirely and replace with the following:

If this Sub-Clause applies, Interim Payment Certificates shall include, under sub-paragraph (e) of Sub-Clause 14.3, (i) an amount for Plant and Materials which have been sent to the Site for incorporation in the Permanent Works, and (ii) a reduction when the contract value of such Plant and Materials is included as part of the Permanent Works under sub-paragraph (a) of Sub-Clause 14.3 [Application for Interim Payment Certificates].

If the lists referred to in sub-paragraphs (a)(i) below are not included in the Appendix to Tender, this Sub-Clause shall not apply.

The Engineer shall determine and certify each addition if the following conditions are satisfied:

(a) the Contractor has:
- kept satisfactory records (including the orders, receipts, Costs and use of Plant and Materials) which are available for inspection, and
- submitted a statement of the Cost of acquiring and delivering the Plant and Materials to the Site, supported by satisfactory evidence; and

(b) the relevant Plant and Materials:
- are those listed in the Appendix to Tender for payment when delivered to the Site, and
- have been delivered to and are properly stored on the Site, are protected against loss.
damage or deterioration, and appear to be in accordance with the Contract.

The additional amount to be certified shall be the equivalent of seventy percent of the Engineer’s determination of the cost of the Plant and Materials (including delivery to Site), taking account of the documents mentioned in this Sub-Clause and of the contract value of the Plant and Materials.

The currencies for this additional amount shall be the same as those in which payment will become due when the contract value is included under subparagraph (a) of Sub-Clause 14.3 [Application for Interim Payment Certificates]. At that time, the Payment Certificate shall include the applicable reduction which shall be equivalent to, and in the same currencies and proportions as, this additional amount for the relevant Plant and Materials.

**Clause 14.7: Payment**

Add the following after the last paragraph

Method of payment will be as follows:

Payments due to the CONTRACTOR in FJ Dollars (FJD) will be made to the CONTRACTOR in accordance with the Schedule of Payments attached and shall apply in cases of disbursements for the payments made with respect to the portion of the contract stated in the currency of the Republic of Fiji Islands.

**Clause 14.9: Payment of Retention Money**

Delete Entirely and refer to Clause 1.1.3.7 above

**RISK AND RESPONSIBILITIES**

**Clause 17.6: Limitation of Liability**

Add the following after the last paragraph

Neither any member of the EMPLOYER’s staff, nor the ENGINEER nor any member of his staff, nor any member or officer of the Government of the Republic of Fiji Islands shall in any way be personally liable for the acts or obligations under the Contract, or answerable for any default or omission on the part of the EMPLOYER in the observance of the Contract Clauses or performance of any of the acts, matters or things which are herein contained.

**Clause 18. Insurance**

Clause 18 is amended as follows.

The Contractor shall as required under the Agreement take out a Public Liability Insurance (PIL) and appropriate Workman’s Compensation Cover valid for the duration of the Agreement or for any extended period thereof. The Contractor shall submit this Insurance certificates within 21
days from the date of Letter of Acceptance.

CLAIMS, DISPUTES AND ARBITRATION

Clause 20.2: Appointment of the Dispute Adjudication Board

Delete Entirely and replace with the following:

Disputes shall be adjudicated by a DAB in accordance with Sub-Clause 20.4 [Obtaining Dispute Adjudication Board’s Decision]. The Parties shall jointly appoint a DAB by the date stated in the Appendix to Tender.

The DAB shall comprise, as stated in the Appendix to Tender, either one or three suitably qualified persons (“the members”). If the number is not so stated and the Parties do not agree otherwise, the DAB shall comprise three persons.

If the DAB is to comprise three persons, each Party shall nominate one member for the approval of the other Party. The Parties shall consult both these members and shall agree upon the third member, who shall be appointed to act as chairman.

However, if a list of potential members is included in the Contract, the members shall be selected from those on the list, other than anyone who is unable or unwilling to accept appointment to the DAB.

The agreement between the Parties and either the sole member (“adjudicator”) or each of the three members shall incorporate by reference the General Conditions of Dispute Adjudication Agreement contained in the Appendix to these General Conditions, with such amendments as are agreed between them.

The terms of the remuneration of either the sole member or each of the three members, including the remuneration of any expert whom the DAB consults, shall be mutually agreed upon by the Parties when agreeing the terms of appointment. Each Party shall be responsible for paying one-half of this remuneration.

If at any time the Parties so agree, they may jointly refer a matter to the DAB for it to give its opinion. Neither Party shall consult the DAB on any matter without the agreement of the other Party.

If at any time the Parties so agree, they may appoint a suitably qualified person or persons to replace (or to be available to replace) any one or more members of the DAB. Unless the Parties agree otherwise, the appointment will come into effect if a member declines to act or is unable to act as a result of death, disability, resignation or termination of appointment.

If any of these circumstances occurs and no such replacement is available, a replacement shall be appointed in the same manner as the replaced person was required to have been nominated or agreed upon, as described in this Sub-Clause.

The appointment of any member may be terminated by mutual agreement of both Parties, but...
not by the Employer or the Contractor acting alone. Unless otherwise agreed by both Parties, the appointment of the DAB (including each member) is the Contractor's requirements for access, accommodation, facilities, personnel, power, transport, water and other services shall expire when the discharge referred to in Sub-Clause 14.12 [Discharge] shall have become effective.

### Clause 20.6 Arbitration

Delete the text of the clause and substitute the following.

i. The Employer and the contractor shall make every effort to resolve amicably by direct, informal, negotiation, any disagreement or dispute arising between them under or in connection with the contract. If amicable settlement cannot be reached then all disputed issues shall be settled by Arbitration as per the Arbitration Act No. 11 of 1995.

The arbitration shall be conducted in accordance with the local Arbitration Procedures and shall be held at such place and time in Fiji Islands as the arbitrators may determine. The decision of the majority of arbitrators shall be final and binding upon the parties hereto and the expenses of the arbitration shall be paid as may be determined by the arbitrators.

ii. Pending the award in any arbitration proceedings hereunder,

a) this Contract and the rights and obligations of the Parties shall remain in full force and effect and

b) Each of the Parties shall continue to perform their respective obligations under this Contract. The termination of this Contract shall not result in the termination of any arbitration proceedings pending at the time of such termination nor otherwise affect the rights and obligations of the Parties under or with respect to such pending arbitration.

iii. Any award rendered by the arbitral tribunal shall determine the extent to which the cost of arbitration is to be borne by each Party. The arbitration centre charges and the compensation to the arbitrators shall be equally shared by the Parties initially.

### Composition of the Arbitral Tribunal:

The arbitral tribunal shall consist of three arbitrators who shall be appointed in the manner provided in the Selection Procedure as given below.

### Selection Procedure:

Either Party shall nominate one arbitrator. These two arbitrators jointly select the third arbitrator who shall act as the Chairman.

### Venue & Language:

The venue of arbitration shall be in Fiji Islands.

Unless otherwise agreed to by the Parties the proceedings shall be conducted and the award
shall be rendered in the English language.

**THE FOLLOWING ADDITIONAL CLAUSES ARE ADDED**

**Clause 21: Personal Liabilities**

Add the following new Clause

Neither any member of the Employer's staff, nor the Engineer nor any member of his staff, nor any member or officer of the Government of the Republic of Fiji Islands shall in any way be personally liable for the acts or obligations under the Contract, or answerable for any default or omission on the part of the Employer in the observance of the Contract Clauses or performance of any of the acts, matters or things which are herein contained.

**Clause 22: Properties in Excavated Materials**

Add the following new Clause

Pursuant of Clause 4.24, all materials and things of any kind obtained from excavations or found on or under the site which the Contractor may be allowed to occupy shall remain the property of the Employer and shall not be used in the Work or sold or otherwise disposed of without the written authority of the Engineer unless otherwise expressly allowed for in the Employer's Requirement.

No excavations are to be made upon the site or any additional sites beyond those shown on the drawings or described in the specification and the Price Schedules without the previous written authority of the Engineer.

Selection of borrow pits shall be to the satisfaction of the Engineer and comply and adhere to the rules and regulations of the respective Local Authorities of the area or any other relevant Government authority.

**Clause 23: Taxes and Duties**

Add the following new Clause

The Contractor's price(s) shall include all taxes, duties and other charges imposed outside Fiji Islands on the production, manufacture, sale and transport of all the goods.

The price quoted by the Contractor shall include business taxes income and all other taxes and charges excluding custom duties and VAT that may be levied according to the law and regulations in being as of the base date of the Employer’s Country on goods and services supplied under the Contract.

Nothing in the Contract shall relieve the Contractor from his responsibility to pay any tax that may be levied in the Employer’s country on profits made by him in respect of the Contract.

"In submitting the rates, proposed price the Contractor must familiarise itself with all the
applicable laws and policies with relation to Taxes, duties and VAT locally and abroad and the proposal when submitted must address this. No separate submission with regards to the above which may lead in the increase in proposed contract price will be considered”

The Contractor’s Staff, personnel and labour will be liable to pay personnel income taxes in the Employer’s Country in respect of such of their salaries and wages as are chargeable under the law and regulations for the time being in force, the Republic of Fiji Islands and the Contractor shall perform such duties imposed on him by such laws and regulations.

Any duties, custom duty, and Port charges, levied on the Plant and Materials to be incorporated in the Permanent Works supplied under the Contract shall be paid by the Contractor directory to the Department of Customs. Any VAT payable shall be charged to the Employer as a separate item and should be supported with VAT Registration Certificate issued by the Fiji Revenue & Customs Authority (FIRCA)

Any additional taxes due to change of government tax policy which directly affect the Contract after coming into force of the Contract will be adjusted in accordance with the Sub-Clause 13.7 [Adjustment for Changes in Legislation].

If the Contractor or is resident in Fiji for tax purposes, all payments made under the Agreement are subject to Value Added Tax (VAT) in accordance with the Value Added Tax (Amendment) Decree. The Contractor must be registered for Fiji VAT in accordance with the VAT Decree. If the Contractor is not so registered, it shall indemnify the Client against any ineligibility of the Client to reclaim VAT that results from the Contractor’s non-registration. The Contractor shall reimburse the Client in full for all such losses incurred by the Client, which the Client may deduct from amounts otherwise owing to the Contractor under the Agreement from time to time.

If the Contractor or a sub-Contractor is not resident in Fiji for tax purposes, payments to the Contractor or sub-Contractor may have Non-Resident Withholding Tax (NRWT) deducted at the prevailing rate by the Client or Fiji revenue authorities.

It shall be the Contractor’s responsibility to determine its applicable tax liabilities and to comply with the law. Any withholding tax payable shall be deemed to be allowed for in the price agreed for the Services. Costs incurred by the Contractor in determining its tax liabilities shall also be deemed to be allowed for in the VIP price agreed for the Services.
CONTRACT AGREEMENT

This Agreement dated this day of __________, __________

between [Name of Employer] 

of [Address of Employer]

and [Name of Contractor] 

of [Address of Contractor]

(hereinafter called “the Employer”) of the one part

and [Name of Contractor]

of [Address of Contractor]

(herinafter called “the Contractor”) of the other part

WHEREAS, the Employer desires that certain Services should be performed by the Contractor, namely:

Supply, Installation & Commissioning of 3.3kV Switchboard & Electronic Soft Starters at Waimanu Pumping Station

and has accepted a proposal by the Contractor for the performance of such Services.

THE EMPLOYER AND THE CONTRACTOR AGREE AS FOLLOWS:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in Clause 1.1 of the General Conditions.

2. The following documents shall be deemed to form and be read and construed as part of this Agreement in the order of precedence.

3. The Contract Agreement.
   a) The Contract Agreement.
   b) The Letter of Acceptance and Letter of Acknowledgement
   c) Agreed Minutes of Contract Negotiations
   d) The Letter of Bid.
   e) Any addenda or amendments issued.
   f) The General Conditions.
   g) The Particular Conditions.
   h) The Employer’s Requirements.
   i) Specifications
   j) Drawings
k) The completed schedules
l) The Contractor’s Proposal. (Technical/ Financial)
m) Any other documents forming part of the contract.

4. In consideration of the payments to be made by the Employer to the Contractor under this Agreement, the Contractor hereby agrees with the Employer to perform the Services in conformity with the provisions of the Agreement. The Employer hereby agrees to pay the Contractor in consideration of the performance of the Services such amounts as may become payable under the provisions of the Agreement at the times and in the manner prescribed by the Agreement.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed the day and year stated above in accordance with their respective laws.

SIGNED FOR ON BEHALF OF THE EMPLOYER AND CONTRACTOR

SIGNED (EMPLOYER)  SIGNED (CONTRACTOR)

PRINT NAME  PRINT NAME

DESIGNATION  DESIGNATION

DATE  DATE

COMPANY SEAL  COMPANY SEAL
6 SPECIFICATIONS

6.1 Section 1 - Contract Specification

6.1.1 General

The works described in this specification and the associated drawings shall form the basis of a supply, installation and commissioning contract subject to the general and special conditions of contract appended.

The contract includes the supply, except where specifically stated otherwise, of all labour, materials, equipment, tools, plant and scaffolding and craneage for the proper delivery, installation, connection, testing, commissioning, maintenance and guarantee of the complete electrical and instrument services installation.

The scope of works and drawings are intended to be mutually explanatory and complete, but all work called for by one, even if not by the other shall be fully executed.

All essential parts of the installation, which are not specified or specifically excluded, shall be supplied and installed. The Contractor shall allow to comply fully with the Fiji Occupational, Health and Safety requirements, Electricity Regulations, Codes of Practice and Local Authority requirements. The Contractor shall carry out all Works in accordance with the AS/NZS 3000:2007 “Wiring Rules” and associated codes of practice.

The Contractor shall utilise experienced tradesmen skilled in their particular class of work and registered or certified where such qualifications are required by law. The requirements of this Specification refer to all electrical and instrument works associated with the project.

The Contractor shall provide upfront information regarding the High Voltage Certification and Qualification of its personnel who would be working on this installation. WAF would not allow anyone without High Voltage Certification and Qualification to work or even touch any of the electrical components.

Where the requirements of this Specification are at variance with information provided in another part of the Contract Documents, the more onerous conditions shall apply.

Any requirements for documentation stated in this Specification shall be in addition to those stated elsewhere in the Contract Documents.
6.1.2 Scope of Works

Except where specifically stated otherwise, the contract includes the supply, of all design, labour, materials, equipment, tools, plant, temporary works, lifting and scaffolding, for the proper manufacture, supply, delivery, unloading, site assembly, attendance at commissioning and guarantee of the complete electrical system which generally include the following:

- Dismantling and removal of existing 3.3kV switchboard and resistor banks in the pump room and handover to client.
- Connection of transformer, generators, black start generator and power factor correction unit to the switchboards.
- Supply and install of partial type tested Form 4 3.3kV Switchboard complete with switchgear, soft starters, motorized transfer switch, surge arrestor and bus coupler and other accessories.
- Supply and install of 3.3kV Electronic Soft Starters to Ramsay switchboard.
- Supply and install of 3.3kV Soft Starters, switchgear for capacitor bank, surge arrestor, existing key interlock system to be upgraded to suit new system, existing manual transfer switch/change over switch to be converted to motorised system and key interlock fitted to suit new system with bus coupler to the existing Ramsay switchboard.
- Supply and install of new UPS complete with connection and other accessories to replace existing UPS located at the existing Ramsay main switchboard room.
- Supply and installation of 1 No. 11kV/3.3kV 1000kVA transformer complete with transformer primary, transformer secondary, pumps, controls cabling and other accessories to existing Ramsay Main Switchboard.
- Supply and install of lights, switches, power outlets complete with cabling and other accessories.
- All cable ladder, tray, trunking, support brackets, clips, ties and stands as required for the proper support and protection of all cable, tubing and equipment.
- All junction boxes as necessary to run and terminate power, control and instrument cabling and wiring.
- Lightning protection complete with lightning rod, dynasphere, cabling, earthing and all required accessories.
- All cabling and wiring shown on the power and control cable schedules including cable ties, glands, crimp lugs and pins, jointing, marking and ferruling.
- All identification and labelling of switchboards, motor control centres, PLC panels, instruments, cabling, wiring, terminals, cable ladders and all miscellaneous electrical equipment.
- Testing and commissioning of all equipment and systems installed under this contract.
- All Guarantees as Stated in the Contract Document,
- Liaison with both the Consultant, and other associated site contractors.
All parts of the installation, which are required for the satisfactory operation of the pumping station equipment and system but not specified or specifically included shall be supplied and installed by the Contractor.

6.1.3 Work Excluded

Provision and installation of a local Remote Termination Unit (RTU) and Programmable Logic Controller (PLC) within the Pumping Station.

6.1.4 Drawings

The drawings as listed in this specification shall be considered a part of this specification and all items mentioned on either the specification or the drawings, shall be considered as included in the other whether specified or not. Where conflict occurs the Contractor shall refer such conflict to the Consultant. Further drawings may be added during the currency of the Contract to amplify details of the above, e.g. termination drawings or schedules. The drawings may be amended, add to or withdrawn from time to time as the consultant in his absolute discretion may see fit.

Subject to the General Conditions of Contract any amended, additional or withdrawn Drawings shall be read and construed as being part of this Specification. The Contractor is responsible for making himself familiar with all drawings that may affect his works including but not limited to instrumentation, piping, civil and structural drawings.

6.1.5 Service Conditions

The high voltage switchgear and motor starters shall be suitable for “normal operating conditions” as detailed in IEC 60694.

- Ambient temperatures range 0-40°C, average temperature not exceeding 35°C over a 24-hour period.
- High humidity with up to 95% humidity.
- Average vapour pressure over a 24 hour period up to 2.2 kPa,
- High lightning incidence

6.1.6 Health and Safety

On the first day of the contract, Contractors and Subcontractors associated with the contract shall attend a Site induction given by the Engineer prior to them starting physical work on site. This shall be done on the site possession date by the Contractor.

The same requirement shall apply for any new staff members and/or subcontractors who begin work on Site part way through the contract. Personnel who have not been inducted will not be permitted to work on the contract.
The Contractor shall ensure that all its staff are trained in the proper use and maintenance of personal protective equipment, monitoring equipment and any other safety equipment used in connection with the Contract Works. The Contractor shall use specialist sub-contractors with suitable qualifications and previous similar experience for specialist work tasks such as sound attenuation, builders work, electrical works, etc.

### 6.1.7 Operation and Maintenance Manuals

Following commissioning the Contractor shall supply accurate comprehensive manuals and drawings embodying all information supplied during the contract updated to an "as-built" status. Additional information shall be incorporated to provide full operating instructions, maintenance procedures and spare parts lists. Copies of all test and commissioning results shall be incorporated in the manual. Two copies of manuals and drawings are required for approval by the Engineer, following approval they shall be supplied in the following quantities and format.

**Manuals:**
- 3 copies in durable hard covered ring binders, clearly inscribed on the front cover and spine, all pages to be A4 1 disk copy on 90 mm disk in Microsoft Word.

**Drawings:**
- 3 paper prints of each drawing
- 1 disk copy for CAD drawing generated. All drawings shall be prepared on AutoCAD 2004(or later) or AutoCAD LT.

Drawings and diagrams shall also be reduced to a convenient size and be bound into the manual. The reduced size drawings and diagrams shall be completely legible and suitable for reproduction. Catalogue material that also gives data for models or sizes other than those supplied shall be clearly marked to indicate which data is relevant to this installation.

Manuals shall include:
- Full operational instructions and warnings.
- Explanation of all alarm conditions and Set points.
- Part numbers of all equipment.
- Complete internal wiring drawings and component drawings including individual assemblies and cards.
- Detailed maintenance and servicing instructions.
- Recommended spares list.
- Fault finding procedures.

As-built drawings shall record all physical details, cable and identification details and set point of adjustable settings.

At the completion of the contract and before he leaves the site, the Contractor shall consult with the Consultant to ensure that the Consultant's set of marked up as-built

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Supply, Installation & Commissioning of 3.3kV Switchboard & Electronic Soft Starters at Waimanu Pumping Station
drawings are complete. The Contractor shall provide the Consultant with all such additional information as he may reasonably require. In the event of any section of the work installed not being covered by the Consultants drawings, and the Consultant so requests, the Contractor shall prepare or obtain suitable drawings.

6.1.8 Information to be Supplied with the Tender

Tenderers shall provide the following information with the tender:
(a) Equipment and component manufacturers.
(b) List of non-compliant items with this specification.
(c) System harmonic analysis and confirmation that his selected motor starters do not exceed the Total Harmonic Voltage at the system point of common coupling and that harmonic resonance will not occur when the system power factor correction equipment is operational – section 5 of this specification.

6.1.9 Information Required During the Contract

Prior to manufacture, three (3) copies of the fully detailed, dimensioned drawings of:
(d) All services distribution boards and control panels
(e) All fixing details and seismic supports and restraints

Within two months of the award of the contract:
(f) Site testing and commissioning procedures, schedules and methods

At other times:
(g) Miscellaneous details where requested by the Electrical Engineer.

6.1.10 Electrical Codes and Standards

All work and material shall comply with the latest issue of the following codes and standards, which are specifically referred to in the Specification. In the absence of a specific standard reference, the work and materials shall comply with the latest issue of relevant Fijian Standards, New Zealand Standards, British Standards and International Electrotechnical Commission standards with the Fijian and New Zealand Standards taking precedence. Compliance with latest Fiji Electricity Regulations and Building Codes and recommended practices is mandatory.

The following applicable standards are to be complied with:

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<td>NZECP:35:1993</td>
<td>Power Systems Earthing</td>
</tr>
<tr>
<td>IEC 502</td>
<td>High Voltage XLPE Cables</td>
</tr>
<tr>
<td>AS1429.1</td>
<td>High Voltage XLPE Cables</td>
</tr>
<tr>
<td>BS381C</td>
<td>Specification for colours for indication and cabling for special purposes.</td>
</tr>
<tr>
<td>AS/NZS3008.1.2</td>
<td>Selection of cables</td>
</tr>
<tr>
<td>NZSD 1716</td>
<td>Components and filters units for radio interference suppression.</td>
</tr>
</tbody>
</table>

Limitation of Harmonic levels (gazetted 1981 pursuant to Reg. 49 of the New Zealand Electrical Supply Regulations).

### 6.1.11 Maintenance

The Contractor shall maintain the installation in full working order in accordance with, and for the period stated in the Contract. The maintenance service shall include regular examinations of the installation during regular working hours and not less frequently than at monthly intervals, such examination being carried out by competent employees and shall include all necessary adjustments and repairs required to keep the installation in full working order to expiry of the maintenance period. An emergency call-back service shall be provided during both regular working hours and after normal working hours.
6.1.12 Defects Liability

The Contractor shall execute a written warranty to the effect that he shall make good any defect arising from any act of commission and/or poor workmanship that may develop in the work within a period of 12 months from the date of handing over of the complete work or any completed portion of the work. If any portion of the work is replaced or renewed, the provisions of this clause shall apply to the portion of the works so replaced or renewed until the expiration of 12 months from the date of such replacements or renewal.

6.1.13 Guarantee

The complete installation including all luminaries, fittings accessories and equipment shall be guaranteed for 12 months. Should any defect occur it shall be repaired within 5 days without charge or the work done by others at the Contractor's risk and expense. The guarantee shall commence when the installation is put into service, at the request of the Engineer or at the time of issue of a Defects Liability Certificate whichever is the sooner.

6.1.14 Quality Assurance and Control

Within 2 weeks of award of this Contract the Contractor shall submit to the Consultant a QA/QC Manual, which defines the Quality Management Strategy to be used for the electrical works associated with the project.

6.2 Section 2 - General Technical Specifications

6.2.1 Introduction

All Materials supplied are to be the best of their respective kind and suitable for the purpose for which they are intended and complying in all respects with this Specification. All materials and equipment shall be new, of good quality and shall comply with relevant Standard, whether specified or not or in the absence of such shall be approved by the Engineer and shall be suitable for their intended service. Tenderers offering equipment constructed and tested to recognised standards other than the Standard specified shall give details of the major differences. Where trade names are specified and alternatives permissible, any alternative offered shall be supported by all information concerning the similarities and their differences. Where alternatives are not permissible the specified brand shall be used. The Contractor is to amend general arrangements, schematic, termination or loop drawings for construction issue. Where trade names are specified and alternatives permissible, any alternative offered shall be supported information concerning all similarities and differences. The Contractor will be responsible for providing general arrangement, schematic, termination or loop drawings require to be amended for construction issue and approval of the Engineer.
6.2.2 Electrical System

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Utility Supply at High Voltage at 11,000V AC 3 phase and Low Voltage at 415V AC 3 phase neutral.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>50Hz</td>
</tr>
</tbody>
</table>

6.2.3 Manufacturers Recommendations

Every item of equipment installed under this contract shall be installed in accordance with its manufacturers’ recommendations. Where a conflict exists between the manufacturers’ recommendations and the requirements of this specification, then the Contractor shall refer the matter to the Engineer for approval before proceeding.

6.2.4 Inspection

All work carried out under this section of the specification will be subject to inspection both during construction and after completion. Approval after inspection and all required testing must be given by the Engineer before invoices for work done will be paid. All permits for the electrical work are the responsibility of the Contractor.

6.2.5 Penetrations

The Contractor shall not cut away or drill any material without the prior permission of the Engineer. Where such permission is obtained, only the minimum material shall be removed which will allow the electrical work to proceed. Joists and beams shall be drilled only when absolutely necessary and then only on the centre-line. Any damage caused by the contractor during such work or his failure to gain the Engineer’s approval shall be made good by the Contractor at his own expense and to the satisfaction of the Engineer. All penetrations through firewalls shall be sealed with expanding foam type fire putty to give a fire rating equal to the wall rating. The contractor shall be responsible for the fire proofing of the penetrations, made by him or by others, which are used for the purpose of the electrical works.

6.2.6 Fixings

All fixings to the building structure shall be as follows:

<table>
<thead>
<tr>
<th>Material</th>
<th>Fixing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timber</td>
<td>Galvanised screws or where copper saddles are installed, brass screws.</td>
</tr>
<tr>
<td>Concrete</td>
<td>Rawl-bolts or Dynabolts with male or female ends.</td>
</tr>
<tr>
<td>Steelwork</td>
<td>Engineer’s galvanised or cadmium-plated screws or hexagon-round hexagon bolts, nuts and washers.</td>
</tr>
<tr>
<td>Concrete Block work</td>
<td>Rawl-plug toggle bolts or metal thread toggle screws.</td>
</tr>
<tr>
<td>Interior Finishes</td>
<td>Chrome-Plated brass or steel</td>
</tr>
</tbody>
</table>
Timber plugs for screws in masonry will not be accepted.
NB: “Galvanised” means Hot Dip Galvanised - Not Zinc Plated

Due to the severe effects of chemicals on cuprous and ferrous metals in the Plant environment, all fastenings shall be stainless steel except for dry interior areas where hot dip galvanised fastenings will be permitted.

Priority brands of shot fastenings, cable saddle fixings etc. are not satisfactory and deteriorate rapidly. In exterior or damp interior, applications, the component supplied cover, fixing screws/bolts may need to be changed for stainless fastenings, and the Contractor shall allow to carry out this requirement to the Engineer's satisfaction at not extra cost.

6.2.7 Earthquake Precautions

All distribution boards/panels and equipment together with the equipment fitted internally, to be supplied on this Contract will be installed in areas subject to earthquakes, and under these conditions the equipment shall continue to operate satisfactorily. Provision shall be made to restrain all plug-in devices and modular elements. The complete distribution boards/panels and equipment mounted thereon shall comply with the Electricity Regulations and NZS 4203: 1992 Risk Factor 1.0. A Registered Engineer's Design Certificate shall be provided for all supports and fixings. The Contractor shall include for all costs to meet these requirements.

6.2.8 Painting

The Contractor shall allow for the painting of all mounting brackets, supports, etc., whether of wood or metal and where exposed to view where corrosion or rotting is possible due to environmental conditions. The paint system used shall be approved by the Engineer prior to any painting.

6.2.9 Marking and Labelling

All switchboards, control panels, switches, circuit-breakers, fuses, fuse-switches, isolating switches, relays, contactors, starters, connection boxes, motors, batteries, signal lamps, etc. shall be identified by a white Traffolyte label with black lettering fixed with two screws. Generally, the labels shall be positioned under the items they identify. The letter typeface shall be in the following sizes:

<table>
<thead>
<tr>
<th>Letter Height</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 mm</td>
<td>Switchboards, control panels, danger labels</td>
</tr>
<tr>
<td>10 mm</td>
<td>Power switches, selector switches, major switch positions etc.</td>
</tr>
<tr>
<td>5 mm</td>
<td>Sockets, switch sockets, minor switch positions, circuit-</td>
</tr>
</tbody>
</table>
breakers, fuses, relays, contactors, connection boxes.
Where space is available no abbreviation or code shall be used - e.g. SWITCHBOARD A, not SB A.

NB: Danger labels shall be White/Red/White or Red/White/Red Traffolyte to Engineers Approval.

6.2.10 Switchboard and Cubicle Installation

The Contractor is to arrange for the 3,300V HV Main switchboard and the 3,300V Motor Starter Cubicles to have steel supporting plinths located at floor level around the circumference of each unit. Supporting plinths and steel channels are to be provided by the Contractor as necessary at each cubicle section to support the equipment. The fastening of switchgear, control panels and motor starters shall be by anchor bolts or hold down bolts. The cubicles shall be levelled with packers located on both sides of each foundation bolt. The distance between foundation bolts shall not exceed 600 mm unless the equipment is specifically designed for a greater distance. The levelling accuracy shall be +/- 0.05 mm/m where height accurate alignment with other machines is required, or as required by the supplier. The pressure on the packer surface shall not exceed 1.5Pa. After levelling and fixing of panels, a non-shrink grouting system shall be used to effectively seal the plinth joint and provide continuous support along the entire length of the equipment.

6.2.11 Damage Prevention

When equipment is being moved into position using rollers and/or levers, back plates, pads and packers shall be used as necessary to prevent damage to the equipment. Finished floors shall be fully protected against scratches and damage by covering the floor with an adequate sheet (e.g.: plywood, galvanised steel).

6.3 Section 3 - High Voltage Switchboard

6.3.1 General

The purpose of this part of the specification is to establish the requirements for the 3,300V: 3 phase alternating current switchgear to be provided and installed under this contract. This specification is also applicable to the operating devices and their auxiliary equipment. The high voltage switchboard will be of the fixed extensible type with Sulphur Hexafluoride (SF6) or Vacuum arc extinction switchgear.

6.3.2 Technical Particulars
### 6.3.2.1 Switchgear

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Indoor</td>
</tr>
<tr>
<td>Busbar</td>
<td>Single</td>
</tr>
<tr>
<td>Busbar material</td>
<td>Copper</td>
</tr>
<tr>
<td>Phases</td>
<td>3</td>
</tr>
<tr>
<td>Rated voltage</td>
<td>12 kV</td>
</tr>
<tr>
<td>Maximum system voltage</td>
<td>3.3 kV</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>50 Hz</td>
</tr>
<tr>
<td>Busbar rated continuous current</td>
<td>630 A</td>
</tr>
<tr>
<td>Busbar short circuit current withstand (1 second)</td>
<td>25 kA (RMS)</td>
</tr>
<tr>
<td>Busbar short circuit current withstand (3 second)</td>
<td>14 kA (RMS)</td>
</tr>
<tr>
<td>Busbar peak fault current withstand (1 second)</td>
<td>62.5 kA (Peak)</td>
</tr>
<tr>
<td>Busbar peak fault current withstand (3 second)</td>
<td>35 kA (Peak)</td>
</tr>
<tr>
<td>Impulse voltage withstand (insulation)</td>
<td>75 kV (Peak)</td>
</tr>
<tr>
<td>Power frequency voltage withstand (insulation)</td>
<td>28 kV (RMS)</td>
</tr>
<tr>
<td>Protection provided by enclosure</td>
<td>IP3X</td>
</tr>
<tr>
<td>Unit construction</td>
<td>Withdrawable</td>
</tr>
<tr>
<td>Control cable entry</td>
<td>Top/Bottom</td>
</tr>
<tr>
<td>HV cable entry</td>
<td>Bottom</td>
</tr>
</tbody>
</table>
Auxiliary supplies:
Controls, indication, shunt trip, spring 110V DC ± 10%
charging motors, closing coils and 20%
protection relays
Space heaters 240V AC ± 10%

6.3.2.2 Current Transformers
The current transformers supplied in the switchgear shall have the following ratings:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated primary voltage</td>
<td>12 kV</td>
</tr>
<tr>
<td>Maximum voltage</td>
<td>3.3 kV</td>
</tr>
<tr>
<td>Insulation class</td>
<td>A</td>
</tr>
<tr>
<td>Short circuit current withstand for 1 second (RMS)</td>
<td>25 kA</td>
</tr>
<tr>
<td>Peak fault current withstand for 1 second (Peak)</td>
<td>62.5 kA</td>
</tr>
<tr>
<td>Accuracy class</td>
<td>0.2</td>
</tr>
</tbody>
</table>

The current transformers are to be wired to combination shorting-insulating terminals within the circuit breaker control section. Tariff metering current transformers are to be suitable for testing and certification for MARI A compliance.

6.3.2.3 Voltage Transformers
The voltage transformers supplied in the switchgear shall have the following ratings:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated primary voltage</td>
<td>12 kV</td>
</tr>
<tr>
<td>Maximum voltage</td>
<td>3.3 kV</td>
</tr>
<tr>
<td>Insulation class</td>
<td>A</td>
</tr>
<tr>
<td>Short circuit current withstand for 1 second (RMS)</td>
<td>25 kA</td>
</tr>
<tr>
<td>Peak fault current withstand for 1 second (Peak)</td>
<td>62.5 kA</td>
</tr>
</tbody>
</table>
The voltage transformers shall be connected three phase star-star (vector group YY0). The voltage transformers are to be wired to combination shorting-insulating terminals within the circuit breaker control section. Tariff metering voltage transformers are to be suitable for testing and certification for MARIA compliance.

6.3.3 Construction

6.3.3.1 General

The switchgear assembly shall consist of individual, freestanding, sheet-steel, enclosed modular vertical sections of uniform height and aligned with the adjacent sections for bolted assembly. Provision shall be made at both ends of the switchboard for future extension. Each cubicle shall be constructed of rigid steel frame strong enough to carry the static and dynamic loading during operation and transport. Provide a 100 mm high base channel for the assembly. Provide engraved traffolyte labels for each panel of the switchboard, e.g. “Main Incoming No1” and for each of the components. Provide sheet steel labels describing technical particulars for each panel. IEC device function number labels shall be used to identify equipment and components where an IEC number is available. Identically rated circuit breakers, fuse-switches and switch-disconnectors shall be interchangeable. Provide a space heater for each cubicle of the HV switchgear.

6.3.3.2 Busbar Compartment

The busbar shall be made of high conductivity copper, either tubular or bar with radius edges. The busbars shall be air insulated and PVC sleeved if required. The busbars shall withstand without deformation the dynamic forces and heating effects due to the short circuit currents specified in the technical particulars.

6.3.3.3 Switchgear Equipment Compartments

Each of these compartments shall house one of the following:

- Withdrawable Circuit breaker
- Withdrawable Starter-Contactor
- Fuse-Switch
- Load-break switch
- Busbar earthing equipment

The tenderer shall specify the exact type, manufacture and model of this proposed equipment within his tender submission. Provide a handle for manually charging the stored-energy mechanism of the equipment. The mechanism shall be readily accessible by removing the front panel when the breaker/switch is withdrawn.

The operating mechanism shall be arranged so that the closing speed of the...
contacts is independent of both control voltage and the operator.

The operating mechanism for the circuit breaker shall be motor-operated, spring-charge type with separate closing and opening springs. The opening spring shall be separate and charged by the closing operation. After the closing operation, the fully charged closing spring shall be able to perform an open-close-open cycle without any intermediate charging. The operating mechanism shall be trip free type. Provide anti-pumping relay and circuit for the circuit breaker.

The operating mechanism of the switch shall be manual-operated type (by a handle) for close and open. The breaker shall be successfully able to perform OPEN -0.3 sec – CLOSE/OPEN - 3 min – CLOSE/OPEN operation sequence.

The switch/circuit breaker equipment shall have the facility for padlocking in open/closed position. The spring charging motor and breaker close/trip mechanism/coils, etc. shall operate within the respective supply voltage variations specified in the technical particulars.

Provide 3 mm thick galvanised steel or 5 mm thick aluminium gland plate for three core and single core cables respectively for cable entry.

The HV cable shall terminate on copper flats supported on cast resin or porcelain insulators and be sized to:
- Carry the respective breaker or switch rated current.
- Terminate the cables indicated in the attached drawing. The cable terminations shall be suitable to install Raychem brand boots.

The HV cables shall not terminate directly on the instrument transformer terminals.

The HV cable termination arrangement shall facilitate easy disconnection and “hi-pot” dielectric withstand testing of busbars and cables.

Current transformers shall be of the ring type or moulded type. The current transformers on the circuit breaker shall have thermal and mechanical ratings commensurate with circuit breaker ratings. The accuracy classification/rating shall be in accordance with applicable standards, system fault levels and relay application. Transformer secondary’s shall generally be 5 A rated. For differential protection, the secondary shall be a 1 A rated.

6.3.3.4 Instrument Compartment

The instrument compartment shall be capable of accommodating the following LV cables:
- DC supply - 2 x 1 core x 6 mm² Cu, PVC
- Spring charging motor supply - 3C x 2.5 mm² Cu, PVC
Controls - 2 x 12C x 2.5 mm² Cu, PVC
Analogue signals - 8 pair twisted, Cu

The instrument compartment shall have its own two-pole isolating switch for disconnecting the DC control supply. The trip and close circuits shall be separately fused. LV fuse holders shall be suitable for cartridge-type fuses and shall have a rating of 250 V, 30 A. 250 V cartridge-type fuses shall be used with current rating as required.

All control wiring, except current transformer wiring, shall be by 1.5 mm² PVC cables. Provide matching terminals and shorting links. Control wiring shall terminate on terminal blocks. No joints will be accepted. Wires shall be terminated with compression ring-type connectors. Soldered connections are not permitted. All wiring shall be adequately braced and supported and shall present a neat appearance. No more than two conductors shall be connected to any one terminal.

Wire numbers shall be identified by markers. Wiring and terminals shall be identified independently. Wire markers shall be applied to both ends of all wiring. Where breaks between shipping sections occur, suitable arrangements shall be made for continuation of the interconnecting wires. All unused terminals of the equipment shall be wired to terminal blocks for future use and labelled individually at both ends as “Spare”.

All terminal blocks shall be located at the instrument compartment, and shall be arranged to permit convenient terminations for the incoming control cables, and to enable the identification labels to be read without difficulty. Terminal blocks shall be channel mounted Klippon type, rated at 600 V AC. Approximately 20% extra spare terminals shall be provided in each instrument compartment. Provide suitable terminals for DC supply cabling of 6 mm² cross sectional area.

Provide the following auxiliary contacts for the Principal's use (apart from those used for control, protection, indication and interlocks):

- 4 NO. + 4 NC - For each circuit breaker
- 2 NO. + 2 NC - For each fuse-switch/switch
- 1 NO. + 1 NC - For the earth switch

Contacts of all auxiliary devices shall be electrically separate, reversible type and shall be wired to terminal blocks. Contact rating shall not be less than:

- 1 A DC Inductive at 125 V
- 1 A AC Inductive at 230 V
- 5.0 A DC Inductive at 30 V/24 V

All the contacts for remote indication shall be wired up to a terminal block in one of the vertical panels. The meters shall be minimum 96 mm² size. Unless specified, the meters shall be electronic type and digital. In place of Wattmeter’s and Varmeters...
shall be digital multi-functional type. The meters in place of shall be suitable for measurement of unbalanced load. A data interface shall be provided for each meter for connection to a SCADA system.

Relays and meters shall be provided with proprietary test terminal blocks for connection to the current and voltage transformers respectively. Each shipping panel shall be equipped with all necessary interconnecting cables to adjacent panels, furnished with sufficient length and coiled for connection in the field. All auxiliary supplies shall be appropriately protected using HRC fuses or appropriate protective devices and have disconnecting switches for isolation.

The protection relays shall be of the microprocessor based type, with cases suitable for semi-flush mounting with removable front covers. Each relay element shall be constructed for complete withdrawal of the element without removing or disconnecting any wiring. All disconnecting devices shall be accessible from the front. The control and instrument switches shall be of the rotary type complete with suitable operating handles and escutcheon plates with engraved marking, to identify the switch positions. Provide MCB/protective device to each panel to isolate the control, space heater and spring charge motor supply.

### 6.3.4 Control, Protection, Indication and Interlock Requirements

#### 6.3.4.1 Control

Each circuit breaker shall have the facility to electrically close and open locally by means of a “spring return to neutral position” switch. The circuit breakers shall be equipped with the following:

- Lockable push buttons for mechanical opening and closing.
- Local/remote (auto/manual) selection switch.
- Closing and shunt trip coils for electrical operation.
- Trip-Neutral-Close switch.

The switch shall have facility to be manually closed and opened locally by means of a handle – “provide a handle”. The circuit breakers shall be closed by means of a motor driven stored energy mechanism. The motor spring charging supply shall be from an 110V DC tripping/Closing battery system. All trip, anti-pump, close and auxiliary relays shall be 110V DC.

Wire “Normally Open” auxiliary contact of the breaker in series with the trip coil and “Normally Close” auxiliary contact in series with the close coil of the breaker. All the controls and protection shall be “hard wired” from auxiliary contacts on the circuit breaker. The controls shall not be wired through a PLC, interposing relay or similar control system device.

Wire normally-close contact (i.e. the contact will remain closed if the protection device has not operated to protect the equipment) of each protection device in
series with the associated circuit breaker/contactor closing coil. That means the breaker/contactor can be closed only if the associated protective devices have not operated.

In the “Local” position of the “Local/Remote” selector switch, the breaker/contactor/switch shall be opened and closed by the Trip-Neutral-Close switch. In the “Remote” position of the “Local/Remote” selector switch, the breaker/contactor/switch shall be opened and closed by the remote command.

For the SF6 circuit breaker type equipment the respective circuit breaker shall trip if the SF6 gas pressure falls below the safe level specified by the manufacturer. If the breaker/switch is used as an earthing device, then it shall not be possible to open or trip it in the “Earthed” position.

6.3.4.2 Protection

Operation of each protective device shall trip the associated breaker. The trip signal from the protective device shall be directly wired to the breaker trip coil without going through selection switches and interposing relays. The Principal’s approval shall be obtained for interposing relays. The protective relays shall operate from a separate 110V DC battery supply system. Provide following protection on each circuit breaker feeder:

- SEL – 710 Relay.
- Non-directional over current and earth fault with high set unit.
- Check synchronising relay to allow closure under following conditions:
  - Line live and bus live
  - line dead and bus live
  - line live and bus dead.

It shall not be possible to close the breaker if both sides are dead.

The over current and earth fault relays shall have all of the following facilities:

- trip indication lamp
- auto and manual reset facilities with a choice to select one of them
- separate trip output for over current
- separate trip output for earth fault
- separate trip output for highset over current
- separate trip output for highset earth fault
- IEC Inverse Definite Minimum Time (IDMT) characteristics of:
  - normal inverse
  - very inverse
  - extremely inverse
- definite time characteristics
- adjustable time for highset over current unit.
- adjustable time for highset earth fault unit
• separate units for directional and non-directional relays
• independently disable normal and high set over current units
• independently disable normal and high set earth fault units.

The relays shall have the facility to momentarily increase the setting to override through inrush current while switching transformers/motors, etc.

The non-directional over current relay shall have the following setting range:

Normal over current (|>):
| = 0.5 to 2.5 In (in steps of 0.05)
t = 0.05 to 60 sec (in steps of 0.05 sec) – Definite time
t = 0.1 to Multiplier (in steps of 0.1) – IDMT

Highest over current (|>):
| = 0.5 to 30 In (in steps of 0.1)
t = 0.05 to 10 sec (in steps of 0.05 sec)

The non-directional earth fault relay shall have the following setting range:

Normal earth fault (|\o>):
|\o = 0.1 to 0.8 In (in steps of 0.05)
to = 0.05 to 60 sec (in steps of 0.05 sec) – Definite time
to = 0.1 to 1 Multiplier (in steps of 0.1) – IDMT

Highset earth fault (|\>o):
|\o = 0.1 to 10 In (in steps of 0.1)
to = 0.05 to 10 sec (in steps of 0.05 sec)

The synchronisation check relays shall have the following setting ranges:
• Voltage for live condition sensing 0.5 to Un (in steps of 0.05)
• Voltage for dead condition sensing 0.2 to 0.8 Un (in steps of 0.05)
• Maximum voltage difference 0.02 to 0.4 Un (in steps of 0.01)
• Maximum phase angle difference 5 to 50 (in steps of 1°)
• Maximum frequency difference 0.02 to 0.5 Hz (in steps of 0.01 Hz).

6.3.4.3 Indications

Provide the following local indications for each circuit breaker:
• A counter for recording the number of operations.
• Lamps for open and close status.
• Mechanical indication for open/close status.
• Mechanical indication for closing spring charged/discharged status (only for breaker).
• Trip coil circuit healthy lamp.
• Capacitive voltage indication lamps per phase.
• Provide the following local indications for each switch:
  a) Mechanical indicator for open/close status.
  b) Lamp for blown fuse condition.
  c) SF6 gas pressure (dial type).
d) Capacitive voltage indication lamps per phase.
   - Provide the following local indication for each earth switch:
     e) Mechanical indicator for open/close status.

6.3.4.4 Interlocks
The earthing switch shall be interlocked with the associated switch (series switch for breaker). The switch shall not close unless the earth switch is in the open position and vice versa. For each circuit breaker cubicle, provide one key, and key locks on the circuit breaker, and the series switch. The operation shall be as follows:
   - The breaker/switch shall not close unless the key is inserted in the lock.
   - The key shall get trapped in the lock when the breaker is in closed position.
   - The key shall be released when the breaker is in open position.

Each panel door shall be interlocked with its earthing switch such that the door can be opened only when the earth switch is closed, and the earthing switch cannot be opened unless the panel door is closed.

The following Fortress Keylock System sequence shall apply:
   - The Bostie Switch to Generator Isolator locks.
   - The Bostie Switch is mechanically interlocked with the Busbar earth switch such that the switch has to be in the off (open) position to allow the earth switch to be closed and vice versa.
   - (2) The key interlocks BES is used to mechanically interlock the generator supply isolator with the Busbar Earth Switch. Locks are set up such that the generator supply isolator has to be in the OFF position to allow the Busbar Earth Switch to be closed and vice versa.
   - The above mentioned two interlocks (1) and (2) ensure that the busbar earth switch cannot be closed with the Busbar feeding the soft starters live.
   - The Key Interlocks BES (existing MSB) and BES1 (new MSB) are master keyed such that either

Provide a 50 x 4 mm (minimum) copper earth busbar running throughout the entire assembly. Connect all non-current carrying metal parts to this earth busbar. Provide suitable holes and arrangements in the earthing bus for connection to the plant earthing system at two distinct locations, preferably at each end of the assembly. Provide an earthing switch for each circuit breaker, switch and contactor for earthing the HV cable. The switch shall have padlocking facility in open and closed position. The earthing switch shall have making capacity equal to the switchboard fault level.

6.4 Section 4 - Motor Starting Equipment

6.4.1 General

It is intended that six soft starting and stopping motor control units will be provided for Supply, Installation & Commissioning of 3.3kV Switchboard & Electronic Soft Starters at Waimanu Pumping Station
the Waimanu pumping station. Therefore, the manufacturer of the motor starter units is to guarantee at the time of tender that the Total Voltage Harmonic component of the fundamental waveform will not exceed 5% at the point of common coupling of the incoming supply with the following system operational conditions:
- Three pumpsets operational at full load rating,
- Allowance for a maximum number of four pumpsets via the use of both main switchboards on site,
- Point of common coupling 11,000V,
- 11,000V 100 MVA HV supply system,
- Transformer No. 4 is as follows ratings; 11,000/3,300V, 1000 kVA, 5.5% Impedance, Vector DYN 11, HV Amperage 52.23Amps, LV Amperage 174.9Amps, ONAN type,
- Two transformers operational together in parallel supplying an MSB.

The manufacturer will also at the time of tendering complete a study to confirm that with the above conditions and that with the procured fixed 1000kVAR Power Factor Correction equipment (to be connected to the existing Ramsay MSB), that no “harmonic resonance” will occur with the motor starter drives.

6.4.2 Soft Starting and Stopping of Motors
6.4.2.1 General Requirements
Each soft starter unit shall be capable of operating as a “stand alone” unit with its own lockable isolator, semiconductor fuses, rectifiers, and controls. They shall be housed in their own floor mounted freestanding steel IP54 enclosure. The enclosure shall be a standard enclosure proven in service with adequate ventilation. The enclosure shall be sized to dissipate the heat generated by the controller within the maximum limits of the specified operational conditions. Each soft starter shall be suitable for operation at High Voltage with a maximum system voltage of 3,300V 3phase 50 Hz and is to be provided with the following salient features:
- A HV non-load break isolation switch and operating handle with auxiliary isolation contacts for the isolation of the control system supply.
- A HV vacuum “in-line” isolation contactor,
- A HV vacuum by-pass contactor,
- Contactor visual wear indication
- Current limiting power fuses with “blown fuse” indication,
- Current and voltage transformers as required,
- A control power transformer,
- A low voltage control panel with microprocessor control module,
- A 50mm x 4mm copper earth busbar,
- Top and bottom cable entry plates.

The HV vacuum in-line contactor is to be mounted within the “power cell” and inter-locked with the HV non-load breaking isolating switch, both electrically and mechanically to provide the following safety features:
• The non-load breaking isolating switch shall be prevented from opening or closing when the contactor is in the closed position,
• The cabinet door to the HV shall be prevented from opening when the contactor is in the closed position,
• The HV non-load isolating switch shall be prevented from closing when the HV cabinet door is open,
• The control system power supply shall be removed when the HV isolating switch and contactor are both in the open position.
• Each soft starter shall have a separate, front accessible, low voltage control compartment. The compartment shall be completely isolated from the HV equipment. The control system supply voltage shall be 240V AC 50Hz from a separate Uninterruptible Power Supply (UPS).

6.4.2.2 Control
Soft starters shall be specifically designed and programmable for soft starting and stopping of centrifugal pumps. The Allen Bradley “SMC Plus” soft starter is considered to be suitable for this application. Starting times are to be adjustable from 0-30s. Pump stopping times are to be adjustable from 0-120s. Start and stop functions are to provide smooth acceleration and deceleration of the pumps. The soft starters shall each be fitted with a HV “bypass contactor" to reduce thermal losses during full speed operation. The soft starters shall each be fitted with an emergency stop HV “in line contactor”.

The motor controllers are to have the following selectable functions:
a) Timed voltage/acceleration ramps for both stop and start.
b) Adjustable current limit ramps 50% to 600% of full load current during starting and stopping. Selection of mode a) and b) shall be selectable on the soft start unit.
The current limit settings are expected to be approximately 300%. Preference will be given to soft starters with acceleration/deceleration control by torque/current sensing. A “kick start or Boost" at the beginning of the voltage ramp shall provide a current pulse of 550% of the full load current for a time between zero and 2 seconds. The thermal rating of the starter shall be 4 starts and 4 stops per hour. Digital parameter adjustment is to be provided by a “built-in” key pad on each soft starter unit. A serial communications port (SCAN port) shall be provided.

6.4.2.3 Technical Conditions
The units shall operate satisfactorily under the following input conditions:

Voltage

<table>
<thead>
<tr>
<th>Rated voltage 3 phases</th>
<th>3,600V AC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor nominal voltage phase-to-phase</td>
<td>3,300V AC</td>
</tr>
<tr>
<td>Control system voltage phase to neutral</td>
<td>240V AC</td>
</tr>
</tbody>
</table>
Nominal supply voltage variation +10 to -15%
Rated insulation voltage 5kV AC
Rated impulse voltage 60kV AC (peak)
Dielectric withstand voltage 10kV AC

**Frequency**

Nominal frequency 50Hz ± 0.75Hz
Maximum frequency deviation ± 2.5Hz
Maximum frequency slew rate 1 Hz/s

**Current**

Nominal current rating 180A

The soft start units shall have a “power ride through” capability of at least 0.5s of zero input voltage without tripping the motor. Each unit shall be fully protected against damage from voltage spikes due to switching transients or lightning strikes on the input supply.

### 6.4.3 Motor Protection and Diagnostics

Protection shall include:
- Three phase current sensing for motor overload
- Electronic thermal memory for motor protection
- Motor protection through the controller while in “by-pass” operation
- Thermistor protection
- Phase rotation
- Phase loss/imbalance
- Peak current
- Stalled rotor
- Overload protection of the motor
- Underload protection of the motor
- Excessive starts per hour
- Over temperature

Each soft starter unit shall be completely self-protecting with built in diagnostics for fault finding. All protective trips shall be displayed on the unit and have common output alarm contacts. The motor protection-sensing unit shall be connected externally to the soft starter unit to ensure that it is operational when the “by-pass” contactor has closed and the motor is at full speed output.

### 6.4.4 Control

Each soft starter shall be capable of operating under local manual control, remote
manual control or automatic PLC/telemetry control. The following volt free contacts/control functions are required as a minimum:

<table>
<thead>
<tr>
<th>Function</th>
<th>Control Local</th>
<th>Control Remote</th>
<th>Indication Local</th>
<th>Indication Remote (via PLC)</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local/Remote</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td>Y</td>
<td>Manual position overrides all remote functions except safety cutouts and emergency stop</td>
</tr>
<tr>
<td>Auto/Manual Switch</td>
<td>Y</td>
<td></td>
<td></td>
<td>Y</td>
<td>Initiates ramp up start and orderly ramp down stop</td>
</tr>
<tr>
<td>Stop/Start</td>
<td>Y</td>
<td>Y</td>
<td>Run/Stop</td>
<td>Run/Stop</td>
<td>Manual reset. (Overrides ramp down)</td>
</tr>
<tr>
<td>Emergency Stop</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>All trips to be manual reset</td>
</tr>
<tr>
<td>Fault</td>
<td></td>
<td></td>
<td>Individual Alarms</td>
<td>Common Alarm</td>
<td>All trips to be manual reset</td>
</tr>
<tr>
<td>Motor Protection</td>
<td></td>
<td></td>
<td>Individual Alarms</td>
<td>Common Alarm</td>
<td>All trips to be manual reset</td>
</tr>
</tbody>
</table>

6.5 Section 5 - Uninterruptible Power Supply (UPS)

6.5.1 General

The Uninterruptible Power Supply (UPS) unit is existing and out of order, not operational. The UPS unit requires an upgrade in order to supply the requirements of the motor starting and instrumentation control systems. The output of the UPS is to be arranged for separate fused circuits for the required system control functions detailed.

6.5.2 Technical Requirements

6.5.2.1 Input Conditions

Voltage and Frequency

Nominal Voltage - 3 phase 4-wire 415/240 V
Steady state voltage variations (without drawing power from battery and maintaining full battery charging capability) +/- 10 %
Frequency Range (without drawing power from) +/- 2.5 %
battery and maintaining full battery charging capability)

Frequency Slew Rate (max) on mains
+/- 3 Hz/s

Frequency Slew Rate (max) on generator
+/- 5 Hz/s

6.5.2.2 Output Conditions

The UPS shall provide full isolation of the output from input voltage and frequency variations. The system shall be in-line with static bypass operation only under fault conditions. An interlock shall be provided between the UPS inverter output breaker and an external maintenance bypass breaker to allow a no break transfer from UPS static bypass to maintenance bypass.

Output Rating

Continuous 5 kVA

Overload for 10s 50 %

Overload for 5min 25 %

Crest factor (repetitive peak current occurring each 1/2 cycle divided by the RMS current) 3:1

Overloads beyond the above shall cause the UPS to bypass automatically and return automatically once the fault is cleared.

Reliability

The UPS module, bypass and batteries shall achieve a MTBF of 80,000h based on a 1h repair time

Output Voltage

System 3 phase 4 wire 415/240 V

Steady state voltage tolerance (as % of RMS voltage) +/- 1 %

Transient limits for <500ms +15 to -18 %

Restoration time to within +6% to -8% 500 ms

Maximum peak voltage variation (times the RMS waveform value) 1.41 +/- 0.14

Static bypass switching time Less than 10 us
Supply, Installation & Commissioning of 3.3kV Switchboard & Electronic Soft Starters at Waimanu Pumping Station

<table>
<thead>
<tr>
<th>Static bypass sensing time</th>
<th>Less than 2.5 ms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage unbalance (maximum allowable)</td>
<td>2.5 %</td>
</tr>
</tbody>
</table>
| (from arithmetical value of the three phase to phase voltages up to 50% load imbalance where imbalance is defined as:

\[ 100 \times \frac{|I_{\text{max}} - I_{\text{min}}|}{I_{\text{max}}} \text{ where } I = \text{phase current} \]

Phase Angle
| maximum displacement relative to 120deg | +/- 1 % |
| symmetrical system | 50% unbalanced load | +/- 3 % |

**Harmonic Content of Output Voltage**

Note the stated limits apply to both phase to neutral and phase-to-phase voltages. Applicable non-linear harmonic load currents are:

<table>
<thead>
<tr>
<th>Harmonic Order</th>
<th>Current (3rd)</th>
<th>Current (5th)</th>
<th>Current (7th)</th>
<th>Current (9th)</th>
<th>Current (11-17th)</th>
<th>Current (Total)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>45 %</td>
<td>8 %</td>
<td>8 %</td>
<td>0 %</td>
<td>&lt;2 %</td>
<td>57 %</td>
</tr>
</tbody>
</table>

The following maximum harmonic limits of the output voltage waveform are allowable under linear and the above stated non-linear load conditions.

**Maximum Voltage Total Harmonic Content**

Maximum content of any individual harmonic

Harmonic content is defined as:

\[ \left\{ \sqrt{\left(V_{3}\right)^2 + V_{5} + V_{7} + \ldots + V_{n}} \right\} / V_{1} \times 100\% \]

The above voltage tolerances shall be maintained under all load, overload, battery and switching conditions.

**Frequency**

<table>
<thead>
<tr>
<th>Nominal Maximum deviation (from 50 Hz)</th>
<th>+/- 0.5 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Slew Rate (must be adjustable from 0.1 Hz/s to 1.5 Hz/s)</td>
<td>0.1 Hz/s</td>
</tr>
</tbody>
</table>

Note the slew rate must not be exceeded under any operating conditions including tracking bypass, transition to and from internal clock

**Power Factor**

| Power factor range at 100% load | 0.7 to 1.0 Lag |
Allowable operational power factor from 0.7 to 0.81
The Tenderer shall state if load reduction is necessary to meet the full operational power factor range

Efficiency
Minimum efficiency at 100% load 90 %

Noise
Noise level at 1m <55 dBA

Battery Backup
Batteries shall be sealed lead acid/gas recombination
Design life 10 Years
Guarantee (full replacement) 5 Years
Battery capacity at 100% load (combined capacity of battery strings) 20 Min
Number of battery strings 2
Battery isolation Each string isolatable with fuses

6.6 Section 6 - D.C Power Supply
6.6.1 General
A DC Power Supply unit is to be provided to supply the requirements of the motor starting and instrumentation control systems. The output of the unit is to be arranged for separate fused circuits for the required system control functions detailed.

6.6.2 Technical Details
The power supply shall be a single output PAA 300F-24 (P Series) 24V DC switched mode unit available from Innovative Energies Limited, Auckland, New Zealand. The unit shall have the following specifications:

INPUT
Voltage 230V
Voltage Range P300 models: 85V to 264V AC auto select.
Frequency 47Hz to 63Hz
Safety Isolation 3,750 AC RMS, in accordance with EIC950
Inrush Current Typically 25A at 100V AC, 40A at 200V AC peak cold start.

OUTPUT
Voltage 24V
Current 14 Amps (336W)
<table>
<thead>
<tr>
<th>Specification</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turn on Delay</td>
<td>300 ms max. at 85V AC in</td>
</tr>
<tr>
<td>Regulation Line</td>
<td>0.4% max. or specified input swing</td>
</tr>
<tr>
<td>Regulation Load</td>
<td>0.83% max.</td>
</tr>
<tr>
<td>Voltage Adjustment</td>
<td>+/- 10%</td>
</tr>
<tr>
<td>Ripple &amp; Noise p - P</td>
<td>150mV max., 20Mhz bandwidth</td>
</tr>
<tr>
<td>Overvoltage Protection</td>
<td>Yes, trip point set at 115% to 140% of rated output voltage</td>
</tr>
<tr>
<td>Overload Protection</td>
<td>Yes, trips at over 105% of rated output current. Auto recovery.</td>
</tr>
<tr>
<td>Temperature Drift</td>
<td>1% over 0 to 55 degrees C</td>
</tr>
<tr>
<td>Hold Up Time</td>
<td>Typically 20mSat85VACin</td>
</tr>
<tr>
<td>Minimum Load</td>
<td>Units will operate with zero load.</td>
</tr>
<tr>
<td>Parallel Operation</td>
<td>Yes master/slave operation is to be possible</td>
</tr>
<tr>
<td>Maximum current</td>
<td>0.9 (rated unit current) x number of units</td>
</tr>
<tr>
<td>Series Operation</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**ENVIRONMENTAL**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>0 degrees C to +50 degrees C @ full load</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-20 degrees C to +75 degrees C</td>
</tr>
<tr>
<td>Cooling</td>
<td>Forced air cooled by internal fan</td>
</tr>
<tr>
<td>Humidity</td>
<td>30% to 90% RH non condensing operational, 20% to 90% RH non condensing storage.</td>
</tr>
</tbody>
</table>

### 6.7 Section 7 - Electrical Control System - Internal Wiring Practices

#### 6.7.1 General

The purpose of this section is to provide a basis for general practices that shall be followed to ensure a high degree of serviceability, commonality and consistency can be achieved throughout the electrical system equipment provision.

#### 6.7.2 Application

The following practices shall be utilised in any of the following types of equipment:

a) Motor Starter Control Panels  
b) SCADA/PLC Marshalling Panels  
c) PLC /Control Panels  
d) Distribution Switchgear  
e) Switchboards

The practices detailed shall apply to the interconnecting wiring between components mounted in the various types of equipment for installation and use at the plant facilities. Equipment forming part of a manufacturer's standard range of manufacture may be exempt, subject to the written approval of the Engineer, from these requirements. It shall however be the manufacturer's or supplier's responsibility to
ensure that the equipment will, in all respects and irrespective of any approvals of dispensations given by the Engineer, or its authorised agents, comply with the latest edition and amendments of the New Zealand Electrical Wiring Regulations.

6.7.3 Objectives

The objective of the practices detailed are to:

a) Allow ready identification of the type and range of voltage likely to be present on each conductor,

b) Correlate conductors within the equipment with those shown on the relevant circuit and wiring diagrams;

c) Provide segregation and shielding of conductors, terminals, and components,

d) Minimise hazard to properly qualified personnel required to work on energised equipment,

e) Minimise the possibility of low voltage equipment being accidentally connected to a higher voltage system,

f) Reduce the possibility of induced electrical noise or transients with low level instrumentation circuits.

It is not the intention of the practices detailed to develop identification systems that will allow ready identification of the function of any particular conductor. The practices have been developed on the basis that once identified, the function and connections of a conductor shall be determined by reference to the wire ferrule number thereon and relevant equipment drawings.

6.7.4 Voltages

The practices outlined shall apply to equipment utilising voltages defined in AS/NZS 3000:2000 as follows:

- a) Extra low voltage: Voltage not exceeding 50 volts AC or 120 volts DC
- b) Low voltage: Voltage normally exceeding Extra Low Voltage but not Exceeding 1000 volts Ac or 1500 volts
- c) High voltage: Voltage normally higher than low voltage

6.7.5 Identification

Conductors, with the exception of those in proprietary brand switchgear shall be identified both by the colour of the conductor insulation and be a numeric or alphanumeric code (ferrule) shown on the applicable drawings and marked on the conductor.

6.7.6 Wire Colouring

NB: Some proprietary brands of imported switch gear/control equipment may utilise Green/Yellow helical striped coloured insulation. All additional or external conductors to be connected to the earth system of such equipment shall be plain green colour insulated.
6.7.6.1 General

All power/control AC circuits to which these practices are applicable shall normally operate at a supply frequency of 50 Hz. The colouring of AC circuits of different frequencies, other than signal circuits, shall be subject to approval. The exception being where power/control circuits applicable to variable frequency speed drive power circuitry in which case the standard 3 phase AC or DC conductor colouring shall apply.

6.7.6.2 Earth Conductors (All Systems)

Earth linking/bonding conductors - Green with yellow strip

Each conductor for intrinsically safe systems shall be legibly and permanently identified as intrinsically safe. Earths shall be terminated in accordance with details given by the appropriate drawing/specification.

NB: Some proprietary brands of imported switch gear/control equipment may utilise Green/Yellow helical striped coloured insulation. All additional or external conductors to be connected to the earth system of such equipment shall be plain green colour insulated.

6.7.6.3 Neutral Conductors

The colour black applies only to the neutral of an earthed system. The two live poles of an unearthed single phase AC system (MEN) shall be wired in the same colour. That is from the secondary side of a transformer where the conductors are "above earth".

415/230 AC Power Wiring

(Min. size 2.5 mm²)

Phases (as appropriate): Red/White/Blue
Neutral: Black

400/230V AC Control Wiring

a) 230V control circuit sourced from one phase

  Phase (irrespective source): Red (Min. size 1.5mm²)
  Neutral: Black (Min. size 2.5mm²)

b) 415/230V control circuit sourced from 2 or 3 phases

  Phase (where appropriate): Red/White/Blue (Min. size 2.5mm²)
  Neutral: Black

Low Voltage AC and DC control circuits other than 230V AC

Conductors (except earth): Orange (Min. size 1.1 mm²)

24V DC Supplies

Positive: Violet (Min. size 1.1 mm²)
Negative: Brown
Extra Low Voltage DC Control
Positive : Grey (Min. size 1.1 mm²)
Negative : Grey

Signal Wiring Twisted Pairs
Positive : White (Min. size 0.64 mm²)
Negative : 

Intrinsically Safe
All conductors (except earth) : Blue (Min. size 1.1 mm²)

Earth (Protective Conductors)
All conductors : Green or Green/Yellow
(Min. size 1.5 mm²)

Cabling Across Door Hinge
All wiring shall be tightly loomed and wiring to door mounted equipment shall be adequately "Goose Necked" using nylon cable ties or wrapped with "Spiro-Flex" or approval equal. Only flexible cable of minimum size 1.1 mm² may be used.

6.7.6.4 Wire Terminal Identification
All conductors within equipment shall be permanently marked at each end with an alphanumeric identification code (ferrule). The coding shall be taken from the wiring diagram for the equipment and shall uniquely identify each conductor, including every loop or common connection of a conductor. In general the coding shall comprise a simple sequence of numbers unless the extent of the wiring indicates that a system of height complexity is justified. Where a DCS / PLC is used input/output numbers will form the basis for wire numbering.

Wire identification shall be by:
a) Firm fitting, full circle, engraved plastic ferrules generally having black characters on a white background. For specific requirements where the nature of a circuit should be identified i.e., shutdown systems, other colours may be used.
b) Typed firm fitting sleeves having a transparent heat shrink oversheath.

Terminals provided for the connection of incoming/outgoing wiring shall be grouped on terminal boards or rail mounted terminals grouped for each individual incoming cable. The terminals on each board of rail shall be sequentially numbered and identified on the drawings by means of a terminal board/block code and the terminal number. All field circuit wiring where it terminates onto a switchboard or panel shall be numbered, including the neutral and earthing conductors.

The ferruling shall include all spacing hyphens and oblique symbols. All ferruling shall
be arranged to be read from left to right irrespective of side of entry of vertical terminal rails. For horizontal terminal blocks the ferruling shall be readable from bottom to top.

6.7.7 Labelling

All electrical equipment shall be clearly labelled with equipment number, name and function. Internal panel equipment such as terminals, terminal rails, control devices, power outlets and light switches (labelled for distribution board and circuit number). Labels shall be engraved traffolyte (white background, black lettering, screw fixed to equipment. Lettering sizes shall be 20 mm, 10 mm and 5 mm Helvetica.

6.7.8 Segregation

415/240V cabling shall be physically segregated or separated from data and instrumentation cabling. Where possible separate routes shall be used but cable runs on a common tray or ladder with a separation over their whole distance of not less than 450mm will be acceptable. Cables shall be firmly secured so that this segregation distance shall not be reduced. Terminals for cabling at different voltages shall be separated or segregated by terminal barriers.

6.8 Section 8 - Electrical Cable Management Systems

6.8.1 General

Cabling support systems used shall be a proprietary make and components and materials shall be selected to withstand corrosion for at least 15 years. Cabling shall be installed using the following methods for installation and support.

6.8.2 Conduit

Conduit shall be rigid galvanised steel or rigid PVC conduit to NZS 2053. Flexible conduit shall be used for the final connection to motors, sensors, and other equipment subject to vibration. Recommended types are “Liquitite” or “Kopex” or equivalent with proprietary conduit glands. Conduits shall be fixed with two hole saddles and spacers onto concrete or other surfaces, fixing screws shall be stainless steel with metal concrete inserts. Conduit systems shall be resistant to ingress of oil and be watertight. Allowance shall be made for thermal expansion. Conduits may be fixed direct to surfaces with saddle spacers or to cable ladder systems. Conduit shall run parallel to or at right angles to building elements. Where conduits cross building movement and seismic joints, they shall be installed perpendicular to the plane or the joint and shall have suitable expansion fittings, which shall permit a transverse movement as well as longitudinal movement.

6.8.3 Cable Ladder
The ladder system shall be of an approved proprietary manufacture of welded construction using either aluminium or steel components or both. All steel components shall be hot dip galvanised. Electro galvanising will not be accepted. Unless shown otherwise on the drawings, ladder runs shall be parallel to walls, ceilings, floors, etc. Supports shall be installed at centreline distances not greater than that shown on the drawings or, where not directed, at distances not greater than those recommended by the manufacturer for the loading concerned. Ladder shall have rung spacing at approximately 300 mm centres, depth approximately 110 mm overall and widths as indicated on drawings or to suit where not indicated. Supports shall be spaced and ladders designed to have a maximum deflection of L/250 at a loading of 80 kg/m and a maximum safe loading of 300 kg/m. (Where L is the distance between supports.) The ladder shall be designed to temporarily sustain 1.5 times the safe load without permanent deformation. All cable ladders and fittings shall have earthbound bridging of all joints and be bonded to earth in accordance with the NZ Electrical Wiring and Safety Regulations 1993.

6.8.4 Cable Tray

All trays shall be heavy duty “Unistrut Burndy LT3” or similar hot dip galvanised steel of the ventilated type with a minimum thickness of 1.6 mm. Maximum deflection shall be L/250 (where L equals the distance between supports). AC Power tray shall have approximately 50 mm upturn and be suitable for a cover. Data cable tray shall have a 100mm upturn and be suitable for a cover. All bends shall be radiused (no right angle corners). All trays shall be supported directly on brackets. Trays shall be bonded will be 6mm² Cu/PVC cable across each joint and bonded back to the Earth bar of each AC Distribution Board.

6.8.5 Cable Trunking

The minimum cable trunking size shall be 100 mm x 85 mm. Wire ways 150 mm x 100 mm and above shall be manufactured from at least 1.5 mm thick steel epoxy or polyester coated, where exposed to view from the cable termination room floor the trunking shall be finished in ‘light straw’ to match existing equipment or where directed.

6.8.6 Cable Clamps and Ties

Cable clamps or UV rated nylon ties shall be used to secure power cables to tray and bracket systems. Each cable shall be secured at 2mtr intervals maximum and immediately before and after every change in direction. Clamps shall be used where cable tie strength is inadequate to hold cable in position. Clamps shall be galvanised steel or non-ferrous metal with non-magnetic inserts for single core cables. Cable ties shall be cut / trimmed flush to the nylon buckle (retainer) face using the proper tool, no sharp or raised edges shall protrude from the nylon face. Control cables shall be fastened to ladder, bracket and troughing systems by PVC straps spaced at approximately 1.0 m centres and at each side of changes in direction. On vertical routes clamps shall be used to provide support. Grounding
conductors 70 mm² and below shall be secured with nylon ties to cable support systems, above 70 mm² they shall be secured with separate clamps.

6.8.7 Segregation

Cabling shall be physically separated between each of the following groups:
- 11,000V cables.
- 3,300V cables
- 230/400V AC power cables.
- Low voltage control and alarm cables.
- Signalling and instrumentation cables.
- DC power.

Control and instrumentation cables shall not be run closer than 600 mm to AC power cables and shall cross over AC power cable routes at right angles.

6.9 Section 9 - Cable Installation

6.9.1 General

Cables to be installed under this Contract are scheduled on the drawings. The installation of cables, unless otherwise approved, shall be in accordance with the requirements of the New Zealand Wiring Regulations and manufacturers requirements. Jointing of cables within runs will not be permitted. The Contractor shall be responsible for the protection of cables during storage and installation. Any repairs to damaged cables shall be authorised by the Engineer prior to any work to restore cables. During handling and installation care shall be taken to ensure that the cable are not bent to an extent which may cause undue stress on the insulation or sheathing but in any case not less than the minimum internal radius specified by the manufacturer. Cables shall not be drawn through their minimum radius during installation. All cable ends shall be kept sealed until the cable is required. If found to be open prior to issue, the Contractor shall test the cable and check for suitability prior to resealing and accepting the cable for use. Reseal after cutting and before re-use should more than one day elapse between cable running out. Kinking of cable will not be accepted. Should this occur, the Contractor will be required to replace the cable. Replacement by means of splicing will not be acceptable. Segregation of functions shall be maintained throughout. The only exceptions being that power cables, and their associated control cables and any earth cables may be bunched on ladders. A minimum gap of 450mm shall be maintained between instrument and electrical designated cables either in trenches or on cable ladders or any other cable support. Should any visible/external damage be seen on any cable, the Contractor shall immediately report it to the Engineer and carry out an immediate IR test on the cable.

When coiling or re-coiling cables, the correct rotation in respect to Neutral Screen and Steel Wire Armour and bedded conductors shall be observed. Cables on cable ladders or trays shall be laid parallel and where possible, crossovers shall be avoided. Cables shall be securely fastened with PVC cables ties, or as approved, at intervals not
exceeding two metres and adjacent to where cables enter or exit bends or where the cables leave the ladder or tray. Cables laid direct in the ground shall be located not less than 0.6 metres below grade on a 50mm thick bed of clean sand. The trench shall be backfilled with a 75mm thick layer, measured from the top of the cable, of clean sand. 600mm x 300mm x 50mm concrete slab shall then be laid end-to-end to provide cable protection. The trench shall then be further backfilled with clean sand or soil, free from rock, stones or other debris, to a level 200mm below the surface. Orange PVC signal tape shall then be laid and backfilling completed, the surface being restored to the density of undisturbed ground. Identification plates shall be provided at entry to buildings and at fences and at all Road Crossings. Where required:

The Contractor shall be responsible for all work associated with the installation of underground cables including trenching, backfilling and the supply and placement of sand, protection, signal tape and backfilling material. Ducts shall be Class 320 pipes and fittings and be of Class D grade, rubber ring jointed, unplasticised uPVC pipe manufactured to NZS 7648. The pipe and fittings shall be installed in accordance with NZS 7463 and the manufacturer's recommendations. Ducts shall be completely sealed against the ingress of moisture. They shall be buried to a depth of at least 800 mm unless shown otherwise. Signal tape shall be laid directly above all wiring ducts. Where the ducts emerge from the ground or through floors or concrete equipment plinths a 100 mm stub-up shall be provided and this shall be protected with a neatly formed concrete encasement trowel finished flush with the duct entry. A tapered wooden plug or plastic cap drilled for a draw wire shall be provided and a draw wire installed. Prior to the commencement of cable pulling, the duct shall be fully swabbed out and all foreign matter removed. All rough edges shall be removed from duct entry and exit points. A pull wire/rope of adequate section shall be used. All cables shall be pulled into the duct at the same time. Once pulling commences it shall continue until completed in one shift. Cables and duct may be lubricated with an approved lubricant such as talc. Following completion of the pull, the upper end of the ducts shall be sealed with a butyl mastic or other approved non-hardening sealing compound, to prevent ingress of dirt and gas.

6.9.2 Selection of Cables

All cables shall be selected in accordance with the power or instrumentation cable schedules as appropriate, furnished at time of tender. Alternative cables shall not be installed without the prior approval to the Engineer. The electrical cables specified are 11,000V cross-linked polyethylene insulated, PVC bedded and steel wire armoured, polyvinyl chloride sheathed (PVC SWA PVC) with stranded copper conductors. The Contractor shall inspect all cables and confirm prior to laying that they have an extruded PVC bedding under the steel wire armour. Cables without such bedding shall not be installed without the approval of the Engineer.

6.9.3 Termination of Cables
Cables shall be terminated in weatherproof (and flameproof where required) metric threaded cable glands in accordance with the cable gland manufacturer's instructions and as noted on the cable schedules. The Contractor shall install adapters to equipment having other than metric threaded cable entries. All field glands shall be weatherproof, matched to cable size and type and shrouded. Shrouds shall be close fitting and shall not trap and contain water or other fluids at the completion of the installation. All exterior cable glands shall be rated as IP 68. The Contractor shall be responsible for ensuring that a cable gland of the correct type and size is used to terminate individual cables. In non-hazardous areas the Contractor shall drill gland plates as required for the mounting of glands. Drilling shall be of a diameter that will allow the threaded portion of the gland to pass, without excessive side clearance, freely through the plate. For flameproof glands, holes shall be pre-drilled and threaded to suit gland. Top cable entry to field equipment will not be permitted. The neutral screen and/or steel wire armour of power and control cabling shall be earthed at both ends of the cable run. Glands shall be of the type approved by the Engineer and he shall ensure those offered will not be affected by the corrosive conditions. Brass unplated glands will not be acceptable.

6.9.4 Termination of Conductors

The conductors in electrical cables shall be terminated in their terminal strips provided in equipment in accordance with the appropriate connection schedule or connection diagram. Conductors terminated on stud type terminals shall be fitted with "full circle" crimp lugs. After crimping the lugs shall be fitted with heat shrink sleeving as directed by the Engineer, to ensure that the Termination has a minimum area of uninsulated conductive surface. All power cables shall be terminated using crimped lugs of a suitable size to suit the cable being terminated. The lugs shall be applied to the cable without removal of any strands of the core and crimp compression shall be applied using an approved tool fitted with the correct die, such that the tool will not release until sufficient pressure has been applied to complete the crimping process. In all cases crimped lugs shall be fitted with Heat Shrink insulation to reduce the area of live uninsulated conductor at the point of termination. Where tunnel type terminations are provided on the equipment, the cables may be terminated without the use of crimp lugs but only on the approval of the Engineer and without the removal of any strands of the cable. Phases shall be colour or numerically coded. Control cores shall be terminated using spade, blade or ring type crimp lugs, crimped with the manufacturer's recommended ratchet type tool which does not release until the lug has been properly crimped and which crimps on both the core and the insulation except where Grafoilplast 'Spark' pin markers are used. Crimp lugs, which do not crimp on the insulation, shall not be acceptable. Where approved tunnel type terminals are provided, cores may be terminated without crimp lugs with the Engineer's approval, but in no circumstances either with or without lugs will the removal of strands to fit the termination be accepted. Uncrimped cores shall be twisted before terminating.
All conduction ends shall be tinned prior to termination and components which have brass or alloys will not be accepted. Alternative plated components will be submitted to the Engineer for approval. Terminations of aluminium conductors onto copper or plated terminals shall be made using fusion welded bi-metallic crimped lugs to be approved by the Engineer and the correct jointing compound used strictly in accordance with the manufacturer's instructions. Such bi-metallic terminations shall be bolted together with either stainless steel or hot dip galvanised bolts. All neutral screens shall be fitted with heat shrink insulation before the crimp lug is applied. Identification markers shall be held captive on the cores and shall be used to identify cores in accordance with the Drawings. "C" type ferrules will not be acceptable. The carrier ferrules shall be of the appropriate size for the cable and shall be tight fitting over the insulation. Wrap-round write-on, or adhesive ferrules will not be acceptable. Cable tails or spare cores within cable not shown on the termination drawings shall be looped within the termination cabinet, cores insulated, heat shrink covered and neatly tied within the cabinet trunking or ducting systems.

6.9.5 Cable and Core Identification

All cables, including TPS wiring, neutral and earth continuity conductors installed or terminated or re-terminated under this contract, shall be identified at each end by means of Critchley cable markers type K on a standard carrier strip tied with cable ties, at both ends of the cable. The cable identification number shall be given in the approved cable schedules. Letters and numbers shall be clearly visible and not less than 5mm high. Stainless steel stamped discs may be used in lieu of the above system. All wires identified by means of wire numbers on the schematics or connection diagrams shall be identified at each end every termination with that wire number by means of full circle plastic cable markers, Critchley Z or approved equivalent. The "Graphoplast" numbering system may be used as an alternative to the above. Similarly, each and every terminal in which an identified wire is terminated shall itself be identified with terminal numbers shown on the termination diagrams using terminal markers matching the terminals. It should be noted that terminal numbers will not necessarily be identical with wire numbers. The core and cabling marking method shall be a shingle unified marking system capable of marking all cores, cables, terminals and contactors and shall have the capability of effecting the marking with either manual or computer generation with full interchangeability. All characters must be etched not printed and shall have the ability to be altered without withdrawal of the core or cable.

6.9.6 Prohibited Installation

Cables shall not be embedded directly either fully or partially in concrete or plaster. Cables shall not be bunched to such an extent that the necessary de-rated cable rating is less than the actual circuit protection setting. Cables shall not be fixed in position where they will be exposed to rain, dripped water, condensation, oil etc. or accumulations of water or oil, to high temperature from hot water pipes or other sources of heat unless the cables and accessories are adequately shielded or are...
specifically designed to withstand the effect of exposure to water, oil and heat and ultra violet light. All external cable ladder systems shall be covered, when requested on the drawings. No through joints in cables shall be permitted other than in outlet fittings or equipment terminal boxes, except that where express authority is granted in special circumstances a through joint may be made in an approved terminal box fitting in an accessible location. No joint will be permitted in a cable cut too short, or found to be too short after correct and certified termination. A new cable will be laid at the Contractor's expense, and no cost to the Client.

6.9.7 Conduits

Metal conduits shall be of screwed galvanised steel type manufactured in accordance with BS4568 or IMC to UL1242.

The size of all conduits shall be one size larger than the minimum required for the number of cables to be drawn in, but in no case shall they be small than 19mm diameter. All conduiting shall be run so as to enable cables to be drawn in after erection, sufficient accessible junction boxes to be provided for this purpose. Inspection fittings are not acceptable as draw in points.

All joints, junction box lids, conduit entrance shall be totally sealed so as to completely prohibit the entry of all contaminants. All conduits shall be delivered straight, free from rust and scale and any sets shall be made cold in such a manner as not to distort the walls of the conduits. Conduits shall be neatly run and securely and fastened by means of approved saddles with a clearance of 3 mm to any surface.

Saddles shall be provided within 150 mm of all fittings or terminations. All burrs shall be removed from ends and screwed bushes shall be fitted to the ends of conduit runs. During installation, the ends of conduits shall be temporarily plugged to prevent the ingress of dirt. The direction of conduit run shall be parallel to the walls, floors and ceilings, wherever practicable. No threads shall be visible after erection.

Conduits shall be installed so as to avoid other pipe systems and services.

Rigid conduits shall be run directly in to fixed components such as switches, junction boxes, etc. Where the equipment being wired may need to be removed for maintenance, e.g.: motors, control components such as flow switches, thermostats and the like, the rigid conduits shall terminate in a suitable junction box and the final connection shall be made via an approved plastic covered flexible metal conduit with watertight screwed ends such as Liquidate, Kopex or similar. Watertight screwed reducers shall be used as required to match the flexible conduit to the equipment entry. The final connection fitting shall be a barrel union so that conduits do not have to be rotated to connect or disconnect plant.

Conduit shall not be used in Hazardous Areas.
PVC Conduits
All conduits shall be Class B High Impact (grey) PVC and all fittings clips, boxes, etc. shall be from the same matching range. Minimum size shall be 19 mm. No duct shall be filled to more than 50% of its cross sectional area.

Where conduit is run to equipment, which may have to be removed for maintenance, the final connection shall be made via junction box and screwed weatherproof Kopex or similar reinforced flexible conduit and compatible fittings.

Conduit systems shall be fully erected before any wiring is installed and sufficient draw-in boxes shall be included to enable this to be done. Inspection fittings are not to be used in draw-in purposes.

Conduits shall be installed so as to avoid other pipe systems and services and the direction of conduit run shall be parallel to the walls, floors and ceilings, wherever practicable. Conduit fixings shall be 500 mm intervals and where necessary to eliminate sagging in the conduit, additional saddles shall be provided. Saddles shall be provided within 150 mm of all fittings and terminations.
All sets and bends in conduit shall be made using approved internal springs of correct size to prevent wall collapse. Conduits in which any collapse of walls is evident will be condemned. All conduits shall be deburred and plugged following installation. Plugs shall be drilled for a pull wire which shall pass clear through the plug at each end. Conduit ends not terminating in a junction box shall be fitted with approved bushes.

All wires on any one run shall be pulled into the conduit at the same time. All boxes and fittings, which shall be of high impact (grey) PVC to match the conduit system shall be installed at right angles to the direction of conduit run. Where junction boxes are exposed to weather the lids shall be sealed with an approved gasket. Pull-in and junction boxes shall be of ample size to enable the wiring to be neatly directed from on conduit to another without undue cramping.

Conduit shall not be used in Hazardous Areas.

6.9.8 Cast-In Conduits
The contractor will provide and install cast-in conduit to all equipment and instrumentation where required. The Contractor shall allow to Co-ordinate the size and positions of conduits required prior to concrete pouring and in sufficient time to allow supply and placement of conduit without interference with the programme.

6.10 Section 10 - Electrical System Earthing

6.10.1 Main Electrical Earthing System
The existing HV station earthing mat system is to be inspected and tested by the Contractor in compliance with AS/NZS 3000:2007 and NZECP 35 Power System Earthing. With all earth bonding cables disconnected the earthing mat system should have a maximum earth impedance of 1 Ohm.

The Contractor is to provide a copy of the test results to the Engineer for his approval to connect the new HV equipment to the existing earthing system. The Electrical Contractor is to provide and install a main copper earth connection bar in the HV 3,300V MSB Room and also within the HV 3,300V Motor Starter Room.

These bars are to be “tinned” copper and dimensioned 75 x 4 x 1000mm and will be used for the main equipotential bonding of the HV system and building metalwork.

The two earthing bars are to be interconnected together with 2 x 1c x 150mm² PVC earth cables via “disconnection test links”. Provide a separate earth cable connection from each of the two bars to the station 3,300V earth mat system. These connections are to be made through “test links” with 2 x 1c x 150mm² earth cables. Provide a separate earth cable connection from the 3,300V MSB room earth bar to the 11,000V station earth mat system. This connection is to be made through a “test link” with 2 x 1c x 150mm² earth cables.

All exposed metalwork within the HV Switchrooms must be connected to the earthing bar system. This will include:
- Metallic water pipes
- Ductwork
- Tanks
- Cable ladders & Trays
- Structural steelwork
- Lightning protection system
- Switchboards and Distribution Boards

All metal armoured cables and conduits must be effectively bonded to switchboard cabinets to ensure a sound electrical connection. All entries shall be fitted with metal or plastic bushes. On switchboard cabinets, if detachable or riveted type conduit entry plates are used they shall each be bonded with 6mm² ECC to the earthing bar within the cabinet.

The contractor is also responsible for testing and interconnection of all earth systems to comply with the Electrical Wiring Regulations. The Contractor is responsible for the testing and interconnection of all earthing systems on site to comply with the Regulations. Testing is required for earth loop impedance, prior to interconnection. Following interconnection, overall system earth values shall be measured and recorded. All results shall be recorded and approved by the Engineer.
6.11 Section 11 - Instrumentation

6.11.1 Installation of Field Devices (Instruments)

The Electrical Contractor shall install field devices, including local control stations, selector switches, junction boxes and instrumentation. The Electrical Contractor shall supply, fabricate and install the materials required to mount the equipment including frames, as detailed in the tender drawings. The field devices shall be installed in the locations shown on the area layout drawings. However, the final locations shall take into account proximity to the related equipment, protection from mechanical damage, access to operators and uniformity with other similar equipment. The actual locations of field devices shall be as approved by the Engineer.

6.11.2 Instrument Installation

6.11.2.1 Mounting Instruments

Instruments shall be mounted:

- In an accessible position for maintenance and at 1.4 m above grade or platform (where this is possible).
- Where the dial can be easily read by a plant operator
- Where the ambient temperature will not exceed 48°C when in the vicinity of heated or fired equipment. (If any doubt exists the best position shall be ascertained in consultation with the Engineer).
- As close to the sensing point on the line or vessel as possible.
- In a position free from vibration when all equipment is operational.
- With all vent plugs located at high point of the measuring chambers, or alternatively with drain plugs at low point.
- Where they do not impede process operation, i.e." masking valves or blocking walkways.
- Where they do not depend upon the process piping or electrical connections to them for support. Direct mounted pressure gauges, temperature indicators, flow switches, etc. where the instrument has been specifically designed to be supported by its process connection, are obvious exceptions to this rule.
- Where they do not impede maintenance operations or access to associated mechanical operations

Instruments shall not be mounted on handrails. All instrument supporting brackets and local panel upstands shall be stainless steel or hot dip galvanised before installation. To ensure a good earth via the frame structure (plant earth) all instruments having electrical connections shall be fixed by means of bolts having a lock washer under both the nut and the bolt. All bolts and nuts shall be stainless steel.

6.11.2.2 Marking and Labelling

All instruments and upstands shall be identified by a white traffolyte label with black lettering fixed with two screws. Generally the labels shall be positioned under the
items they identify. Text shall consist of instrument tag number and description. The letter type face shall be in the following sizes:

<table>
<thead>
<tr>
<th>Letter Height</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 mm</td>
<td>Instrument control panels, major equipment, danger labels</td>
</tr>
<tr>
<td>10 mm</td>
<td>Instrument upstands</td>
</tr>
<tr>
<td>5 mm</td>
<td>Individual items of process instrumentation</td>
</tr>
</tbody>
</table>

6.11.3 Instrumentation Electrical System

Instrument installation and reticulation shall comply with the Installation and Materials requirements. In addition it shall comply with the requirements of this clause.
Correct earthing and screening is of the utmost importance in instrument electrical installations and the following rules must be adhered to:

- The armouring of steel wire armoured cables shall be connected to earth at the field junction box via a cable clamp, or steel wire armoured gland.
- The instrument cable armouring shall be connected to earth at the control room or switch room via cable clamp or SWA gland.
- The shielding of electronic signal cables shall be continuous and grounded only at the control point (Instrument Control Panel).
- Instrument earthing within the control panel shall be common and connected to the instrument earth bar as shown on the earthing schematic.

Instrument cable should be insulation tested on the drum before installation and immediately after laying before any connections have been made, either in the field or at the control building. The use of a Megger on instrument cables forbidden at all other times due to the danger to electronic instrumentation that its use presents. 12V maximum battery operated lamp, buzzer or low voltage ohmmeter should only be used for continuity and wiring testing.

No instrument circuit is to be energised without the approval of the Engineer. Top entry of cables into field junction boxes is not allowed.
No wire or cable shall be left with a mechanical strain on it.
The following precautions shall be observed in laying instrument cables:

- Cable channel, ducting, tray or conduit cannot be supported from process lines or laid against them but must always be supported off the structure.
- Instrument cables shall be laid at least 450 mm from electrical cables.
- Above ground cables should be places so that no process fluids particularly acids and solvents can be spilt on them.
- Cables shall be run well clear of any hot lines or equipment.
- Care shall be taken that the cables are not bent to a radius less than the manufactures stated minimum bending radius.
- Care should be taken that the cable is not twisted or stretched and open ends should be sealed immediately after the cable is cut.
• Cables shall be placed neatly and in order in the trench, channel or tray.
• The cable route shall be marked at ground level with concrete marker tiles reading "Instrument Cable" at not more than 30m spacing and at every change in direction.
• Cables mounted above ground on trays or in channels shall be marked in a similar manner at distances not exceeding 10 m and at their starting and termination points.

6.11.4 Identification of Equipment

Nameplates and tags shall be provided to properly identify each instrument and its auxiliary equipment. Control panels and consoles will be provided with labels both at the front and back of panel by the panel manufacturer. Nameplates for field instruments shall be provided and attached by the Contractor to the instrument support by means of screws. The label shall be positioned such that it remains on the support when the instrument is removed for repair or calibration.

6.11.5 Identification of Wiring and Junction Boxes

All wiring, terminals and junction boxes shall be marked clearly, durably and consistently as specified below. Junction boxes shall be marked externally with suitable nameplates of engraved plastic laminate. Terminals in junction boxes shall be numbered consecutively in accordance with the relevant cable connection diagrams. All wires shall be individually marked on each side of each terminal with plastic ferrule marker.

6.12 Section 12 - Supervisory Control and Data Acquisition (SCADA) Input/Output

6.12.1 General

An existing SCADA remote termination unit (RTU) is provided within the pump station control room by "others". This contract will allow for the review and recalibration of signals from the designated equipment that are wired to a SCADA marshalling section within that equipment cubicle. The signals are wired via a set of “Krone” terminals and marked according to the respective signal and equipment function.

6.12.2 RTU and SCADA Input/Output Signals

<table>
<thead>
<tr>
<th>Description</th>
<th>RTU Input</th>
<th>RTU Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kilowatt Hours Totalisation (RS - 485 output signal)</td>
<td>RS 485</td>
<td></td>
</tr>
<tr>
<td>Each 3.300V Main Incomer - Tripped</td>
<td>DI</td>
<td></td>
</tr>
<tr>
<td>Generator incomer - Closed</td>
<td>DI</td>
<td></td>
</tr>
<tr>
<td>Pumpset No1 to 4 – Auto Position</td>
<td>DI</td>
<td></td>
</tr>
<tr>
<td>Pumpset No 1 to 4 - Manual Position</td>
<td>DI</td>
<td></td>
</tr>
</tbody>
</table>
### 6.13 Section 13 - Instrumentation Commissioning

#### 6.13.1 Instrument Power Supply Systems

Inspection and testing of the instrument power systems, including emergency power back-up systems, shall be the responsibility of the Electrical Contractor.

#### 6.13.2 Electronic Loop Testing

All electronic instrument control loops shall be functionally tested for correct operation. Verify that all power is off. Disconnect the transmitter leads to their termination in the control room. Check resistance of each lead to ground. For transmitters requiring a DC power supply in the loop, the polarity of the transmitter leads shall be verified by connecting an ohmmeter across the transmitter leads. In the reverse direction (positive ohmmeter lead to the negative transmitter lead), the impedance would be infinity. In the forward direction (positive ohmmeter lead to positive transmitter lead), a lower impedance value will be read, (value will depend on particular make). Short transmitter output and short DC power supply output,
connect ohmmeter in series with the loop and check total loop impedance. Short out each input individually to each device to verify values. Set the load adjustment, if available. Re-connect loop wiring correctly. For loops where it is possible to directly apply a calibration check signal to the transmitter, proceed by performing the steps specified under the particular type of transmitter. For loops where it is not possible to apply the calibration signal to the transmitter, the transmitter shall be disconnected and a suitable DC current source shall be connected to the loop. Connect a precision voltmeter across the precision loop test resistor located at the transmitter or in the control room termination facilities. Turn on all power required. The loop against the reader on the precision voltmeter. Set current actuated alarm or shutdown switches. On loops containing controllers, set correct controller action, the proportional band adjustments to 100%, reset to lowest value, control index to 50% and control to automatic. Apply calibration signal of 50%. Controller output should read approximately 50%. Apply calibration signal of 0%, on direct action controller output should to maximum, on reverse action to minimum. Switch control to manual and check full output rangeability. Check and correct, if necessary, "open-close" designation on manual output adjustment. During the above operations, the control valve and/or positioner should be observed for proper operation. Verify single point earthing of all shields.

6.13.3 Alarm and Shutdown System Testing

All alarm and shutdown systems to be functionally tested for correct operation. Simple systems, such as those consisting of one switch and one annunciator point shall be tested at the time of calibration check of the device actuating the switch. Complex systems shall be tested by simulating inputs and monitoring outputs against Logic Diagrams. Additional tests to the above and commissioning requirements outlined above, the Contractor shall allow for whatever additional tests that are required by the specialist subcontracts, package vendors, equipment/component suppliers and Power Authority to ensure correct setting up, calibration and operation of the plant. The Contractor shall replace or repair at his own cost any component or item of plant that may be damaged or cause to malfunction, which can be shown to have been caused by his lack of preplanning and/or incorrect testing and commissioning procedures for work that is under his direct control. All such repairs and/or replacement shall be to the satisfaction of the Engineer. The Engineer may reject any part of the work, which he reasonable considers unsatisfactory. Any rejected part of the work shall be made good by the Contractor at his expense without inconvenience to the Engineer and shall not be regarded as a cause beyond the control of the Contractor justifying an extension of time in which to complete the work.

6.13.4 Failure to Complete Preliminary Tests

Should the Engineer's testing or inspections be unduly prolonged due to the failure of the Contractor to undertake his own preliminary testing or preparation, the Contractor shall be notified of the deficiency and all additional time, travel,
accommodation and costs spent by the Engineer will be charged to the Contractor at the Engineer's normal charge out rates. These charges will be deducted from the Contractor's next progress payment.

### 6.13.5 Test Instruments

All test instruments and other testing facilities shall be provided by the Contractor within his tender price. Should the Engineer have any doubt as to accuracy of a measuring device, he reserves the right to instruct the Contractor to have the instrument recalibrated at no extra cost. Nevertheless, if the recalibration was in fact not necessary, the cost will be borne by the Principal.

### 6.14 Section 14 - Electrical System Commissioning

#### 6.14.1 Electrical Commissioning General

Inspection, testing and commissioning shall be split into two categories:

- For cubicles, switchboard and panel manufacturing and acceptance thereof, prior to delivery to site.
- For the completed on site installation works.

The following procedures/requirements shall be allowed for, observed and strictly adhered to.

#### 6.14.2 Switchboards, Panels, Cubicles, Instruments

All such products irrespective of any subcontractural supply agreement made by the Contractor shall be subject to workshop inspection and testing by the Engineer. The Contractor shall prepare a detailed shop testing programme 2 weeks prior to start of the workshop testing sequence. The programme shall be submitted to the Engineer for comment prior to commencement. The Contractor shall at no extra costs, allow for any reasonably alterations and/or additions to the test programme at the Engineer's request. The following procedures and tests shall be carried out by the Contractor in the presence of the Engineer.

- Vendor standard tests and procedures (detail to Engineer).
- All tests and procedures specified in the Contract Documents.
- Individual components shall be proved separately prior to proving in combination.

The Contract shall give 7 days' notice in writing to the Engineer of the date after which he will be ready to carry out any tests required under the Contract. On receipt of such notice the Engineer shall agree with the Contractor as to the day or days on which the tests shall take place which shall be within 10 days of the date on which the Contractor has indicated he will be ready for the tests. If any portion of the works fails to pass the tests that portion shall, if required by the Engineer or by the Contractor, be
retested within a reasonable time upon the same terms and conditions, save that all
direct expenses incurred by the Engineer as a result of the repetition of the tests beyond
defined shall be deducted from the Contract Price save that no claims for
indirect losses or damages shall be made.

6.14.3 Installation Works - Testing and Commissioning

All equipment and component parts shall be checked by the Contractor. This
includes that cells, busbars within switchboards, pushbutton stations, and all other
types of control and indication devices. The Contractor shall test all cables prior to
connecting. Commissioning schedules are found in the Appendix to the
Specification. These shall be submitted and approved by the Engineer and used by
the Contractor to record these tests. The Contractor shall complete commissioning
schedules for all parts of the installation, where no schedules exist the Contractor shall
prepare schedules and submit to the Engineer for approval. The General Test
Procedure shall include as a minimum, tests on protective equipment, switchgear,
transformers, etc, as stated and as relevant to the duty, type and classification of
equipment. Test results shall be recorded on appropriate sheets

Tests and inspections may be witnessed by the Engineer.

All alarm circuits shall be individually IR tested by utilising a functional test using
external initiating controls. All motors are to have IR tests on all windings of 1000 volts,
with checks on the following:

- Shaft/float
- Gland/labyrinth clearance
- Cooling air circuit
- Oil drain
- Winding temperature connections
- Terminal box sealing
- Hold down bolt securing
- Cable glanding

Where relevant, all motors shall have a four hour run, process conditions permitting, i.e.
with coupling split and at no load, where possible. Check temperature rise and
bearing conditions. All Contractor supplied equipment shall be subject to calibration
tests as follows in relation to manufacturers’ curves:

- Set the overload to the required motor full load current
- 115% FLC Stability (thermal) for 15 minutes
- 125% FLC Operation
- 600% FLC Operation
- Earth leakage trip (as applicable)
- Single phasing operation (as applicable)
- Thermistor/thermal operation (as applicable)
- Full load currents shall be taken from motor nameplates
- Metering (ammeters, voltmeters etc):

**Accuracy Against Standard**

Switchboard, motor control centres - general (power/lighting/instruments switchboards):
- Busbars connection, control wiring, terminals, terminals and general security check.
- Busbar IR Test
- Switches/Isolators operation, locking and interlocking facilities.
- Protective Device/Fuse ratings
- Incoming and outgoing cables IR tests
- Cable identification labels
- Phasing
- Phasing rotation
- Voltage
- Operation of indication/integration/recording equipment
- Ducter tests across busbar joints and connections.

**Earthing**

- Test power system earthing
- Test tanks, vessels, drums etc earthing
- Test lightning conductor earthing (if applicable) Test continuity on all earth reticulation
- Soil resistivity at 5 points on site
- Alarms: Ducter test across critical connections and joints
- All circuits shall be individually IR tested
- Functional test using external initiating controls

**Exterior Lighting**

- Earthing tests - check continuity and resistivity at selected points
- IR test distribution cables only
- IR test distribution cables and lighting column circuits
- Security check, termination, nuts, bolts etc
- Check operation

All instrument Transformers shall be checked for:
- IR Tests - primary, secondary
- Phasing - single/operable operation. Vendor supplied certificate.
- Check earthing
- Check voltage stability on load
All cables will be subject to Insulation Tests as tabulated below: Where specified cable types/ratings apply:

<table>
<thead>
<tr>
<th>Cable Type</th>
<th>Min. IR Values</th>
<th>IR Test Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>600/100 volt rubber or plastic</td>
<td>50 Megs</td>
<td>1000 Volts</td>
</tr>
<tr>
<td>440 volt MICC</td>
<td>30 Megs</td>
<td>1000 Volts</td>
</tr>
<tr>
<td>250 volt MCC</td>
<td>10 Megs</td>
<td>500 Volts</td>
</tr>
<tr>
<td>250 volt rubber or plastic</td>
<td>10 Megs</td>
<td>500 Volts</td>
</tr>
<tr>
<td>Compensation Cables</td>
<td>1 Meg</td>
<td>250 Volts</td>
</tr>
<tr>
<td>Type installed against type specified</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glanding secure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labelling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminations correct –phase check to confirm before livening.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weather sealing where necessary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical protection and fixing regarding the Electricity Regulations 1993</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Board and Way Data**

**Board Calculation Errors**

**Board Input Data**
7 PERSONNEL, EQUIPMENT, FACILITIES AND SERVICES TO BE PROVIDED BY OTHERS

7.1 Personnel
None

7.2 Equipment, Facilities and Services
None

7.3 Information
The Employer will provide the Contractor with the following information in addition to that contained in the Agreement:

- Waimanu Pumping Station Electrical Upgrades - Electrical Services Drawing
8 REMUNERATION & PAYMENT

8.1 Basis of Payment

Prices entered by the Contractor in the Schedules of Prices shall be deemed to have included allowances for all costs, overhead and profit for carrying out and successfully completing the Services in accordance with the Agreement and other documents referenced therein incurred by the Contractor in performance of the Services.

8.2 Invoicing

The Contractor shall submit invoices not more frequently than once per month.

8.3 Cost Adjustments

No allowance will be made for cost adjustments due to Inflation within the period of the Agreement. The Contractor shall be deemed to have allowed in its proposed price for the effects of inflation on the Services.

8.4 Payment Terms

Payment will be made as follows:
- 50% on shipment of switchboard and other equipment to Suva. This would be released upon successful production of bill of lading documents.
- 40% upon practical completion
- 5% upon satisfactory completion of 12 months maintenance and inspection period
- 5% retention upon completion of the 12 months defects notification period

8.5 Additional Services

Payment for additional work of similar scope to the normal services will be negotiated based on rates in the Schedule of Rates for Additional Services where the additional services are not comparable to those in the Schedule of Rates and Prices for Normal Services.

8.6 Provisional Items (indicated ‘PI’ in the Price Schedule)

Provisional Items are fixed price items at the Employer’s option and are unit rates or lump sum prices inclusive of overheads and profit. The inclusion in the Schedule of Rates and Prices of a Provisional Item does not confer on the Contractor the right to perform the work to which the item relates.
Such items shall be carried out only on the instructions of the Employer’s Representative and paid for at the rates or lump sums entered by the Contractor in the Schedule of Rates and Prices.

8.7 Provisional Sums (indicated ‘PS’ in the Price Schedule)

Provisional Sums may be included by the Employer in the Schedule of Prices for services to be executed by the Contractor which are not accurately quantifiable at the time of submitting the proposal. Provisional Sums are items to be undertaken as directed by the Employer and will be unit rate or lump sum prices inclusive of overheads and profit in general accordance with the Schedule of Rates (Additional Services) or at negotiated prices / rates. The inclusion in the Schedule of Prices of a Provisional Sum does not confer on the Contractor the right to perform the work to which the item relates.
8.8 **Contingency Items**

Any contingency sum in the price schedule shall be regarded as a Provisional Sum and shall only be used in accordance with the Employer’s instructions to pay for Additional Services, if required. The inclusion in the Schedule of a Contingency does not confer on the Contractor the right to execute such services. Any contingency amount not so instructed by the time of completion of the Services will be deducted from the agreed sum when valuing the final payment.

8.9 **Taxes and Duties**

If the Contractor is resident in Fiji for tax purposes, all payments made under the Agreement are subject to Value Added Tax (VAT) in accordance with the Value Added Tax (Amendment) Decree. The Contractor must be registered for Fiji VAT in accordance with the VAT Decree. If the Contractor is not so registered, it shall indemnify the Employer against any ineligibility of the Employer to reclaim VAT that results from the Contractor’s non-registration. The Contractor shall reimburse the Employer in full for all such losses incurred by the Employer, which the Employer may deduct from amounts otherwise owing to the Contractor under the Agreement from time to time. If the Contractor or a sub-Contractor is not resident in Fiji for tax purposes, payments to the Contractor or sub-Contractor may have Non-Resident Withholding Tax (NRWT) deducted at the prevailing rate by the Employer or Fiji revenue authorities. It shall be the Contractor’s responsibility to determine its applicable tax liabilities and to comply with the law. Any withholding tax payable shall be deemed to be allowed for in the price agreed for the Services. Costs incurred by the Contractor in determining its tax liabilities shall also be deemed to be allowed for in the VIP price agreed for the Services.

8.10 **Payment Items**

Refer to the items in the Schedule of Prices in the table below.
### 8.11 Schedule of Prices

#### 8.11.1 Schedule A

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>COST (FJ $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Demolition Works inclusive of existing switchboard in pump room and resistor banks. Handover to client.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Trace and Megger test of all circuits at the existing distribution board labelled DB-Pump. No Megger test on extra low voltage cabling connected in any way to existing DB-Pump. Removal of the existing distribution board in the pump room and replace with new distribution inclusive of switchgear and other accessories. Note during the removal of the existing distribution board, always maintain power supply to the protection of the controls of MSB 1 at all times.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Complete connect of 2 No. 1000kVA transformers to the new 3.3kV Switchboard in pump room.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Complete connect of 1 No. 2000kVA 3.3kV 50Hz generator to the switchboard in the Pump room.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Complete connect of 1 No. black start 110kVA, 415V, 50Hz generator to the DB-Pump in Pump room.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Complete supply and install of new Form 4 3.3kV Switchboard in pump room inclusive of switchgear, soft starters, motorized transfer switch, provision for power factor correction unit, surge arrestor and bus coupler</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Complete connect of new three phase 415V Uninterruptible Power Supply (located in the Ramsey switchboard) to new 3.3kV Switchboard in Pump room.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Complete supply and install of all control cables.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Complete supply and install of new distribution board inclusive of switchgear, cabling, conduits and other accessories.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Complete supply and install of lights inclusive of light switches, cabling and other accessories.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Complete supply and install of power outlets inclusive of cabling, conduits and other accessories.</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Complete supply and install of cable support systems inclusive of trenching works, cable trays and other accessories.</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Complete cost for Preliminary &amp; General inclusive of mobilization, site establishment, insurances, transport and accommodation.</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Lightning protection complete with lightning rod, dynasphere, cabling, earthing and all required accessories.</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Complete earthing system inclusive of earthing rods and other accessories.</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Complete cost for provision of 12 inspections at monthly intervals after practical completion of the installation of new switchboard in pump room.</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Shop Drawings</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>As-Builts, Operation and Maintenance manuals</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Other costs.</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Freight Cost of all Equipment to the Port of Suva, Fiji</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Transportation Cost of all Equipment from the Port of Suva to the Storage Site and Erection Site (Waimanu, Fiji)</td>
<td></td>
</tr>
</tbody>
</table>
Add Provisional Sum (10%)
Sub-Total of Works
Add VAT @ 9%
Total
Add Contingency (10%)
GRAND TOTAL (FJ $ VIP)

8.11.2 Schedule B

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>COST (FJ $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Removal of existing soft starters and all accessories from existing Ramsay switchboard in the existing Main Switch room. Hand over to client.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Removal of existing defective 30kVA UPS and all accessories from the existing Ramsay Main Switch room. Handover to client.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Complete supply and install 3.3kV Soft Starters, SEL 710 Relays, switchgear for capacitor bank and pumps, surge arrestor, existing key interlock system to be upgraded to suit new system, existing manual transfer switch/changeover switch to be converted to motorised system and key interlock fitted to suit new system with new bus coupler to existing Ramsay switchboard (MSB 1) and other accessories.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Complete supply and install of 3 phase 30kVA 415V Uninterruptible Power Supply and other accessories in the Ramsay switch room and connect to the Controls of MSB 1 and MSB 2 (New MSB in the pump room).</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Completesupplyandinstallationof1 No. of 11kV/3.3kV 2000kVA transformer and transformer primary, transformer secondary, pumps cabling and other accessories.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Complete connect of power factor correction bank to the existing Ramsay Switchboard.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Complete supply and install of control cables</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Complete supply and install of emergency lights inclusive of light switches, cabling and other accessories.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Complete supply and install of cable support systems inclusive of trenching works, cable trays and other accessories.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Complete cost for Preliminary &amp; General inclusive of mobilization, site establishment, insurances, transport and accommodation</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Complete earthing mat system inclusive of earthing rods and other accessories.</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Complete cost for provision of 12 inspections at monthly intervals after practical completion of the installation of all the above mentioned electrical equipment, cabling and accessories at the existing Ramsay Main Switchroom.</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Shop Drawings</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>As-Builts, Operation and Maintenance manuals</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Other costs.</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Freight Cost of all Equipment to the Port of Suva, Fiji</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Transportation Cost of all Equipment from the Port of Suva to the Storage Site and Erection Site (Waimanu, Fiji)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Add Provisional Sum (10%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sub-Total of Works</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Add VAT @ 9%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Add Contingency (10%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>GRAND TOTAL (FJ $ VIP)</strong></td>
<td></td>
</tr>
</tbody>
</table>
9 APPENDICES

Appendix 1 - Bidders Qualification following Prequalification
Appendix 2 - General Requirements
Appendix 3 - Electrical Services Drawing
10 SUBMISSION

Tender submission should be sealed in an envelope clearly marked
as: Tender No WAF 16/07/01/PMU/SSEW

Tender for Supply, Installation and Commissioning of 3.3kV Switchboard and
Electronic Soft Starters at Waimanu Pumping Station

Tenders should be hand delivered in a sealed envelope to:

Water Authority of
Fiji Wailoku Depot
PROCUREMENT
OFFICE

Overseas suppliers can send their tender submission to: wattender@waf.com.fj.

Closing time and date for Submissions shall be **2.00 pm Fiji time on the 29th of July, 2016.**

For further information on the Tender Process Contact:

**Tevita Balenivalu**
Acting Procurement Manager
Email: tevita.balenivalu@waf.com.fj
Ph: +679 9104019

For further information on the Scope, Basis of Payment & Schedule of Prices or other
general information, contact:

**Vicky Sahayam**
Project Manager: Water Authority of Fiji
Email: vsahayam@waf.com.fj
Ph: +679 9126588