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TECHNICAL SPECIFICATION FOR HYDRAULICS SERVICES

PROJECT	PROPOSED EXTENSION TO EXISTING BUILDING-CRYO LAB
CLIENT	PACIFIC COMMUNITY
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1.0 DEFINITIONS AND ABBREVIATIONS

For the purpose of this specification the following definitions apply:

The term "Project" shall be as defined on the tender schedule.

The term "Site" shall mean the location defined on the tender schedule where the Project will occur.

The term "Employer, Client, Principal, and Owner" shall be as defined on the tender schedule.

The term "Project Manager" shall be as defined on the tender schedule.

The term "Architect" shall be as defined on the tender schedule.

The term "Structural Engineer" shall be as defined on the tender schedule.

The term "Services Engineer" shall mean **Edison Consultants Limited**.

The term "Builder" shall mean the company appointed to carry out the main building works for the project.

The term "Electrical Utility Company" shall mean the organisation defined on the tender schedule that supply electricity to the community.

The term "Telecom Utility Company" shall mean the organisation defined on the tender schedule that supplies telecommunication services to the community.

The term "Water Utility Company" shall mean the organisation defined on the tender schedule that supply water to the community.

The terms "Contractor, Tenderer, Nominated Sub-Contractor" shall mean the company bidding for and having subsequently been accepted to carry out the works in this specification.

The term "Contract" or "Sub-Contract" shall mean the works included in this specification and the accompanying engineering drawings, Contract Specifications and relevant Australian and New Zealand Standards to which the project shall be built. The most updated version of the Australian standards shall apply during the period of construction, and this shall supersede the relevant standards version applicable at the time of tendering and contract negotiations.

"Approved" shall mean subject to the inspection and written approval of the Services Engineer before being worked or fitted into the Contract works.

"Indicated" shall mean as indicated in the Contract drawings and specification and by notes, figures, sketches or writing, thereon or by any combination thereof.

1.0 INTRODUCTION

This specification details the requirements for Hydraulics Services Works for The Project. The Hydraulic Services covers the supply and installation of potable domestic water services, Sanitary Drainage Systems, connection to fire hose reel water pipe work and all other works necessary to implement this specification as indicated in the hydraulic services drawings.

1.1 DESCRIPTION OF PROJECT

The description of the project will be defined in the tender schedule.

1.3 REFERENCE DOCUMENTS

This specification is to be read with conjunction in all relevant reference documents and engineering drawings that are part of this project. All work covered by this specification shall be subject to all provisions of the Conditions of Contract.

1.4 STANDARDS AND CODES OF PRACTICE

Standards of workmanship, materials, and details of construction are to conform to relevant Australian and New Zealand Standards with any amendments unless specifically noted in this specification and drawings.



All work in respect to materials and workmanship shall meet or exceed relevant local and overseas engineering standards, best practices and recommended methods. In particular, relevant applicable sections of the following standards shall be deemed part of this specification.

All works shall comply with the following major standards as well as other codes called upon in these specifications:

The applicable version of all of these standards shall be the current version at the time of tendering & construction shall be used for this project.

1.4.1	The National Building Code, Fiji
1.4.2	Local Municipal Authority Regulations
1.4.3	Health and Safety Regulations
1.4.4	Electricity/Telecommunication Authority Regulations
1.4.5	AS/NZS3500: The National Plumbing and Drainage Code.
1.4.6	BS21:1985, Pipe threads for tubes and fittings where pressure tight joints are made on the threads.
1.4.7	BS 143 & 1256:1968, Malleable cast iron and cast copper alloy screwed pipe fittings for steam, air, water, gas and oil.
1.4.8	BS4161: Cast iron spigot and socket soil waste and ventilating pipes (sand cast and spun) and fittings.
1.4.9	BS1723 and BS 1845:1984 : Brazing
1.4.10	BS 3974 : Pipe Supports
1.4.11	NZS/AS 1477:1996 PVC pipes and fittings for pressure applications
1.4.12	NZS 7642:1971, Unplasticized PVC soil and ventilating pipe, fittings and accessories.
1.4.13	NZS 7643, Code of Practice for Installation of Unplasticized PVC Pipe Systems.
1.4.14	NZS7649:1988, Unplasticised PVC sewer and drawn pipe fittings.

1.5 CONTRACTORS TO INFORM THEMSELVES

The Contractor shall familiarize themselves with the site and the requirements of this specification before tendering. No allowance shall be given for the lack of knowledge of the site conditions and the requirements of this specification. Any discrepancies with the requirements of the specifications or any difficulties with the site conditions shall be brought to the Services Engineer's attention prior to tendering for clarification. The Contractor shall be fully responsible for meeting the requirements of the specification thereafter.

The Contractor shall be responsible for obtaining Local Municipal and Health Authority approvals, permits, inspections and final compliance certification for all work included in this specification. The cost for the same shall be included in the Tender Price.

Full allowance shall be made in the tender price for all costs, including taxes, duties, local authority fees, transportation and any other applicable costs.

1.6 CONDITIONS OF CONTRACT

All work covered by this specification shall be subject to all provisions of the Conditions of Contract document provided by the Client. The Contractor shall obtain a copy of this contract and become familiar and agree with the requirements of the Contract, prior to accepting the terms of this contract.

Contractors shall ensure that they read and understand all Conditions of the Contract prior to submitting their tender. The contractor will be required to endorse this contract once the contract has been awarded as this will form the basis from which this contract will be administered.

1.7 CO-ORDINATION WITH OTHER TRADES

The Contractor shall at all times liaise with other Sub-Contractors, builder, the Services Engineer & the Client to ensure that works are carried out in a timely, orderly fashion so as to minimize delays, disturbances and damages to any equipment or property.



1.8 SUPPLY OF ITEMS BY OTHERS

It may be the intention of the Principal to directly supply to the contractor, major items of plant and equipment.

The Contractor shall make allowance to take delivery, store safely, install, commission, test and provide warranty maintenance for supply of items by others. The Contractor shall ensure and allow necessary costs and resources for liaising with suppliers to ensure the installation is successfully carried out without delays and / or adversely affecting the installation, operation, performance or warranty of items supplied by others.

1.9 INSPECTION OF EXISTING SERVICES

It shall be the Contractor's responsibility to inspect the job site and become familiar with the conditions under which the work will be performed.

Contractor shall carry out through site inspection and survey of existing site and familiarize with the existing site conditions before commencing any work. The Contractor shall be responsible for prior coordination of all works.

1.10 SITE MEETINGS

A representative of the Contractor, who is fully qualified in all aspects of Hydraulics Services works, shall be required to attend all site meetings called by the Project Manager. The said representative shall be fully conversant with all aspects of this current project, including the latest site developments, prior to attending meetings. The said representative shall have been authorized by the Contractor to make decisions on the Contractor's behalf which shall be deemed binding on the Contractor.

1.11 WORK PROGRAMME

The Contractor shall submit a program of works with their tender in Gantt Chart Form, specifying Tasks, Duration, Resources and dependencies between scheduled tasks. This program shall be kept updated at all times for the entire duration of the project.

1.12 OCCUPATIONAL HEALTH AND SAFETY

The Contractor shall ensure that all personnel are fully trained in matters relating to work safety. The Contractor shall ensure that their personnel are fully equipped with safety equipment and that a strict regime of safety is followed on site that complies with local OHS (Labor Department) Authority requirements.

1.13 ERRORS IN DOCUMENTATION

Errors, ambiguities and omissions in drawings or specifications shall be reported to the Services Engineer for correction before any part of the work involved is started. Unless otherwise expressly stipulated, no additional allowance shall be made because of errors, ambiguities or omissions which should reasonably have been discovered during the preparation of the tender or which may become evident later and which should have been directed to the attention of the Services Engineer in timely manner. The written decision of the Services Engineer shall be final.

1.14 QUALIFICATION OF PERSONNEL

The contractor shall have successfully completed projects of comparable size and complexity. The Client reserves the right to reject any components for which evidence of a successful prior installation performed by the contractor cannot be provided.

The contractor shall have in-house engineering and project management capability consistent with the requirements of this project. The contractor is responsible for retaining qualified personnel for detailed system documentation, coordination of system installation requirements, and final system testing and commissioning in accordance with these specifications.

1.15 WORKING CONDITIONS/HOURS

All work may be conducted during normal working hours, 8:00 a.m. to 5:00 p.m., Monday through Friday, by properly coordinating the work with the Client. Contractor is to include, in his base bid, all overtime necessary to complete his work.



The Contractor shall remove rubbish and debris resulting from his work on each occasion. Rubbish not removed by the Contractor will be removed by the Client and back-charged to the Contractor.

Removal of debris and rubbish from the premises shall be coordinated with the Client.

1.16 BUILDING SERVICES ENGINEERS' INSTRUCTION (BSEI)

All tender queries and correspondence shall be formally sent to the Services Engineer via email. Responses to these queries will be issued in the form of Building Services Engineers' Instruction (BSEI).

All BSEI's shall be deemed to constitute an addendum to the tender documentation. If there is any conflicting information between the BSEI's or technical specifications; the latest BSEI that has been issued shall take precedence over the rest of the documentation.

Note that the preferred mode of transmission for tender queries shall be email.

All tender queries shall be provided in writing to the Services Engineer no later than 5 working days before the tender closing date. The Services Engineer will not be held accountable to answer any queries after this date.

1.17 CONTRACTORS DOCUMENTATION AND REPORTING

The Contractor shall submit detailed documentation on the progress of work, as specified that documents the work done on site. The contractor's submissions shall be witnessed by the representative of the Principal and form the basis of contract payments. Incomplete, not witnessed and/or unsigned documentation shall not be acceptable and shall not be paid for.

1.18 MAINTENANCE AND DEFECTS LIABILITY REQUIREMENTS

Contractor shall provide a general description and maintenance plan as part of tender submission. After award of tender, the Contractor shall submit a detailed maintenance plan for the Services Engineer's approval.

A copy of the manufacturer's warranty shall be provided with close-out documentation and included with the operation and installation manuals.

The equipment manufacturer and/or supplier shall maintain a service organization with adequate spare parts. Any defects that render the system inoperative shall be repaired within 24 hours of the Client notifying the Contractor.

A logbook shall be provided to record each service activity that has been performed at each visit, the conditions of the system and equipment at the visit, and any defects found during the visit including rectification tasks. The logbooks shall be located on site as directed by the Services Engineer. Each maintenance visit shall be recorded with details of work done including any measurements taken. The maintenance record sheet shall be signed off by the technician carrying out the works and shall be countersigned by the client's representative. Copies of the maintenance records shall be submitted to the client and the Services Engineer.

All maintenance activities shall be carried out by competent personnel who are trained in these activities.

GENERAL MAINTENANCE REQUIREMENTS

- Carry out monthly maintenance of all works under this contract for a period terminating twelve (12) months from the date of practical completion of the whole of the Contract Works.
- Replace or repair any faulty equipment or materials, or the results of unsatisfactory workmanship, free of charge.
- Carry out maintenance and testing as required by relevant standards and local authority regulations.
- Provide replacement of consumables at Contractors cost.
- Provide maintenance records, duly filled and copies submitted as required
- Maintain a stock of spare parts required
- Contractor to make available personnel to attend to any maintenance or emergency calls with a minimum of 2 hour response on 24 hour x 7 day basis, for the defects liability maintenance period



1.19 PRACTICAL COMPLETION

Practical Completion Status for works under this contract shall be granted only after all of the following conditions are fulfilled to the satisfaction of the Services Engineer:

- Submission of correctly completed ITP's
- Submission of all progress inspection reports
- All final testing and commissioning has been completed and all works specified by this document are installed and operating correctly
- Client instruction and training manuals for the same have been submitted
- Submission of progressive and final certification by the relevant local authorities
- Written Certification by the Contractor, Suppliers and Manufacturer's that all equipment has been installed and is operating to the capacities and performance levels specified
- Submission of approved and final as built documentation [3 Hard/soft copies]
- Contractors Completed Certificate of Compliance issued to the Services Engineer.

A Certificate of Practical Completion will be issued by the Services Engineer on satisfactory completion of all of the above.

1.20 FINAL COMPLETION

Final completion shall be considered achieved when the Maintenance and Defects Liability Period has been satisfactorily completed and all specified requirements have been met to the Services Engineers satisfaction. The following requirements have to be met prior to granting final completion status:

- Final and comprehensive maintenance servicing of all works
- Final inspections with the contractor and sub-contractors of all works
- Rectification, repair and/or replacement of any defective works
- Submission of all regular maintenance reports and evidence that maintenance has been regularly and correctly carried throughout the course of the defects liability period.
- Test and operate all plant and equipment. Demonstrate to the Services Engineer that all plant, equipment and systems are operating correctly as intended.

2.0 SCOPE OF WORKS

The scope of work includes the supply, installation, commissioning and final certification from the Local Municipal and Health Authorities for complete Hydraulic Services Installation for this project. All works necessary to provide a fully functional and compliant system as detailed in this specification and drawings shall be carried out. These works shall include any minor works and/or materials not explicitly stated but necessary to implement the services required.

The Contractor shall make allowance in terms of cost and time for all necessary equipment and materials required to implement this specification whether or not explicitly stated and whether or not permanently installed upon completion. These items shall include but not be limited to hiring of equipment, fastening materials, minor building works such as penetrations for cables and support systems.

Supply all materials, labour cartage, tools, plant and equipment necessary for the completion, testing, commissioning and certification of the sanitary plumbing and drainage systems described in this specification.

Where specific plant, systems, equipment and pipe work materials are described in this specification, tenderers shall base their tender on these specific requirements. Where no specific requirements are described, the Contractor shall install systems, which comply with the standards described in these documents.

2.1 SCOPE OF WORKS SUMMARY

The scope of works is defined on the tender schedule.

3.0 EQUIPMENT AND MATERIALS

The equipment used and workmanship employed shall comply with the standards noted in this specification.

3.1 COLD WATER SUPPLY SYSTEM

Cold Water shall be supplied from the cold water supply as defined on the Building Services Engineer's drawings.

3.2 HOT WATER SUPPLY SYSTEM

NOT ALLOCATED.



3.3 FLOOR WASTE AND DRAINS

Floor Waste & Drains shall be provided as defined on the Building Services Engineer's drawings. Floor Waste Gullies shall be provided with chrome plated grates and clamp rings. All floor waste outlets shall be installed so that the top of the outlet is 3 mm below the finished floor lining level.

3.4 SOIL AND WASTE VENTS

Provide soil, waste, and vent systems from all soil and waste fixtures as per AS/NZS 3500. Vent pipes shall be UPVC.

3.5 CLEANING EYES, INSPECTION OPENING AND ACCESS PANELS

Provide cleaning eyes in accessible positions as shown on the drawings and in the following locations.

- In the easily accessible locations on each soil and waste stack.
- Near the base of each soil and waste stack.
- At all pipe junctions.
- At the ends of all horizontal combined waste or soil pipes. Provide inspection openings in accessible positions as shown on the drawings and in the following locations.
- At the pipe junctions at ground level.
- Below bath tub drainage

3.6 EXPANSION JOINTS

Provide expansion joints to soil, waste and vents in accordance with NZS 7643, the Code of Practice for the Installation of un-plasticised PVC Pipe Systems.

3.7 VALVES

Provide line size isolating valves in the cold and hot water pipe work serving all plumbing including the equipment on the back of house services platform. Use bronze ball valve with stainless steel ball. Contractor shall allow for all provisions for future connections.

Provide isolating valves on all mains, sub-mains, branch and fitting pipes to allow isolation of supply to sections of the distribution.

Provide isolating valves on inlet and outlet of each pump. Provide non-return valves on the outlet of each pump before the isolating valve.

Provide tempering valves after the hot water supply heater to ensure delivered water temperature does not exceed 50 degrees Celsius.

3.8 CONDENSATE DRAINAGE PIPEWORK

Coordinate the connection of all air conditioning and refrigeration units' condensate drainage pipe work with the Mechanical Services Contractor.

4.0 PIPEWORK AND INSTALLATION

Only registered plumbers and drain layers shall carry out the installation of the Hydraulic Services. The Services Engineer reserves the right to call for a test certificate of all components. These certificates must use the tests listed in the appropriate standard.

All fixtures shall be provided and installed in accordance with the Schedule of Sanitary Ware in the Architectural Specification.

All sinks and wash hand basins and cleaner's sinks are to be complete with chromed brass waste outlet tail pipe and trap with cleaning eye, and plug and chain. The wastes shall be firmly clamped to the fixture with a locking collar to allow the trap to be removed. All waste outlets shall be positioned low enough to ensure complete drainage of the fixture.

All joints on stainless steel fixtures shall be welded and ground to a smooth finish. Weld discoloration shall be removed.

4.1 PIPEWORK

All pipe work supplied for the project shall be new and unused. The Contractor shall ensure that all pipe work complies with the relevant standards referred to in this specification. Detailed specifications for pipes to be used in this project as listed below.



The pipe and materials for each type of hydraulic application shall be as defined on the Building Services Engineer's Drawings.

4.2 PIPE HANGERS AND SUPPORTS

All pipe supports are to be installed as per the code requirements. Contractor shall visit site to familiarise themselves with the standard of workmanship required. Provide hangers or other approved supports at intervals as required by the relevant standards.

4.3 PENETRATION AND CHASING OF PIPEWORK

The setting out of work and fitting of core and sleeves in floors, beams, columns, and walls will be done by the Builder in conjunction with the fixing of form work and/or placing of concrete. The Contractor is to advise the Builder and the Services Engineer the location and size of all required core holes associated with his work before formwork proceeds. All penetrations are to be approved by the Services Engineer before work commences to avoid weakening of the structure.

The Contractor is to advise the Builder and the Services Engineer in writing of the location and size of all required chases associated with his work before formwork or layers of masonry proceeds.

Do not encase pipes in masonry or concrete walls and floors except with permission of the Services Engineer. Joints in pipe work are not to be encased. Pipes encased in concrete are to have a minimum concrete cover of 25 mm. All pipe work is to be wrapped in foil or polythene faced "Denso Tape" with a 50% overlap where chased or encased to allow for expansion and contraction. Pipe work chased or encased in masonry and concrete are not to cross any building movement joints.

4.4 FIRE RATING OF PENETRATIONS

All pipe work penetrations through fire-rated walls, floors and partitions shall be fire rated using an approved fire rating system as recommended by the pipe work manufacturer and by the relevant standards. All penetrations through fire rated walls/structures shall be sealed with fire rated collars which incorporate sleeve and intumescent infill for pipes. The contractor is required to provide fire rated collars and mastic sealants to the same detail as the existing hydraulics services on site. This fire rated sealing shall also be in agreement with the minimum fire rating of the respective barrier and should also be compliant with the municipal authority requirements and the Fiji Building Code.

4.5 EARTHING OF METAL PIPEWORK AND FITTINGS

Provide electrical earth bonding for all metallic pipe work and metal fixtures such as stainless steel sinks, etc. Co-ordinate earthing of pipe work and fixtures with the Electrical Contractor.

4.6 SEISMIC RESTRAINT

Provide Seismic Restraints for all plant, pipe work and equipment at all mounting points in accordance with the Fiji National Building Code, NZS 4219 and NZS 4203.

4.7 JOINING OF PIPEWORK

No mechanical joints except those connecting to plant items will be permitted in permanently enclosed spaces such as walls or floors.

4.8 COPPER PIPEWORK

Provide seamless copper tubing pipe work where required.

4.9 PVC PIPEWORK

Joints on PVC pipe shall be spigot and socket pattern jointed with solvent welding cement. Prior to welding the pipe and fittings must be assembled and checked for position and alignment, both parts being marked with pencil, not scored, to ensure re-assembly in the correct position. The pipe end within the joint should be roughened to provide a key, all swarf and dust cleaned off and degreased with cleaning fluid. The inside of the socket should also be degreased. The full depth of the spigot should be coated evenly with a heavy layer of solvent weld cement then pushed firmly into the socket and held completely immovable for a minimum of 30 seconds.

The joint should not be subjected to any load for 5 minutes and not used or tested for 24 hours after jointing. No oil or grease should be allowed to foul the joint, it should not be twisted after assembly and it should be assembled immediately the solvent has been applied and before drying commences.

For pipes 100 mm and larger, the joint shall be retained in a purpose-made jig to prevent movement for the duration of the 5-minute period.



4.10 BENDS IN PIPEWORK

All elbows and bends are to be long radius. The use short radius bends and elbows require specific approval from the Services Engineer. Site pulled bends is not permitted above 40 mm for steel and 50 mm for copper unless specifically approved by the Services Engineer.

For copper pipe work use bends and springs, and not elbows. Machine makes pipe bends with a minimum radius of 3 times the pipe diameter wherever possible. No appreciable flattening or corrugation of the pipe will be permitted.

4.11 PIPEWORK REDUCERS AND ENLARGERS

All reductions and enlargements in pipe bore are to be of the eccentric type and are to be proportional to provide an easy transition. Arrange horizontal pipes reductions and enlargements so as to prevent air pockets and permit draining of piping system.

4.12 EXPANSION AND CONTRACTION

Expansion and contraction is in general to be taken by pipe bends and changes of direction and the methods of support are to ensure complete free and silent movement when expansion or contraction occurs.

Particular attention is to be paid to anchoring of pipe work as a means of controlling the extent and direction of movement in any section of pipe work.

In the erection of both horizontal and vertical runs, due allowance is to be made for pipe movement in relation to the building structure. Ensure that branch pipes passing through holes in the building structure remain clear of the structure and that no pipe or fitting is unduly stressed due to lateral movement.

Accommodate expansion in PVC pipe work due to temperature changes without damage to pipelines by following manufacturer's instructions and the relevant Code of Practice for pipe work installation. PVC piping to NZS 7641 and 7642 - To PVC piping provide un-plasticised PVC expansion fittings incorporating a rubber-sealing ring. They shall be of the same manufacture as the pipe work fittings. The fitting may be in the form of an adaptor with joint for solvent welding to a fitting or coupling with allowance for expansion at both ends.

All pipe work expansion calculations shall be submitted to the Services Engineer prior to installation.

4.13 LABELING OF PIPEWORK FIXTURES AND FITTINGS

All pipe work, fixtures and fittings shall be labelled in accordance with NZS 5807.

4.14 PAINTING AND CORROSION PROTECTION

All plant items and motors are to be painted. Painting shall be carried out in accordance with the relevant standards and the paint manufacturer's recommendations.

All steel bracket and bases outside the building or where noted on the drawings, shall be hot dip galvanised after manufacture. Due allowance for undercutting threads and over sizing bolt hole or slots shall be made prior to galvanising.

4.15 CONTACT BETWEEN DISSIMILAR METALS

The Contact between dissimilar metals shall be prevented in locations where wetting occurs by a coating of bituminous emulsion "Flintkote" or equal. Contact between aluminium, copper, and concrete or timber shall be similarly prevented.

5.0 STRUCTURAL WORKS

The new structural supports required for installing the storage water heater and solar collectors shall be provided by the builder. The Contractor shall allow to co-ordinate structural works with other parties to ensure correct provisions are done.

The Contractor shall co-ordinate with the Builder and Structural engineer, marking out, providing detailed shop drawings to facilitate the construction of the platforms and frames and weather covers if necessary.

6.0 INSTALLATION WORKS

The Contractor shall provide for mobilization and carrying out the uplifting and installation operation using specialist personnel, safety precautions, public notification, local authority permits and all necessary costs for moving equipment onto site.



The specialist personnel shall be on site to direct supervise the assembly of the water pumps, water heaters, submersible sewer pumps including the installation, commissioning, sign-off and warranty certification of the equipment.

7.0 ELECTRICAL & ELECTRONIC PROTECTION OF ALL EQUIPMENT

All electrical equipment supplied on this project shall be provided with motor / equipment protection against voltage imbalance, asymmetry, earth leakage, voltage surges and sags and transient voltage spikes.

8.0 TESTING, COMMISSIONING AND CERTIFICATION

The Contractor shall upon completion of works test all components of the system as per the relevant standards and procedures noted below.

The Contractor shall be responsible for arranging inspections by the relevant local authorities before, during and upon completion of works.

Carry out the commissioning of all component parts and of the whole installation under the direction of qualified personnel competent in the relevant fields. Issue testing and commissioning results to the Services Engineer for approval.

8.1 PRESSURE TESTING

All pressure tests are to be carried out as per AS3500 standards and at a minimum pressure of 1500kPa and a minimum duration of 30 minutes. Pressure tests are to be witnessed by the Services Engineer. Maintain tests for a period of not less than four hours without loss of pressure and carry out testing under the supervision of the Services Engineer or his representative. Provide duplicate test certificates for all tests duly signed by the Contractor and Services Engineer's representative. Repair any defects and repeat the tests until the system is free from faults. All instruments used to measure system and equipment performance are to be certified for the accuracy and are to be calibrated within the three months preceding their use on this contract.

Pipe work fittings or plant not rated to withstand the test pressure shall be temporarily removed for the test with temporary pipe inserts used instead.

All tests shall be carried out in the presence of the Services Engineer or his appointed representative. The Services Engineer shall be given at least 1 days' notice of when a test will take place. Practical Completion certificates will not be issued until all testing and commissioning is complete.

8.2 WATER SUPPLY PIPE TESTING

Test all new pipe work other than for wastes, drains, vents, and overflows at pressures 50% greater than the maximum working pressure of the system. Disconnect items of plant and equipment liable to damage at the test pressure during testing.

8.3 SOIL AND WASTE PIPEWORK TESTING

All new piping shall be smoke tested by pumping smoke into the section under test until a pressure of 75 mm water gauge has been obtained. Maintain this pressure for the duration of the visual inspection.

All waste, drains, overflows shall be flood tested with water after sealing off the open ends of the system, with the system inspected when full.

Check the operation of each floor waste by flushing one bucket full (minimum 9 litres) on to each outlet.

8.4 PLUMBING FIXTURES

All new plumbing fixtures shall be operated and checked for correct operation in accordance with the Manufacturer's starting and operating instructions

8.5 CONNECTION TO THE WATER SUPPLY AND SANITARY STUBS

The Contractor shall be responsible for testing the connections to the water supply and sanitary drainage lines to the satisfaction of the Project Services Engineer.

A practical completion certificate will not be issued until the tests have been completed and an acceptance letter has been obtained from the Project Services Engineer.



9.0 DEFECTS LIABILITY

Maintain the Hydraulics work for a period terminating 12 months from the date of practical completion of the whole of the Contract Works, replacing or repairing any faulty equipment or materials, or the results of incompetent workmanship, free of charge.

A copy of the manufacturer's warranty shall be provided with close-out documentation and included with the operation and installation manuals.

The Supplier shall maintain a service organization with adequate spare parts. Any defects that render the system inoperative shall be repaired within 24 hours of the Client notifying the Contractor.

The contractor shall warranty the entire Hydraulic services under this contract for a period terminating 12 months from the date of practical completion of the entire contract works. The contractor shall maintain the entire work, replace or repair any faulty equipment or material or any defect arising out of incompetent workmanship, free of charge.

The contractor shall maintain a service organization with adequate spare parts. Any defects that render the system inoperative shall be repaired within 24 hours of the client notifying the contractor.

10.0 WORKMANSHIP

All works carried out under this contract shall be according to best trade practice and shall be of a high standard. The Services Engineer to the contract shall reserve to reject any work that does not meet quality or engineering standards.

11.0 EQUIPMENT AND MATERIALS AND SITE STORAGE

All equipment and materials used shall be new, unused and be of first grade quality. The Contractor shall submit complete engineering specifications of all equipment for approval prior to ordering the same for the project. Equipment shall be delivered to site in the manufacturer's original packaging.

Where standard or special fittings or finishes are required, the Services Engineer may require samples to be submitted for approval. These shall be submitted free of charge. Samples shall be returned to the Contractor after inspection by the Services Engineer.

The Services Engineer reserves the right to request pipe work or other equipment to be cut open for examination or analysis. Where the sample removed is found to be defective, reinstatement shall be at the Contractor's expense.

The Services Engineer reserves the right to require a performance vibration and noise test of plant before accepting delivery or approving progress payment. Such tests may be made either on site or on another approved location.

Note that only short term storage of equipment will be permitted on site to meet the specified requirements for contract program. Material and equipment stored on site shall be adequately protected and secured in a weatherproof building away from direct sunlight and high temperature environments. Installation shall not proceed until the contract building can provide a suitable standard of protection from the weather and other contract activities. No materials or equipment may be delivered to the site until these storage requirements can be met. The Services Engineer reserves the right to order that inadequately stored or protected equipment be removed from the site and to refuse progress payment.

12.0 STRUCTURAL AND SEISMIC REQUIREMENTS

The installation of plant units, pipe work and fittings shall meet Structural and Seismic Standards according to NZS4219. Where additional building or structural supports or penetrations are required, the Contractor shall provide all necessary details and get it reviewed and certified well in advance by the structural engineer.

13.0 BUILDERS WORK, PENETRATIONS AND MAKING GOOD

The Contractor shall provide construction drawings for prior approvals showing all locations where penetrations and other changes to the building are proposed. Details of each such location such as penetration size and purpose shall be indicated.

The drawings supplied with this specification are diagrammatic only and the Contractor shall check all details on site including locations of all equipment and any building work requirements.

The Contractor shall provide sleeving for all penetrations. Where service pipes, ducts or cables are passing through fire rated structures, these shall be installed as per fire protection standards. Sleeving and sealing of the penetration with fire rated material shall be the responsibility of the Contractor.

All penetrations shall be covered with escutcheon plates, flush mounted to give a clean, neat appearance.



14.0 CLIENT INSTRUCTION

Following the completion of the commissioning process, the Contractor shall train and instruct the Client's representatives, engineers and operators, in the correct, efficient and safe operation and servicing of plant. During this instruction the Contractor shall also explain the content of the as built drawings as well as use of the Operating and Service Manuals.

This instruction shall be carried out by a competent and experienced engineer experienced in this work.

The Training shall include all necessary demonstrations and explanations of the correct sequence of operation and function of the complete system under both automatic and manual control and a description of the actions to be taken in the event of a system fault occurring.

This service shall be provided during normal working hours, before a Certificate of Practical Completion is issued.

15.0 SHOP DRAWINGS

The Contractor shall provide shop drawings within one week after tender award. Shop drawings must be approved by Engineer before commencement of work on site. The drawings shall consist of existing schematics, proposed schematics, existing layouts, proposed layouts, existing elevations, proposed elevations, existing sections, proposed sections and details. Drawings to have a minimum scale of 1:100 for floor plans, 1:50 for elevations and 1:50 for sections and plant layouts.

3 copies of shop drawings shall be submitted to the Services Engineer for approval 2 weeks before work is due to commence on site. The drawings shall be reviewed by the Services Engineer and any changes required shall be carried out by the Contractor until the drawings have been approved for construction.

Pipework and Fittings - Detail the layout of all pipe work, valves, fittings and wiring for hydraulics services. Include such details as insulation and vapor seals, levels and grades, hangers, hanger brackets, anchors, etc, including provision for seismic restraint, vibration isolation, co-ordination and terminal connections to plant and to any services.

In all cases, shop drawings for pipe work are to include sufficient detail to demonstrate compliance with the specified standards.

16.0 AS BUILT DRAWINGS

The Contractor shall supply As-Built Engineering Drawings of all equipment supplied and installed, including equipment layout on floor plans and/or reflected ceiling plans, detailed engineering drawings showing the ductwork and air-conditioning unit installation details showing dampers, connection points, plenums etc. The drawings supplied shall all the details for both the new units required by this specification as well as the connections to the existing units.

Detailed manuals for the equipment supplied shall be provided. These manuals shall be in English and contain detailed engineering specifications, operation and maintenance information.

Three full copies of all drawings and manuals [both hard and softcopy] are to be supplied. All documentation shall be marked up to show as built status.

The practical completion certificate will not be issued until as built documentation is approved.

17.0 SCHEDULE OF EQUIPMENT

Where a selection of equipment and plant has been made by the Services Engineer for a particular manufacturer or type, the tender shall be based on that selection.

Where equipment has not been selected by the Engineer, and a performance specification given instead, the Tenderer shall complete and submit a Schedule of Performance of Specified Equipment, complete with required duties

The schedule shall include current descriptive trade literature complete with performance information, curves, etc. Note that trade literature will be considered to supplement the description of equipment in the tender documents but if it is inconsistent with the specified requirements in any way, tenderers shall draw attention to such inconsistencies in their tender. Otherwise the Contract will require the performance specified in the tender documents to be met.

Where trade literature includes models or options that are not part of the tender, clarify which sections are relevant. The use of such terms as "or equal approved" where equipment has been nominated by the Services Engineer does not allow Contractors to nominate alternatives after the tender stage.



Alternative plant and equipment may be offered for approval. Any alternatives shall be listed on a schedule and shall be submitted with the tender.

If an alternative plant schedule is not returned with the tender, the Contractor will be deemed to be installing the equipment selected by the Services Engineer without variance.

No plant or equipment on this list may be ordered until approval from the Engineer has been received in writing.

Where any plant offered as an alternative does not fully comply with the Tender Documents, this shall be stated and reference shall be made to the relevant specification clause or drawings. Any proposed changes to sizes, or performance of equipment or control systems shall be similarly described.

19.0 DOCUMENT COMPLIANCE FORM

Refer to the tender schedule.

20.0 PRICE SCHEDULE

Price Schedule is defined in the tender schedule.

The prices to be set out in this schedule are to provide a breakdown of the tender sum and shall be inclusive of all incidentals in accordance with the specifications. This is a comprehensive supply and installation contract and the tenderer shall take all responsibility for all items required to complete the Contract Works in accordance with the Contract Documents



21.0 TENDER FORM

NAME OF COMPANY
TENDERING I/We _____

ADDRESS OF
COMPANY TENDERING Of _____

Do hereby agree to supply, construct, install, test, commission, maintain during the warranty period and carry out the whole of the works as specified in this specification and its associated engineering drawings:

For the fixed, lump sum price, inclusive of all duties, fees and taxes in Fiji dollars

Amount in words _____

Amount in F\$ VIP _____

Authorized Signatories _____

Name of Signatories _____

Dated this _____

