Nadi International Airport Terminal

Improved Air Filtration Project

Principal's Requirements

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Name of Project:	**Nadi Airport – Improved Air filtration**
Project Manager:	**David Crute**
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Contents

1. Purpose of This Document 5

2. Related Documents 5

3. Project Overview 5

3.1 Objective 5

3.2 3.2 Organisational Structure 6

3.3 3.3 Project Management Structure 6

4. Site Information 8

4.1 Site Induction 8

4.2 Health and Safety Policy 9

4.3 Site Work Practices 9

4.3.1 Supplier Management 9

4.3.2 Supplier Qualifications 9

4.3.3 Working Hours 10

4.3.4 Site Access 10

4.3.5 Delivery and Installation 10

4.3.6 Supplier Facilities 10

4.3.7 Setting Out 11

4.3.8 Protection 11

4.3.9 Site Cleaning 11

4.3.10 Hiring and Dismissing Employees 12

4.3.11 Safe Work Plans (SWP) 12

4.3.12 Confined Space Work 12

4.3.13 Working at Heights 12

4.3.14 Hot Work Permits 13

5. Facility Requirements 13

5.1.1 Performance Requirements 13

5.1.2 Design Criteria 15

5.1.3 Project Scope 15

5.1.4 Project Inclusions 15

5.1.5 Project Exclusions 15

5.2 Expected Life Cycle 15

5.2.4 Quality of Indoor Environment 16

5.2.5 Camfil Primary Filters 16

5.2.6 Camfil Secondary Filters 16

5.2.8 UGVI Systems 17

5.2.8 Spare Parts 18

5.2.9 Safe Design Principles and Requirements 18

5.2.10 Prior Works and Existing Conditions 20

5.2.11 Joining Up 21

5.2.12 Codes and Regulations 21

6 Design Deliverables and Reporting Requirements 22
6.1 Overview 22
6.1.1 Qualifications of the Designers 22
6.1.2 Drawing and documentation Protocols 22
6.1.3 Software Requirements 23
6.1.4 Design Workshops 24
6.2 Design Submissions 24
6.2.1 Tender submission by Suppliers 25
6.2.2 Design Submission – 50% and 100% 25
6.2.3 Design Presentations 25
6.2.4 Design Approvals 25
6.3 Construction Stage Submissions 26
6.3.1 Documents 26
6.3.2 Prototypes and Samples 26
6.3.4 Submissions by the Supplier 26
6.3.5 Shop Drawings 27
6.4 Commissioning and Handover Strategy 28
6.5 Substantial Completion 29
6.5.1 Requirements for Substantial Completion 29
6.5.2 Documentation Requirements for Substantial Completion 29
6.5.3 As Constructed Drawings & Operations and Maintenance Manuals 30
6.5.4 Certification 1
6.3.5 Warranties 1
6.3.6 Alternative Materials or Work 1

7 Defect Liability Period 2
3.4 7.1 Requirements 2

8 Electrical 3
3.5 17.1 Performance Criteria 3
3.6 17.2 Lighting 3
17.2.2 Lighting Control 4
17.2.3 Internal Lighting 4
17.3 Power 4
17.3.1 Cabling General 5
17.3.3 Final Sub-Circuits 5
17.3.4 Accessories 5

9 Mechanical 5
3.7 18.1 Performance Criteria 5
3.8 18.4 Painting Labelling and Identification 6
3.9 18.5 Weather Resistance 6
3.10 18.6 Provisions for Maintenance 6

APPENDIX A. Operational Specification 7

APPENDIX B. **AHU Scope schedule 1**

APPENDIX C. **Base HVAC Installation: Operations and Maintenance Manuals and commissioning data** **2**

1. Purpose of This Document

This document together with the associated Appendices details the Design Brief and Principal's Requirements under the Contract.

This document describes the requirements for the new air filtration requirements and includes specific details and requirements for the Supplier in undertaking the Supplier's activities associated with the project.

The words "Principal", Purchaser and Employer shall be taken as synomomous for the purpose of this contract where the context demands". The word "Contractor" shall be taken to be synonomous with "Supplier" where the context demands. The word "supplier" shall be taken as synonomous with "Manufacturer" where the context demands.

The role of this document is to summarise key information for use by the design build Supplier to undertake the design, construction and internal configuration and to provide the Supplier with sufficient information to gain an understanding of Fiji Airport's objectives and project requirements.

For this purpose, it is intended that the document be used as follows:

- A concise statement of the functions and accommodation requirements for the works
- The principal source of information to be used by the Supplier and the Supplier's design consultants for the commencement of the design, construction and internal configuration
- A secondary source of information (for remainder of project's life) to be used in conjunction with the completed design documentation as reference material
- Verification of concept design by comparing concept design deliverables against the functional requirements specified in this brief.
- As a reference document to understand the requirements and obligations of the Supplier with regard to their activities associated with the project.

2. Related Documents

This document is not the complete 'preliminary design' as defined under the contract. This document provides a full listing of the referenced design documentation, and these documents should be reviewed to understand the full specifications and requirements of this project.

These related documents are as follows

APPENDIX A.	Operational Specification
APPENDIX B.	Mechanical AHU Scope Schedule
APPENDIX C.	Nadi Terminal Operations and Maintenance Manual including commissioning data

3. Project Overview

3.1 Objective

Airports Fiji Pte Limited trading as Fiji Airports is a Government Commercial Company. Fiji Airports operates 15 airports in Fiji and provides air traffic management facilities and services in Fiji and the region covering an area of over 6 million square kilometres with over 400 employees.

Nadi International Airport is the international gateway to Fiji and provides the inbound route for approximately 95% of all international tourists into Fiji. With the return of international tourists Fiji Airports with the support of the Asian Development Bank seeks to improve the quality and efficacy of air filtration at Nadi Terminal, in accordance with good Covid 19 airfiltration practices as endorsed by ASHRAE, CDC and the Airports Council International.

The proposed air filtration approach for consideration is a layered approach which similar to the approach as advised by the CDC is intended to reduce exposures to SARS-CoV-2, the virus that causes COVID-19. This approach includes using multiple mitigation strategies, including improvements to building ventilation, to reduce

the spread of disease and lower the risk of exposure. In addition to ventilation improvements, the layered approach includes physical distancing, wearing face masks, hand hygiene, and vaccination.

This design brief details an air filtration system which technically does not filter at MERV13 yet provides a likely higher efficacy in addressing the risk of SARS-CoV-2 transmission. The system is also intended to be sustainable, maintainable and relatively cost effective. The proposal mitigates any significant changes to fans ductwork and air handlers given the filtration response **does not significantly constrain airflow** (if we change our existing filters).

The project framework detailed in this document FA to achieve design, product selection, construction, installation, and commissioning that will prioritise long life, enable low-cost maintenance, facilitate ease of maintenance, promote sustainability and energy efficiency and minimise capital expenditure.

3.2**3.2** Organisational Structure

Definitions:

Principal: The role of principal's representative or "principal" as per is held by Rowan Chalmers of FA.

Contract Administrator: The role of Contract Administrator as per is held by David Crute of David Crute Projects.

Supplier's Representative: The Supplier's representative is a specific person appointed by the main Supplier.

FA organisational chart

- Rowan Chalmers, Chief Executive Officer
  - **David Crute, Consultant**
    - **Waqa Taukei, Manager Mechanical and Electrical**
      - **Brendon Marr, Mechanical Supervisor**
        - **Main Supplier, Engaging Supervisor**

3.3**3.3** Project Management Structure

Project Correspondence and Documentation:

All formal project correspondence and documentation will be handled in accordance with the Documentation Management Approach.

Governing Policies:

FA develop, own, and maintain our own buildings. Design and product selection should prioritise long life, low cost maintenance, ease of maintenance, sustainability, and energy efficiency above low cost capital expenditure.

Quality Assurance:

There are a number of formal measures FA will take to control quality of project delivery.

- Construction Monitoring by the Supplier's engaging supervisor
- Construction Monitoring by FA staff, consultants, or other independent parties.
- A continuing and collaborative Defects Register to be maintained.
- Supplier Audit to be completed by monthly, or randomly, by an FA staff member and at the end of the project.

Allied projects:

FA have other capital infrastructure projects occurring during the same proposed timeline for this project. These are:

- Gate 8 Lounge Upgrade

Designers and Suppliers may be involved in several projects simultaneously.

4. Site Information

4.1 Site Induction

All site visitors are required to be inducted or accompanied and actively supervised by an inducted person. The following must be addressed prior to visiting site:

General

- Airside access cards are required for entry to site. These require 2 No. passport photos to be provided together with proof of identification as well as proof of vaccination (2 doses).
- Police reports may be required should the Supplier wish to maintain airside access cards for greater than a month.
- Smoking onsite only in designated smoking areas only
- Location of nearest hospital is the Nadi Hospital approximately 10kms away.
- Provision of first aid kits should be carried by the Supplier
- The airport is an operational facility and works are expected to be progressed after hours to avoid interface between passengers (who may be a high covid risk) and Supplier staffing.
- Access to work areas is via a work permit system.

Hazard Management

- Site hazards that may be created by the Supplier and their workers must be identified before work begins or at the earliest time possible. Proposed hazard controls must accompany all identified hazards.
- Existing specific site hazards that the Supplier and workers may be exposed to during the course of their work (e.g. underground cables, chemicals, overhead wires, biological,) must be documented and displayed at the site entrance. These will be identified prior to any on-site work.
- New hazards or damage must be reported immediately by phoning the FA Contract administrator and Site Manager and then following up in writing within one hour.
- Copies of Safety Data Sheets for substances used by Supplier must be current and sent to the FA Clerk of works Contract administrator for record keeping.
- All formally identified Hazards must be accompanied by a Hazzard Assessment.

Emergency Management

- The Supplier must prepare emergency procedures in the event of a fire alarm or evacuation. All workers that notice an emergency situation are required to notify the FA Contract administrator and Site Manager.
- Emergency contacts are below
    - FA 24 hour contact: Security – *To be provided to successful tenderer*
    - Airport Manager: Joe Grey, Priti Singh – *To be provided to successful tenderer*
    - Clerk of Works: Brendon Marr - *To be provided to successful tenderer*
- All site workers must be shown:
    - Location of fire extinguishers, fire call points, and fire hose reels etc.
    - Location of first-aid kit
    - Location of chemical spill kit

Personal Protective Equipment (PPE):

- The PPE required for site work must clearly be identified on the site notice board. This may include:
    - Masks
    - Protective Overalls
    - Hearing Protection
    - Eye Protection
    - Hi Viz Clothing
    - Safety Footwear
    - Respirator

Waste Disposal: All waste must be collected and disposed of by the Supplier. No construction waste is to remain on site unless otherwise noted in the Waste Disposal Plan.

Sign off: Projects are complete and handed over only after formal sign-off by the Site Manager on the FA project handover document. No project is understood to be Substantially Complete without formal document sign-off.

4.2 Health and Safety Policy

Our commitment:

FA is committed to providing a safe and healthy work environment for all our employees, Suppliers, associates, and visitors. A positive safety culture is fundamental to the successful performance of our organisation, along with the consideration of the physical and mental wellbeing of our people.

In meeting the FA Health & Safety commitment the Supplier will:

- Ensure health and safety is your first consideration when undertaking your activities, with all operating procedures incorporating appropriate safety requirements.
- Ensure people have the skills, training and supervision to work safely at all times.
- Encourage participation and engagement at all levels in the project team in activities and initiatives intended to promote a safe and healthy workplace, either directly or through health and safety representatives or critical risk management groups.
- Ensure adequate resources have been allocated to health and safety management. Work is planned to allow enough time, people and equipment to do the job safely.
- Expect all managers with direct reports, to be role models who actively seek to positively influence safety behaviours.
- Consider health and safety in the design, planning, and conduct of all project activities and promote best practice and continuous improvement in the project's safety management practices.
- Ensure workplace hazards are identified, risks assessed, and appropriate control mechanisms are in place.
- Ensure accurate and timely reporting, recording, and investigation of all accidents, incidents, and notifiable events, with remediation actions enacted promptly.
- Comply with relevant legislation, regulations and Codes of Practice.

As is reasonably practicable FA will consult, co-operate with and co-ordinate activities with other organisations (Persons in Control of a Business or Undertaking (PCBU's)).

All project personnel are expected to:

- Communicate health and safety issues or concerns either directly to their Manager or through a Health and Safety Representative.
- Use plant, equipment, vehicles and materials safely and in the manner intended.
- Take reasonable care that no action or omission adversely affects the health, wellbeing and safety of themselves or others.
- Seek expert guidance and instruction before continuing any task where there are concerns regarding safety.
- Take an active role in contributing to worker participation and engagement processes including participating at meetings, training and other health and safety activities when offered.
- Identify, report and control any hazards, accidents or incidents observed in the workplace immediately.
- Correctly use any information, training, personal protective equipment and safety devices provided by the project team or FA Research.
- Comply with relevant legislation, regulations, policies, Safe Operating Procedures, and Codes of Practice.

4.3 Site Work Practices

4.3.1 Supplier Management

The Supplier must ensure all project personnel including contactors, subcontractors, or their employees are qualified to complete the work. The Supplier is responsible for project personnel health and safety, any hazards they introduce to the site, and exposure to hazards already present. The Supplier must take "all reasonable steps" to ensure all project personnel are not harmed while undertaking any work the Supplier was engaged to do.

4.3.2 Supplier Qualifications

The Supplier must use subcontractors which hold the following qualifications and experience:

- Licensed Plumber who holds a Cert 3 qualification.
- Electrical Supplier who holds a Cert 3 qualification with EFL wireman's licences.
- Registered Professional Engineer in Fiji or accredited Commissioning Agent (in NZ or Australia) to provide certification for the design and construction of the project.
- BMS requirements. Supplier to set up alarms suitable for N4 protocol. FA will be responsible for BMS head end infrastructure.

The Supplier must provide evidence to the satisfaction of FA that staff performing the services have sufficient experience and expertise in these fields to competently carry out the services required.

4.3.3 Working Hours

The Airport is generally open between 6.00am and 11.00pm and works for this project are expected to occur generally after 8.00pm and before 8.00am.

FA supervision and assistance is limited between the times of 6:30am – 9:30pm Monday to Friday. If the Supplier is permitted or required by the Principal to carry out work outside the normal working hours stated above then the Supplier shall pay all additional costs including costs of extra supervision, consultants or first aid or other personnel. The Supplier shall ensure that any such work is properly supervised.

4.3.4 Site Access

The Supplier must not obstruct or hinder the normal use of or access to any part of the airport. There is a limited laydown and parking area in direct proximity of the terminal.

2 No. Access cards/Fobs will be provided at zero cost to those Supplier staff who hold current Airport Identification Cards. If cards are not returned at project handover, they will be charged the replacement cost of the lost cards.

Deliveries are to be booked in accordance with site rules. Where possible, the Supplier is to use 'just in time' deliveries to minimise double handling and storage of materials.

4.3.5 Delivery and Installation

The Supplier shall comply with the manufacturer's instructions for transport, handling and storage of all materials and shall handle all materials in a manner that prevents damage or deterioration or excessive distortion.

The Supplier must include all insurances to cover goods and services for the period of the project.

The Supplier shall provide all cranage, labour and materials necessary to unload. All damage done to the materials in transit or during unloading shall be satisfactorily repaired by the Supplier at his own expense.

The Supplier shall allow for a dilapidation report for the existing Air handlers prior to commencement of works.

4.3.6 Supplier Facilities

The Supplier in consultation with FA may be allowed to connect the temporary services to existing onsite infrastructure. This will be subject to verification and approval on use, amount and capacity and impact on existing infrastructure including potential disruptions to the site. When the Supplier wishes to make a temporary connection they are to contact the Supplier Administrator with the Supplier requirements. The Contract administrator may decline or reschedule a proposed connection based on the impact to the Institute.

Lighting shall be provided as required to create a safe work area by the Supplier or its subSupplier as required.

The following table details the Suppliers on site facilities:

SERVICE	FA TO	SUPPLIER TO	ISSUE
ELECTRICITY - MAINS single phase	Verify potential connection and provide connection point power where available and capacity is not constrained	Nominate potential connection and configure to needs including installation of temporary switchboards with earth leakage	Supplier to install if deemed necessary
ELECTRICITY - GENERATOR SUPPLY	Nil	Nil	Supplier to install if deemed necessary
POTABLE WATER	Verify potential connection and supply connection where available and capacity is not constrained	Nominate potential connection, Supplier to install if deemed necessary	
COMMUNICATIONS CABLING	Nil	Nil	
MOBILE PHONE	Nil	Supply own	Vodafone and Digicel both provide coverage with the terminal
SEWERAGE	Verify and if necessary nominate Supply connection where available and capacity is not constrained	Nominate potential connection, Supplier to install if deemed necessary	

FA will accept no liability for loss of power, downtime or any other facility provided.

4.3.7 Setting Out

The Supplier shall be responsible for all setting out of the work.

4.3.8 Protection

Supplier shall protect all surrounding works and pavements until Substantial Completion. The Supplier shall be particularly responsible for all surfaces adjoining the works. The Supplier shall protect same and shall make good any damage. The Supplier shall undertake a final clean and/or removal of protection as and when directed by the FA Project / Site Manager.

The Supplier will not unreasonably destroy or damage any property.

Sites shall be subject to temporary fencing to completely enclose the worksites, with appropriate site signage including directional signage to the site perimeter.

4.3.9 Site Cleaning

All Suppliers must abide by the Workplace Health and Safety regulations at all times, or any direction given by site management.

All associated redundant materials and rubbish (work, lunch or camp related) are to be removed from workplace and placed in rubbish skips daily or as directed by FA Project / Site Manager. Should this not be completed to

the satisfaction of the FA Project / Site Manager, will complete and contra charge at rate of $50/hour – minimum 1 hour.

Suppliers are to clean and remove all trade and installation markings created or applied by the Supplier immediately prior to final clean operations.

4.3.10 Hiring and Dismissing Employees

The Supplier shall not hire, terminate, or retrench workers on or near the Site.

4.3.11 Safe Work Plans (SWP)

A Safe work plan (SWP) is used to document health and safety considerations of hazards and control of those hazards for specific work that will be undertaken at a FA site. A SWP is to be completed prior to work commencing in addition to all other Supplier management documentation. The Supplier completes signs and returns the SWP to the engaging supervisor.

Once completed and signed by all parties the SWP will be filed and shared with the Supplier. The completed SWP is to remain with the Supplier at all times during the course of the work being undertaken for review and update as required. The document and any updates will be shared with the National Health and Safety Advisor for FA.

4.3.12 Confined Space Work

A confined space is an enclosed or partially enclosed space that is not intended primarily for human occupancy, within which there is a risk of one or more of the following:

- An oxygen concentration outside the safe oxygen range
- A concentration of airborne contaminant that may cause impairment, loss of consciousness or asphyxiation
- A concentration of flammable airborne contaminant that may cause injury from fire or explosion
- Engulfment by a stored free flowing solid or a rising level of liquid that may cause suffocation or drowning

Work in confined space should generally be avoided through alternate work plans or strategies. Before any work in a confined space takes place a Confined Space Work Permit needs to be completed by the engaging supervisor or an appropriately trained Manager who will be responsible for the confined space work. Any FA worker (or Supplier) that may have to enter an area described as above must adhere to the Worksafe Confined Space Code of Practice.

It is mandatory that any person supervising the entry must have completed a recent (within 2 years) Confined Space Training course and complete a Safe Entry / Work Plan prior to planned entry - submitted to the FA representative and inform the National H&S Advisor.

4.3.13 Working at Heights

The Supplier must ensure all project personnel use the safest height access equipment for the job, any ladder use is compliant with Australian safety standards, and the right ladder is used. Suppliers must make the following considerations when working with ladders:

- Consider use of correct elevated working platform (EWP) for access areas as / if required (Fall arrest harness must be worn where necessary)
- ensure safe areas of common access to roof areas
- accessibility to roof and the provision of fixings to ‘ tie off ladders ‘
- Supplier’s ladders to ensure they are suitable for the access

- Signage / discussion to ensure only authorised staff / Suppliers access the roof areas
- Single pole ladders (max length 9 meters)
- Extension ladders (max length 15 meters)
- Step ladders (max height 6.1 meters)
- Dual purpose ladders must have safe and functional hinges and locks
- Platform (podium) ladders to be used in preference to A frame ladders

All project personnel must be suitably trained and certified to use Elevated Work Platforms (EWP). Certification of EWPs must be sent to the engaging supervisor for review and filing. Training and certification evidence of user competence must also be sent to the engaging supervisor for review and filing. Use of ladders must be substituted by a certified EWP wherever practicable.

Safe Working with Ladders and Step Ladders outlines some basic safety rules when working from a ladder. Ladders must adhere to the Standard: AS/ NZ 1892 - Portable Ladders. For full information refer to Best Practice Guidelines for Working at Heights from Worksafe Australia.

4.3.14 Hot Work Permits

Hot work is defined as, any work involving processes that have the potential to cause a fire or explosion. Hot work activities may involve using open flames, other heat sources, or equipment that generates sparks. Examples of hot work include any activities where an open flame torch or any other type of heat source is used – e.g., acetylene or propane torch, welding or soldering gear, or even an electric heat gun, as well as activities such as welding, grinding, soldering, gas cutting, brazing and paint stripping— all of which have the potential to ignite combustible materials.

The methods that FA uses to manage hot work are:

- confining hot work to areas that are specifically designed and built for hot work such as specific labs, workshops, welding bays etc
- A hot work permit system that controls and allows hot work in all other areas not specifically designed for hot work.

All hot work outside of designated hot work areas requires a hot work permit. The Supplier must define the work to be undertaken and the area in which it is to occur. Hot work will be permitted only if all hot work risks are managed appropriately. FA may suspend work underway if not satisfied hot work risks are managed appropriately.

The Supplier must ensure that any hot work on a drum or tank is double-checked to ensure there are no remnants of combustible material left in the drum or tank. Any degassing must be done prior to work commencing and vapours should be checked using a gas detector. Suppliers must be able to demonstrate competent use of gas equipment safely. Appropriate fire extinguishers must be kept available and visible at all times and Suppliers must be trained in their use. No hot work is permitted in confined spaces.

5. Facility Requirements

5.1.1 Performance Requirements

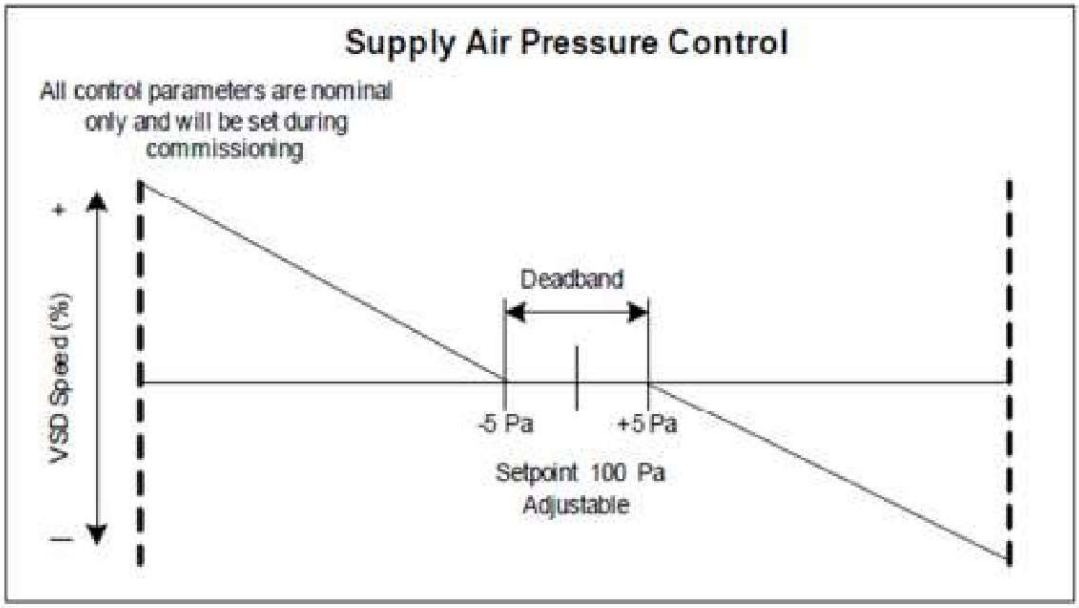
The proposed Air filtration system is intended to achieve the objectives of the air filtration of greater than MERV 13 equivalent via the following actions

1. Maximise outside air intake
2. Replacement of existing air filters with high efficiency filters
3. Installation of In-duct UVGI systems Light systems

The Supplier is responsible to ensure all work is in accordance with relevant ASHRAE and Australian Standards, regulations and follows approved standard designs and mechanical plans specific to this site. FA will conduct a site inspection to enable tenderers to obtain measurements of the site and locations of the existing power source and Air handlers. The Contactor is responsible for all design, set out and confirmation of existing infrastructure.

Details of the current system:

- The Air-conditioning system at the terminal utilises 30 no. air handler units (AHU's) which supply constant volume air to dedicated spaces with outside air damper sets. Cooling to each space is provided by controlling the supply air temperature. The control is achieved by way of a modulating chilled water valve. Supply air pressure is maintained by a variable speed drive. Modulating outside air and return air dampers are used for Co2 control
- AHU's -Vertical and horizontal air handling enclosures are constructed from Colorbond Steel sandwich panel double skin with stainless steel fixing. Units are completely weatherproof. Unit compartments shall be insulated with 50mm polyurethane doubleskin.
- Cabinets have been designed with access panels which allow access to all serviceable components including coils and drain pans, in accordance with AS3666. All access panels have foam gasket seals. Extruded aluminium pen a post framing with thermal break and 75mm galvanised steel welded channel base.
- All coils shall comprise seamless copper tubing, mechanically expanded into aluminium fins.
- Air Filters are manufactured by Camfil farr or approved equal as scheduled or indicated on the drawings.
- All Filters comply with the requirements of AS1324.
- All Filters shall be mounted in stainless steel. Uni-lok filter holding frames.
- Pressure Sensors are mounted on both sides of all filter banks and connected back to the
- BMS system plus a Dwyer Magnahelic pressure gauge.
- The supply air pressure control is driven by a pressure sensor to maintain constant supply pressure in the duct. The pressure set point is an internal software point that was initially set during commissioning with ongoing user adjustability. The output from a control algorithm is used to modulate the fan's variable speed drive, this alternating supply air pressure. As pressure decreases the fan speed is increased and vice versa.
- The Operations and Maintenance Manual as included in Appendix D provide specific details of the AHU commissioning data including pressure drops at the filters.



The Improved Air filtration system is to comprise the following:

- Replace Primary Air filters on all Air handlers with F5 (as per existing) Camfil Farr or approved equivalent washable filters
- Replace Secondary Air filters on all Air handlers upgraded **F7 (MERV 13)** Camfil Farr or approved equivalent washable filters
- Install UGVA systems in the nominated Air handlers.
- Update BMS controls logic to maintain the required air pressure as per the original commissioning

5.1.2 Design Criteria

The AHU's following installation of the improved air- filtration shall meet the airflows in litres per second as per the original project commissioning data. Design submissions at 50% and 100% shall explicitly detail pressure and forecast airflow losses.

5.1.3 Project Scope

The works comprise design, supply, installation and commissioning of new and additional air filtration for terminal AHU's. Works include new Filters, electrical connections, filter supports and brackets, and provision of additional access panels where required to provide access.

5.1.4 Project Inclusions

The project shall include:

1. Compliance with the Operational Specification.
2. Compliance with the Requirements of this document.
3. Replace Primary Air filters on all Air handlers with F5 (as per existing) Camfil Farr or approved equivalent washable filters
4. Replace Secondary Air filters on all Air handlers upgraded **F7 (MERV 13)** Camfil Farr or approved equivalent replaceable filters
5. Install New UGVA systems in the nominated Air handlers.
6. Update BMS controls logic to maintain the required air pressure as per the original commissioning.
7. All electrical connections and controls to the nearest mechanical services switchboard, including the installation of additional RCD circuit breakers within the board as required.
8. Allow for 12 months of monitoring and collection of test data of filtration performance involving two additional post completion site visits to verify filter operation and performance at 6 months and 12 months respectively.

5.1.5 Project Exclusions

- Upgrade of mechanical switchboards (it is assumed that additional power will be supplied from existing switchboards).

5.2 Expected Life Cycle

The following table details the design service life requirements. The requirements include minimum periodical maintenance and replacement of ancillary components over this lifetime:

Component	Service life
Camfil Filters (washable)	5 years
UV lamps	2 years
Mechanical assets - incl. valves / actuators, motors and pumps, and other equipment	15 years
Electrical assets - Switchboards	15 years
Electrical cabinets	20 years
Instrumentation and control (incl. PLC/SCADA)	15 years

5.2.4 Quality of Indoor Environment

The health and productivity of inhabitants and users should be maximised. As a minimum, all relevant standards as referenced in the Australian standards should be applied. Attention should be drawn to:

- Enhanced indoor air quality;
- Adequate and efficient lighting;
- Effective air distribution patterns;
- Acceptable noise level; and
- Acceptable thermal comfort and compliance with legislation.

5.2.5 Camfil Primary Filters

Provide Camfil Farr F5 **washable** filters to each air handling unit as specified herein. They shall be installed and contained in a rigid frame.

All filters in any bank shall be identical.

The air filters shall be installed in accordance with manufacturer's recommendations complete with all accessories necessary for their proper performance. All filter connections to adjoining equipment, panelling or support framing shall be sealed airtight to prevent any air bypassing the filter media.

Adequate access shall be provided to each filter for inspection, maintenance and removal.

The sealing between filter media and frames and filter frames and unit casing shall be such that no air bypasses the filter. Where filter frames are required to be bolted together approved felt sealing strips shall be supplied. Filter frames shall be of adequate strength and rigidity to resist distortion and buckling under any multiple arrangement of filter cells.

Filters shall be held into frames by means of approved quick acting clamps such that they shall be easily removable for cleaning and/or replacement.

5.2.6 Camfil Secondary Filters

Provide Camfil Farr F7 (MERV 13) disposable filters within each air handling unit as specified herein.

The air filters shall be installed in accordance with manufacturer's recommendations complete with all accessories necessary for their proper performance. All filter connections to adjoining equipment, panelling or support framing shall be sealed airtight to prevent any air bypassing the filter media.

Air filters shall be deep bed extended surface, dry media, disposable filters mounted in clip-in frames within plenums or slide-in frames within ducts. The filter shall be, fabricated from dry media and supported in reusable galvanized frames with galvanized wire mesh support. The soiled media shall be readily removable and simply replaced with clean media.

Minimum performance in accordance with AS 1324.1 shall be F7.

Adequate access shall be provided to each filter for inspection, maintenance and removal.

The sealing between filter media and frames and filter frames and unit casing shall be such that no air bypasses the filter. Where filter frames are required to be bolted together approved felt sealing strips shall be supplied. Filter frames shall be of adequate strength and rigidity to resist distortion and buckling under any multiple arrangement of filter cells.

The filters shall conform to the following requirements:

- UV stabilised materials

- Maximum Face Velocity 2.5 m/s
- Efficiency to AS 1324 No. 1 Test Dust 20%
- Efficiency to AS 1324 No. 2 Test Dust 95%
- Efficiency to AS 1324 No. 4 Test Dust 85%
- Initial Resistance (Maximum) 60 Pa
- Minimum dust holding capacity at 125 Pa (No. 2 Test Dust) 1.0 kg/ m2
- Type 1 Class B in accordance with AS 1324.1.

All filters in any bank shall be identical.

Filters shall be held into frames by means of approved quick acting clamps such that they shall be easily removable for cleaning and/or replacement.

5.2.8 UGVI Systems

Supply and install on-coil UV-C emitter system. within the nominated Airhandlers (AHU's) forming part of the mechanical services for this project. The UV-C system shall be of "Sterile Air" manufacture or equal and approved.

Each UV-C system shall be capable of providing a minimum of 254 nanometre wavelength within the light spectrum. Each system shall be industry proven in providing a minimum of 90% decontamination of common surface and airborne agents and shall have testing data available for review. Testing data shall be based on the requirements in ASHRAE standard 185.2-2014.

All on-coil UV-C emitter systems. must capable of achieving and maintaining the noted decontamination level under the air-off-coil temperature conditions for the air conditioning equipment in which they are to be installed.

UV-C lighting shall be installed in a manner that no emitted light can be viewed from locations external to the equipment. Reed switches must be installed on access points to compartments where UV-C lighting is installed to ensure the lighting is deactivated when maintenance is performed on equipment.

UV-C lighting shall be installed in a location downstream from the coil surface and shall be positioned within each air conditioning unit to provide decontamination treatment to the full surface area of the coil and drain pan area. The type of UV-C installation/retrofit shall be selected to suit the equipment type ensuring adequate access space in design for replacement of tubes when required.

Power supplies shall be variable input systems designed to provide maximum lamp performance, reliability and life cycle. The power supply for the UV-C system and associated electronic components shall not be installed within the air conditioning unit. Provide a UV-C control box (IP55) rated in maintenance access locations on the external housing of units. The UV-C control box shall have LED indication lights indicating performance of UV-C lamps and an on/off switch.

Provide and install a suitable UV-C light meter and centralised signal processing/BMS card to monitor the status of each UV-C lamp

The AHU Door(s) shall be clearly labelled.

Power to the UV-C lighting shall be interlocked with the door.

UV lighting safety chain

5.2.8 Spare Parts

Provide all necessary spare parts for the maintenance and operation of the modifications to the systems as described in this document for a period of 12 months including and not limited to:

- UV-C lamps
- FA damper actuators

5.2.9 Safe Design Principles and Requirements

Safe design is a process of integrating hazard identification and assessment of risks early in the design process to eliminate or minimise the potential risks of injury or ill health throughout the life of the structure or building. Safe design begins from the earliest conceptual and planning stages and considers the whole lifecycle of the building or facility.

In particular, issues that affect occupants or users and their work-life health and safety quality, such as safe access, safe plant and equipment, layout and space, acoustics, choice of building materials, work systems and ergonomics of human interaction must be addressed throughout the project through consultative processes within FA.

The design should allow for safe operations and maintenance (O&M) by incorporating design features including but not limited to those listed below:

- Suitable clearances around devices to enable O&M to occur.
- Lifting points above devices that require lifting for operations and maintenance.
- Avoiding ‘confined spaces’.
- Locating devices such that access by ladders etc is minimised.

The following Table details key design stage Safety in Design Actions and Deliverables by the Supplier.

Activity	Responsibility	Action By	Deliverable
Site visit	Review the Client’s documentation on hazards and risks on the site visit	Supplier’s Design Consultant	Site Report
Site visit	Determine if the site may require specialist reviews and recommend to the Client	Supplier’s Design Consultant	Site Report
Site visit	Prepare Site Visit Report and issue to Client	Supplier’s Design Consultant	Site Report
Design Phases	At each phase of design -- concept, schematic, development and documentation -- the Design Consultants must review the designs and assess risks and hazards. The information must be documented on the Safe Design Risk Matrix.	Supplier’s Design Consultant	Safe Design Risk Matrix
Safe Design Risk Management	The Contract administrator will seek assurance from the Supplier’s Design Consultants that the risks / hazards identified have been closed out through design revisions if possible and within the designer's skill and capacity • The Safe Design Risk Matrix must note the design revisions made to eliminate or mitigate risks / hazards	Supplier’s Design Consultant	Safe Design Risk Matrix

Activity	Responsibility	Action By	Deliverable
	• If a risk cannot be closed out, the risk will be documented as a residual risk		
Testing of Design solutions	If a design solution is required and the solution needs to be tested and analyzed. The Contract administrator will seek assurance results and from the Design Consultants that copies of all analysis documentation are obtained	Supplier's Design Consultant	Safe Design Risk Matrix
High Risk Activities	Contract administrator will seek assurance that all designs have been reviewed to determine if any high risk activities (as defined by state Work Health & Safety agencies) exist for the construction of the designs • Any high risk activities that cannot be designed out for construction must be documented	Supplier's Design Consultant	Safe Design Risk Matrix
Design Certification	Each designer to submit a letter certifying that the final design is compliant.	Supplier and Supplier's Design Consultant	Certification Letter
Safety in Design workshops	Organize design workshops with FA representatives, such as Health and Safety staff, to review the designs, identify residual risks, and discuss the implications of the residual risks	Supplier and Supplier's Design Consultant	Safety In Design Workshop Minutes, Safe Design Risk Matrix
Safety in Design Report	Design Consultants to prepare a Safe Design Report that collates all documentation in the Safe Design project process and incorporates all documentation	Supplier and Supplier's Design Consultant	Safety in design report
Design Completion	Project Board to meet, provide copies of the Safe Design Reports, and advise that the Report should be included in tender documentation and provided to the Principal Supplier	Project Board	Safety in Design Report. Project Board Meeting Minutes
Pre-construction	Supplier to ensure that the SubSuppliers has been provided with the Safe Design Report. Meet with the SubSuppliers to discuss Supplier recommendations in the Report that could not be designed out and that require control measures Contract administrator and Independent Safety Consultant to review the Supplier's Safety Management Plan and applicable SWMS to check the control measures are addressed	Contract administrator and Independent Safety Consultant	SWMS, Suppliers Safety Plan
Post Construction documentation	Contract administrator to check, with assistance of the Supplier and Design Consultants, that all information from the Safe Design Report that requires administrative controls by FA for operation of the facility have been included in the Operations & Maintenance Manual(s)	Contract administrator, Supplier and Design Consultants	Operations and Maintenance Manuals
Post Construction	Contract administrator to conduct a post-construction workshop with FA and Supplier for lessons learned	Contract administrator and Supplier	Lessons Learned Report

The Safety in Design Report is required prior to each and following each Safety in Design Workshop and will be finalized at the 90% design deliverable and should include the following sections:

- Introduction
- Applicable Legislation and Codes of Practice
- Process
- Safe Design Risk Assessment
- Testing and Analysis (if undertaken)
- Hazardous Materials
- Residual Risks

- Letters from Design Consultants
- Recommendations for FA
- Recommendations For the Construction Phase
- Recommendations for the Operational Phase

5.2.10 Prior Works and Existing Conditions

The project is within an existing terminal building that has incomplete and inaccurate as built documentation. It is a requirement that the Supplier undertake full and comprehensive investigations of the existing facility and services prior to the issue of developed design documentation.

Some existing services on the site are indicated on the drawings. The absence of such indication does not guarantee that no service exists and shall not relieve the Supplier of any responsibility under this contract.

The Supplier shall, before commencing work, ascertain details of all services in the area affected by the works, including completing an Excavation/ Penetration Permit for approval by FA. The Supplier shall arrange for and bear all costs and responsibilities incurred in any interruption of service or temporary or permanent relocation of services, except such services as are shown on the drawings to be relocated by others.

The Supplier shall exercise reasonable care in carrying out the works to avoid damage to existing services, whether or not details of such services have been made available to him. The Supplier shall be held solely responsible for any damage to existing services and in the event of damage shall immediately advise the Contract administrator and shall cooperate with the Contract administrator in making safe and / or restoring the service and shall bear any costs so incurred.

Where the proper execution of the Supplier's Activities is dependent upon or appreciably affected by the quality or completeness of any work to be carried out or that has been carried out by any other person (**"Prior Work"**) the Supplier must:

- inspect the Prior Work as soon as is practicable after FA gives the Supplier access to the Site;
- if it discovers any defects or matters in or connected with the Prior Work which in its opinion renders or is likely to render the Prior Work unsuitable, unsatisfactory or detrimental in any way to the proper execution of the Supplier's Activities, immediately notify the Contract administrator in writing providing:
- full particulars of the defects or matters identified; and
- the reasons for the opinion formed by it in respect to the defects or matters identified; and
- The recommended Temporary works or rectifications required to mitigate or remove the impediment.
- Not commence or continue with the execution of any part of the Supplier's Activities dependent upon or appreciably affected by the Prior Work the subject of the notice referred to in paragraph (2).

On receipt of the Supplier's notice, the Contract administrator will investigate the Prior Work the subject of the notice and:

- if the Contract administrator agrees with the Supplier - issue a direction to the Supplier and value any work carried out by the Supplier by reason of that direction as a Variation of the Conditions of Contract; or
- if the Contract administrator disagrees with the Supplier - issue an instruction to the Supplier to commence or continue with the Supplier's Activities.

If the Supplier fails to:

- inspect the Prior Work as required by this clause; or
- notify the Contract administrator of any defects or matters which should have been detected at the time of such inspection by a prudent, competent and experienced Supplier and which may render the Prior Work unsuitable, unsatisfactory or detrimental in any way for the proper execution of the Supplier's Activities and the Prior Work subsequently proves to be unsatisfactory for the proper execution of the Supplier's Activities, then any work which is required to be executed in order to render the Prior Work suitable, satisfactory and non-detrimental for the proper execution of the Supplier's Activities will be performed by the Supplier at its own expense.

5.2.11 Joining Up

Where the method of joining up of old and new work is not specified, the cutting away and joining up must be carried out by the Supplier in a manner approved by the Contract administrator and made good in all trades to match existing adjacent work.

5.2.12 Codes and Regulations

The minimum standards for design and installation of the works must be as stated below and in accordance with the manufacturer's specifications, the Fiji National Building Code and other associated relevant codes, acts and regulations such as:

- All electrical work in accordance with Electrical Standard AS/NZS 3000:2018.
- AS 1100 Drawing Practice
- AS 1101 Graphic Symbols for General Engineering
- AS 1132 Methods of Test for Air Filters for Use in Air Conditioning and General Ventilation
- AS 1323 Glossary of Terms for Air Filters for Use in Air Conditioning and General Ventilation
- AS 1324 Air Filters for Use in air Conditioning and General Ventilation
- AS 1345 Identification of Piping, Conduits and Ducts
- AS 1432 Copper Tubes for Water, Gas and Sanitation
- AS 1530 Methods of Fire Tests on Building Materials, Components and Structures
- AS 1554 Structural Steel Welding Code
- AS 1571 Seamless Copper Tubes for Use in Refrigeration
- AS 1572 Seamless Copper and Copper Alloy Tubes for Engineering Purposes
- AS 1588 Filler Rods for Welding
- AS 1590 Copper Alloy Threaded Pipe Fittings for Use with Tubes Threaded with Pipe Thread of Whitworth Form
- AS 1650 Galvanised Coatings
- AS 1668 Mechanical Ventilation and Air Conditioning Code
- AS 1890 Thermally-Released Links
- AS 2053 Non-Metallic Conduits and Fittings
- AS 2184 Moulded Case Circuit Breakers
- AS 2312 Guide to the Protection of Iron and Steel against Exterior Atmospheric Corrosion
- AS 2625 Rotating and Reciprocating Machinery - Mechanical Vibration
- AS 2700 Colours Standards for General Purposes
- AS 2768 Electrical Insulating Materials
- AS 2936 Fan Test Code
- AS 3000 S.A.A. Wiring Rule
- AS 3008 Electrical Installations - Selection of Cables
- AS 3013 Electrical Installation - Wiring Systems AS 3111 Miniature Overcurrent Circuit Breakers AS 3112 Plugs and Plug Sockets
- AS 3126 Extra Low Voltage Transformers
- AS 3135 Semi-Enclosed Fuses for a.c. Current
- AS 3147 PVC Insulated Electric Cables and Flexible Cables for Working Voltages of 0.6/1KV
- AS 3187 Mineral Insulated Metal Sheathed Cables
- AS 3188 Terminations and Glands for Mineral Insulated Metal Sheathed Cables
- AS 3500 National Plumbing and Drainage Code
- AS/NZS 1680 Series Interior and Workplace Lighting
- AS/NZS 1668.1&2 The use of ventilation and air conditioning in buildings
- AS/NZS 4360 -2004: Risk Management
- ISO 9000 & 9001: Quality Management and Quality Assurance Standards

Occupational Health and Safety (OH&S)

Facilities will be required to comply with the OH&S requirements of the following:

- Health and Safety at Work Act 1996
- Fiji National Building Code
- Australian Standards relating to building design and practice

- National Environmental Protection Council (NEPC) Standards
- Hazardous Substances Regulations
- Dangerous Goods Regulations
- AS1668.2- Air Quality
- AS/NZS 6803 Acoustics - Construction noise
- ASHRAE reference standards including Guidance for Building Operations During Covid -19 Pandemic[2]

This list is not exhaustive and may be amended and expanded as the project progress or as the codes are amended. It is the responsibility of consultants to keep themselves informed about the content and currency of the codes, regulations and standards that affect this project.

6 Design Deliverables and Reporting Requirements

6.1 Overview

The Supplier shall comply with the following requirements associated with design documents issued under this contract. Failure to comply with these requirements may entitle the Contract administrator to reject the design documentation as provided and hold payment on the associated construction works until the design deliverable is provided in the form required by this contract.

6.1.1 Qualifications of the Designers

The Supplier shall engage suitably qualified designers who shall hold the following minimum qualifications:-

Building Services Engineers shall hold current registration in Fiji or the State of Queensland Australia (RPEQ). Commissioning Agents may be a registered professional engineer or qualified technician with demonstrated
knowledge on nominated systems commissioning, and has previous experience with the commissioning process of at least 2 projects similar in scope.

All designers shall hold a minimum of 2 million dollars professional indemnity insurance and this shall remain current for a period of 7 years post Substantial Completion.

6.1.2 Drawing and documentation Protocols

Drawings shall have the following typical naming convention:

Building ID - Discipline - drawing number
For example: A - M--004

This is an architectural drawing of Area A facility, produced by company ABC and is a plan layout drawing. All drawings are to be registered and subject to document transmittals.

Where not agreed otherwise the following convention will be adopted for all drawing numbering:

Computer file references shall be identically identified and include revision number.

[2] https://www.ashrae.org/file%20library/technical%20resources/ashrae%20journal/2020journaldocuments/72-74_ieq_schoen.pdf

Facility Identification (terminal is split into Zones)	Discipline	Type/Number
Zone A	**M**- Mechanical	**000**- Site plans, layouts
Zone B	**E**- Electrical	**100**- Plans (1:100)
Zone C		**200**- Elevations
Zone D		**300**- Sections
Zone E		**400**- Construction Details
		500- Schedules
		600- Room Details
		700- Fit out Details
		800- Details
		900- Shop Drawings

Where drawings are of works associated with the existing facilities, the drawings shall be numbered to coordinate with the existing system. Discuss this with the FA Contract administrator to receive current drawing numbering and associated documentation.

Revisions issued during pre-working drawing phase to be numbered sequentially and revisions issued during working drawings phase to be identified with letters.

For example:
Preliminary Drawing revisions shall be numbered progressively from P1, P2, P3 etc and when 'approved for construction' A, B, C etc.

All changes to working drawings or to any drawing issued in any tender documentation and their subsequent revisions shall be clearly clouded with a brief comment on the changes to the drawing included in the revision column.

Approved drawings shall be numbered progressively from A in an alphabetical manner.

- All drawings should be clearly marked as 'PRELIMINARY' or 'SKETCH' or 'MEASURED DRAWING' until approval of the drawing is provided by the Contract administrator.
- All drawings are to include a clear note stating 'NOT FOR CONSTRUCTION' until the Contract administrator approves a drawing 'FOR CONSTRUCTION'.
- All drawings are to include the Client (FA) logos as shown in the footer and the Project Logo as applicable shown in the header of this document.
- Drawing file names shall be the same as the drawing number but with the revision added so the file can be uniquely identified eg drawing number OS-A-ABC-004, file name OS-A-ABC-004-P1.
- All drawings shall be numbered and revision numbers updated in line with changes. Changes to drawings to be detailed in the title bar next to the revision number and the area affected highlighted i.e. clouded.
- All drawings in Revit are to be in readable in Revit 2018 or later format.
- All working drawings are to be typically in A1 format, with drawings suitably sized for clarity and group to ensure effective sizing.
- Drawings are typically drawn with one drawing unit equalling one millimetre.

6.1.3 Software Requirements

The following computer software is approved for use on this project. The Client reserves the right to reject documents or drawings submitted on incompatible versions or outdated software versions.

- Microsoft Office 2013 or later (with MS Access)
- Microsoft Project 2013 or later
- Adobe Acrobat Professional 9.0 or later
- Revit Architecture/Structure/MEP 2022

All external computer files must be checked for viruses prior to being copied or transferred to the firm's computer. Where computer files are protected by a password, the FA Contract administrator must be advised, in writing, the password.

All formal project correspondence and documentation will be handled on Aconex. All project personnel must formally request access to Aconex. Formal correspondence will begin from FA issue of the project brief via Aconex.

All 'for construction' design documentation is required to be provided in its native file format in addition to pdf format.

6.1.4 Design Workshops

The Supplier and their design consultants shall attend workshops as may be required by the Contract administrator.

These workshops may include, but are not limited to:

- Start-up workshops
- Stakeholder workshops convened to resolve particular issues
- Design Stage Presentation (minimum 1)
- Safety in Design workshops (minimum 1)
- Construction phase workshops convened to resolve particular issues
- Commissioning phase workshops convened to assist commissioning planning and/or to resolve particular issues
- Post occupancy and operations evaluation workshop, if required.

These workshops may be undertaken remotely via Microsoft teams.

6.2 Design Submissions

The following design documentation is required to be provided at defined stages under the Contract engagement. The Supplier will not be paid for construction on works where works have proceeded without the submission and review of the associated design documents by the Contract administrator in accordance with the provisions of the Contract.

Utilise the ASHRAE 'Calculation Approach to Increase MERV in an AHU'[3] and provide calculations based on the nominated filters.

For the final issues of the Concept Design Report and Contract Documentation supply three bound hard copy (A4 or A3 for specifications, schedules and the like; A3 and A1 copies of drawings), one loose-leaf hard copy and an electronic copy (PDF) of all documentation. Preliminary issues of documents shall be in a format e.g. email, hard copy, appropriate to the information being provided and the urgency of response required. All correspondence will have a specific reference to that transmittal.

Electronic copies of specifications, reports, manuals and similar shall be in PDF and most current version of Microsoft Office attached to emails or copied to compact disks or USB devices.

Hard copies of specifications, reports, manuals and similar shall be in A4 or A3 format, as appropriate, with appropriate Project identification and issue status on each page.

Electronic copies of all drawings shall be supplied in Revit file format current version along with all support files including x-refs, fonts, shapes, images, plot styles, plotter configuration files and CTB files. A PDF copy of the drawing shall also be issued at the same time.

For the final issues of the Operation and Maintenance manuals three hardcopies suitably fitted in 3 or 4 ring A4 binders shall be specified. Appropriate Project identification, Contract administratoring system

[3] https://www.ashrae.org/technical-resources/building-readiness#intent

identification and issue status shall be provided on each page. An electronic copy of the Operation and Maintenance manuals on USB shall be provided. The use of PDF files is an acceptable format for the electronic copy of the Operations and Maintenance manuals.

6.2.1 Tender submission by Suppliers

The Supplier shall provide

- Manufacturer's warranty must be provided in the submitted tender documents.
- Indicative program for the works. Programs that provide an accelerated delivery will be well regarded.
- Sketch Plans of the filter installation into a standard AHU and a sketch plan of a UGVI installation to enable understanding of the concepts and for presentation to internal and external stakeholders
- Ducting and AHU indicative layout plans.
- Key typical details as required.
- A detailed design program indicating when the submissions required by this scope of work is provided.
  A preliminary bill of quantities materials budget estimation that includes item descriptions, quantity, unit, rate, sub-totals, and totals based.

6.2.2 Design Submission – 50% and 100%

The Supplier shall provide at 50% and 100% design stage calculations

Supply an Operation and Maintenance Manual for all plant and equipment including calibration and servicing that is in accordance with manufacturer's instructions.

Supplier is to allow for one (1) week review of supplied documentation.

- Supplier is to incorporate any comments from the 50% and 100% review into the documentation if applicable.
- Supplier is to submit all final ("For Construction") documentation in PDF, Microsoft WORD and AutoCAD format.
- Provide Engineering certification at time of 100% submission.

6.2.3 Design Presentations

The Supplier with any key design consultants shall present the full design deliverables for the applicable phase (eg drawings, schedules, specifications, design reports and all other design documents) to the Project Board, Key Users at the 50% and 100% design milestones in coordination with the Contract administrator. These may be conducted by Microsoft teams.

The main intention for design presentations is to supplement design submissions by providing an overview for stakeholders / authorities of the documents being submitted.

- Allowing the design consultants to emphasise key items in the design plus responses to key issues.
- Allowing stakeholders to ask questions and seek clarifications.
- Allowing the design consultants to receive feedback on key design issues that might be identified by the stakeholders.

Each presentation shall have an agenda prepared by the Supplier and circulated beforehand and shall have an action list prepared by the Supplier and circulated within 2 days following the presentation.

6.2.4 Design Approvals

The Supplier will allow for the following approvals processes in addition to those required under the contract. The Supplier will ensure that the Supplier and the associated consultants are available to present the design documentation to the Principal and shall allow for these presentations within the Supplier's program.

Ref	Item	Approval By	Comments
1.0	50% Design	Project Board Users and user groups as described under functional requirements Management Group	HOLD POINT: Supplier will need to do formal briefings to the Project Board These would be final approval of the specification, design, implementation strategy, budget, timeline
3.0	For Construction Design Documents 100% documentation	Contract administrator	HOLD POINT: Suitability of documentation for construction purposes. (allow 7 days)
4.0	Construction Completion	Contract administrator Project Board	HOLD POINT: Consultant certification also required as specified

6.3 Construction Stage Submissions

6.3.1 Documents

Documents produced by or on behalf of the Supplier and written information, including all drawings, sketches and specifications, supplied by the Principal to the Supplier, including the Contract Documents, shall be kept by the Supplier at the Site or other location approved by the Principal and shall be always available for reference by the Principal or any person it nominates (including other representatives of the Principal). Documents provided to or produced by or on behalf of the Supplier and the Contract Documents shall be kept in good order and marked to show where superseded or modified by later documents or instructions.

The Contract Documents and any other drawings or documents issued by or on behalf of the Principal and copyright in the Contract Documents and any other drawings or documents shall be, as between the parties, the property of the Principal. The Supplier shall not use, copy or reproduce the Contract Documents or any other drawings or documents issued by or on behalf of the Principal for any purpose other than the performance of the Contract. The Supplier shall return the Contract Documents to the Principal immediately upon request.

6.3.2 Prototypes and Samples

Where specified or requested by the Contract administrator, the Supplier shall submit identified prototypes or samples of materials, products, items and finishes to be used in the Works, allowing a minimum of 14 days for assessment and resubmission.

6.3.4 Submissions by the Supplier

The Supplier shall provide, at its cost, all technical data, manufacturing and installation details, commissioning results, test results, shop drawings and samples as required by the Contract or as the Principal may require from time to time.

Where an electronic web based document sharing program has been established and is being implemented by the Principal the Supplier must fully participate in and provide all things necessary (except software) for full participation in such programs including the provision of adequate and compatible hardware.

Each document including shop drawings shall be given a unique number by the Supplier and shall at the Contract administrator's option be:

- submitted in electronic web based document sharing "dwg" and "pdf" formats; or
- submitted in transparency form and in paper form in the number specified in Schedule 1 (unless the Contract administrator's Representative notifies the Supplier in writing that submission in paper form is not required).

The Supplier shall be responsible for and ensure that all documents and samples submitted:

- meet the requirements expressed in or to be inferred from the Contract;
- conform to the requirements of Authorities and Legislative Requirements and indicate compliance if subject to inspection by any Authority;
- are submitted in sufficient time to allow examination and comment by the Principal (or its representative) and the Principal and for any modification to be carried out prior to commencement of manufacture and without delay to the Works; and
- are coordinated with the requirements of other trades, and submitted at the same time as documents and samples submitted by related trades.

Work to which the submitted documents or samples relates shall not proceed until 7 days following submission has expired.

The Supplier is wholly responsible for the content and accuracy of shop drawings and other documentation and samples prepared by or for the Supplier, notwithstanding that there may have been ambiguities, errors, omissions or discrepancies in any documentation provided by the Principal.

Any approval or other indication given by the Principal in relation to any submitted document or sample or this clause, in no way relieves the Supplier of any responsibility under the terms of the Contract.

The Supplier shall provide the Principal with the 3 hardcopies and 1 electronic copy of the as built drawings, maintenance manuals, operating instructions, or other similar documents in a form acceptable to the Contract administrator for all work under the Contract.

The Supplier shall keep at the Site or other location approved in writing by the Principal one set of written information which it is obliged to have, prepare or supply in terms of the Contract which shall be always available for reference by the Principal and any persons authorised by the Principal.

6.3.5 Shop Drawings

The Supplier shall ensure that arrangements or outline drawings identify all types and sizes of electrical, mechanical and other components, principal dimensions, access and part dimensions, sizes and dimensions of anchor bolt holes, forces generated (if any) and clearances necessary (if any).

The Supplier is a minimum is required to submit shop drawings of the following:

- Filter layouts and supports
- UVGI system layouts.
- Electrical layouts
- Modifications to existing mechanical switchboards
- Mechanical ventilation systems and layouts
- PID's
- Process system flows
- Process Controls Functional Description

Shop drawings may be coordinated at meetings convened as and if required by the Principal. The Supplier shall attend any such meetings. The Supplier shall supply shop drawings and other documents to be supplied by the Supplier to the Principal and to any other relevant Suppliers in a timely manner. Where co-

ordination meetings have been scheduled the Supplier shall supply such items to the Principal and any other relevant Suppliers at least 7 days prior to the relevant co-ordination meeting.

The Supplier shall:

(a) resolve any co-ordination problems (including any such problems identified by the Principal) with other trades. In the absence of timely and satisfactory resolution the Principal may elect to impose a solution as reasonably necessary to overcome co-ordination problems between trades. In the event that the Principal imposes a solution it shall be implemented without any adjustment to the Contract Sum or any program dates;

(b) allow for the co-ordination of the Works with other trades and shall be deemed to have allowed for the effects of co-ordination of its work with the work of other Suppliers The Supplier shall have no Entitlement in connection with any cost, loss, expense or damage resulting from such co-ordination or its failure to coordinate. For the purpose of this clause "shop drawings" includes penetration drawings which accurately detail all penetrations; and

comply with directions given by the Principal (including at any co-ordination meeting) for the purposes of sub-clause (a) above.

The Principal shall not be obliged to review or comment upon any information design or document (including shop drawings) or to check any design for errors, omissions or compliance with the Contract. The Principal or its agents or consultants receipt of, or review of or comment upon any such information design or documents (including shop drawings) shall not relieve the Supplier from responsibility for the Supplier's errors or omissions or any departure from the requirements of the Contract.

6.4 Commissioning and Handover Strategy

The Supplier shall prepare a project commissioning and handover strategy during the Design Stage. This strategy shall follow the requirements as stipulated by ANSI/ASHRAE/IES Standard 202-2018 Commissioning Process for Buildings and Systems.

The commissioning strategy shall clearly demonstrate the performance of the system following installation of the filtration systems as nominated.

This strategy shall form the guide for:

- Requirements to be documented in the tender documents in regard to commissioning and handover
- The planning for commissioning and handover tasks to be undertaken by the design consultants and others at and around completion(s)

The commissioning and handover strategy shall include as a minimum:

- Commissioning & handover purpose
- Commissioning & handover process
- Commissioning & handover program
- Commissioning & handover management and procedures
- Commissioning tasks (work breakdown structure)
- Handover tasks (work breakdown structure)
- FF&E planning
- FF&E procurement
- Inspections, testing & certification
- WAE documents
- Operating & Maintenance manuals
- Operational training & education
- Post-occupancy/completion report
- Defects liability period tasks
- Operational and statutory maintenance activities during the DLP
- Final completion procedures
- Coordination with the project overarching documentation

The Supplier shall define during the Design Stage the operational and statutory maintenance required by the Supplier during the Defects Liability Period(s).

6.5 Substantial Completion

6.5.1 Requirements for Substantial Completion

The achievement of Substantial Completion shall in addition to any other requirement of the Contract require compliance with the following:

- all equipment, plant, services and installations have been demonstrated to perform as required by the Contract both under normal conditions and under simulated emergency conditions;
- all normal and emergency start up and shut down functions perform in sequence without interruption or malfunction;
- all plant and equipment has been demonstrated to the satisfaction of the Principal to have been physically completed, commissioned, tested and is in a continuously useable condition;
- the Supplier has provided to the Principal all warranties, certificates, guarantees, manuals and any other information in respect of the Works required by the Contract or which in the reasonable opinion of the Principal are required for the use, occupation or maintenance of the Works or which are required for the purpose of the Principal obtaining any certificate of occupation for the Head Contract Works and any warranties which are available from suppliers and manufacturers for the plant or goods used in or provided for the Works; and
- the Supplier has performed to the satisfaction of the Principal's Representative:
    - the handing over of all information necessary to ensure the proper and efficient operation and maintenance of any part of the Works (including any services, plant, equipment and materials requiring maintenance);
    - the removal of all Supplier's rubbish, plant and surplus material from the Site and from the Works, other than, where allowed by the Principal, plant required for the carrying out of the Supplier's obligations in the Defects Liability Period;
    - a final clean of the Works including the cleaning of any glass and sanitary fixtures including windows and other external glazing forming part of the Works;
    - the handing over to the Principal of any documents in its possession issued by or evidencing approvals of Authorities and compliance with Legislative Requirements in connection with the Works;
    - the handing over to the Principal of all keys forming part of or required for the Works;
    - the provision of certificates from each design consultant retained by the Supplier that the Works have been constructed in accordance with the design prepared by that consultant;
    - any other obligation under the Contract the non-performance of which may delay, prevent or hinder Notice of Substantial Completion; and

6.5.2 Documentation Requirements for Substantial Completion

Approved and completed commissioning and handover plans for all services and building elements.

Designer certification that completed works meet the requirements of the Supplier's design documents and the preliminary design.

All required Authority approvals and certificates including:

- Workplace Health and safety Certificates as applicable
- Electrical authority approval

Documentation as required by the Commissioning and Handover Strategy

Keys - Cylinder and Key handover Operations and Maintenance manuals

- Submit details of maintenance procedures and program, relating to installed plant and equipment, 2 weeks before the date for Substantial Completion. Indicate dates of service visits. State contact telephone numbers of service operators and describe arrangements for emergency calls.
- Coordinate with FA staff (Arrange meeting as part of training schedule)

As Constructed drawings and documentation as required.

Witness test signoffs by FA on all systems including:
- Site inspection by Principal's Representatives (determine final clean completed etc.)
- Final Commissioning Verification and Tests

Certificates of training completed by FA on all systems including:
- Schedule of training on each of the following:
- Mechanical Services Installation
- Building management system
- Hydraulics
- Building materials maintenance (Cleaners and Facility Management)
- Safety in Design Report – Contract administrator sign off of incorporation of post commissioning activities in Operations and Maintenance Manuals

QA tests including:
- As required by the trade specifications and the preliminary design.
- Tests on continuity of all cables and circuits
- Tests on rotation of electrical equipment
- Run up and Run in tests on all rotating equipment
- Electrical tests on switchboards
- Tests on all electrical protective equipment (RCD's etc.)
- Data and communications cabling tests.
- Pressure Tests on Pipework
- Operation and Pressure tests on AC units
- Sound level tests
- Mechanical Electrical Tests
- All certificates from inspections as required.

6.5.3 As Constructed Drawings & Operations and Maintenance Manuals

The Supplier shall organise and supply As Constructed information to satisfy compliance with these requirements including but not limited to, the requirements as set out below to the Contract administrator for a check on construction work and for the completion of ‘As Constructed’ drawings.

Provide Operation and Maintenance Manuals for all systems and components covered by this specification. Include As-Installed documentation for the entire installation in these manuals.

Provide three copies of manuals and drawings neatly bound into A4 size hard cover ring binders which are permanently labelled with the Project Name, Contract Description and Supplier’s Name.

Include the following in each set of manuals:

- Index
- Copies of all test results, certificates and approvals.
- Manufacturer's operating instructions and details of model numbers, serial numbers, operating instructions, and manufacturer's guarantee certificate for equipment and appliances.
- Brief description of each component of the installation.
- A recommended maintenance programme for all equipment installed.
- A recommended list of spare parts.
- Log sheets to record maintenance activity and relevant dates.
- Addresses, names and phone numbers of all relevant suppliers, spare parts suppliers, service companies etc.

- As-installed drawings as follows:
    - Layout drawings in the same size and form as the workshop drawings, but modified to reflect all changes which occurred during construction, and access locations, positions of dampers, air quantities and locations of all registers shown.
    - System schematic diagrams and schedules.
    - The title block of each drawing amended to include the Supplier's name and contact details, Supplier's drawing number and date of issue.
    - In AutoCAD DWG format.
    - In Adobe Portable Document format (PDF).

Provide a draft set of the Operation and Maintenance Manuals to the Contract Administrator not less than 2 weeks before the date of practical completion, for the purpose of review and comments.

Submit final sets of the Operation and Maintenance Manuals to the Contract Administrator not more than 2 weeks after the receipt of comments on the draft from the Contract Administrator.

Final contract payment will not be approved until satisfactory Operation and Maintenance Manuals have been received.

6.5.4 Certification

A suitably qualified and experienced person from the engaged consultant of the relevant discipline shall sign all Detail Design drawings as complete and correct. Appropriate system design certificates shall be provided to support certification of the building. The requirement for certification of installations, provision of as-built drawings and Operation and Maintenance manuals by the Supplier shall be included as appropriate in the Detail Design documents.

The Supplier's for construction documentation shall include the issue of a separate copy of the design documents with each drawing and specification signed by the associated designer to designate that the designer has reviewed and checked each of the design documents.

The design consultants shall also provide Certification **prior to Substantial Completion** that the works as constructed are in accordance with the design and instructions as provided by the consultants.

6.3.5 Warranties

The minimum warranties for the major elements are to be as follows:

- Mechanical Services 2 years
- Electrical Services 2 years

These shall be provided by the Supplier and the associated SubSupplier in the format as provided by FA.

6.3.6 Alternative Materials or Work

The Supplier shall be deemed to have allowed for the materials and methods of work described in the Contract whether they are proprietary items or otherwise.

Where materials specified are not available or the method of work specified is not possible or for any other reason, the Supplier wishes to substitute an alternative material or method of work, then in each instance:

- the Supplier shall request the substitution, from the Contract administrator, in writing in time to allow a response to be given within 5 days of receipt of the notice so as not to cause delay to the progress of the Works;

- the Contract administrator may allow the substitution at no additional cost to the Principal or the Contract administrator may issue a Variation to effect a reduction or increase in the value of the Works; and

- the Supplier shall be responsible for the suitability and performance and the fitness for purpose of the substituted material/item or method of work. The Supplier is required to supply a sample of the proposed item, and evidence that the performance is equal to or greater than that specified.

The Supplier shall not be entitled to compensation for any rejection of a submitted alternative, nor, unless otherwise agreed, shall adoption of an alternative be ground for any claim for additional cost damages or extension of time.

7 Defect Liability Period

3.4**7.1** Requirements

Defect liability period will begin from the last day of commissioning for a period of no less than 12 months. This will cover any defects on the plant and works completed by the Supplier. All defect works will be completed at the Supplier's expense.

8 Electrical

3.5 17.1 Performance Criteria

The installation shall conform to the requirements of applicable legislation, AS/NZS 3000 (Wiring Rules), local Supply Authority's Service and Installation Rules or Network Service Provider (NSP) as applicable. Power (i.e. Switched Socket Outlets and the like) will be provided throughout and protected by residual current circuit breakers and in accordance with Workplace Health and Safety Regulations. An earthing system will be provided to the facilities in accordance with the relevant standards.

All equipment shall be capable of correct operation under the service conditions that are encountered at the location in which the equipment is installed when conditions at the site are as specified below. This shall include suitable de-rating as a result of elevated temperature. The design temperature for equipment shall be the Site Maximum Ambient Temperature plus any temperature rise caused by environmental factors such as exposed locations or the operation of adjacent equipment, together with losses from the equipment contained within the enclosure. As a minimum, the following temperature rises due to environmental factors shall be adopted in these calculations:

- Within well ventilated buildings: + 0°C.
- Within external enclosure not exposed to the sun: + 0°C.
- Within external enclosure exposed to direct sun: + 15°C.

Site Design Parameters
Maximum Ambient Temperature: 44°C.
Minimum Ambient Temperature: 5°C.
Yearly Average Temperature: 17°C.
Relative Humidity: Max: 100%, Min: 20%.
Altitude not Exceeding: 1000 m.
Ambient Air: Tropical/Marine to AS/NZS2312:1994.

3.6 17.2 Lighting

17.2.1 Luminaries

All luminaries to be with full complement of lamps, with suitable control gear / drivers as specified by the luminaires manufacturer. Luminaries shall be protected against ingress of moisture and dust to IP64.

Light fixtures need to be suitable for a dangerous goods storage environment. Lights should be easily maintained and replaceable. Prioritise 10 year life cycle cost above capital cost.

- Long life fittings
- Easy maintenance
- Low cost maintenance
- Durable and suitably IP rated for chemical storage
- Sparkless light fittings

Luminaries comply with AS 6106, AS 6210, AS 6705, AS 6741, BS 2818, BS 3772, BS 4017 and IEC NO155.

Cables have been run in wall cavities, ceiling spaces, recessed conduits and straight lines, grouped together, parallel to each other and parallel/perpendicular to the building structure. No cables are to rest upon the ceiling, catenaries are to be used.

All sheet steel components have been suitably pre-treated and painted using acrylic polyester or epoxy powders. Unless otherwise specified the colour is white RAL 9010.

All luminaries designed for internal use have been constructed to IP 20.

For fittings greater than 100mm wide a minimum two screws each end has been used.

Wiring of suspended luminaires is comprised of 10A plug-in ceiling rose complete with flexible 3-core 1.5mm2 PVC/PVC cable.

17.2.2 Lighting Control

Lighting is controllable via local switching.

All lighting control complies with AS 2065 with a minimum rating of 16A used for switch plates.
Light switches in damp or exterior locations are rated to a minimum of IP 56.

17.2.3 Internal Lighting

The levels of artificial lighting will be in accordance with the recommendations of AS 1680. Interior lighting for the various tasks is to be provided in all the internal spaces. Artificial lighting levels are to be a minimum of 360 lux or greater than the levels prescribed by the various standards and Codes of Practice for dangerous goods storage.

Lighting should be achieved using high efficiency LED (or fluorescent fittings if costing is ineffective).

Low energy use, high efficiency lamp sources and luminaries will be selected to suit the application. Luminaires must come with battery backup for emergency lighting operation. Luminaires are to be sparkless, weatherproof, surface mounted batten fittings.

17.3 Power

The general power installation will comply with AS/NZS 3000. Generally the use of residual current devices (RCD's) will be provided in accordance with Wiring Rules requirements and Workplace Health and Safety Regulations.

Final sub-circuits will be provided to fixed electrical equipment throughout the facility. Sub-circuits switched socket outlets will be provided for the connection of all portable and semi-portable electrical equipment and will be fitted with RCD's.

Care shall be taken to limit the number of points on a circuit to a maximum of 8 double socket outlets (or less where the anticipated load requires) and to distribute the points with leakage current to avoid nuisance tripping. All power circuits shall be provided with minimum 25% capacity for additional outlets.

17.3.1 Cabling General

Cabling shall be protected to the recommended level in accordance with AS/NZS 3000:2018 and will ensure that a minimum protection level as agreed with FA is achieved. All wiring systems shall be designed as appropriate for the zone in which it is installed which may include the need for suitable hazardous rated wiring and accessories.

17.3.3 Final Sub-Circuits

All final sub circuits will be protected by suitably rated residual current circuit breakers. Spare capacity (25%) will be provided on all lighting and power final sub circuits. All cable sizes will be selected in accordance with AS/NZS 3000:2018. All final sub circuits will be run in suitable containment systems and concealed within false ceilings, floor voids or walls as necessary.

17.3.4 Accessories

All accessories shall be as follows unless otherwise approved by FA:

- All GPOs are external weatherproof and are from the IP rated PDL 56 series.
- Provision of underground/ in slab conduits, floor boxes, trunking, containment etc for

9 Mechanical

3.7 18.1 Performance Criteria

Mechanical services shall as a minimum comply with:

- Building Code of Australia
- Related Codes of Practice; and
- Applicable Australian and New Zealand Standards
- AS/NZS -1668.2-2002 - The use of ventilation and air conditioning in buildings - Ventilation design for indoor air contaminant control.
- AS/NZS 4452-1997 - The storage and handling of toxic substances.
- AS/NZS 5026:2012 The storage and handling of flammable and combustible liquids

In addition, matters relating to acoustic design shall comply with:

- National Standard for Occupational Noise, NOHSC:1007-2000;
- National Code of Practice for Noise Management and Protection of Hearing at Work NOHSC:2009-2000; and

- AS/NZS1269 series, AS1276, AS1670.1, AS2107, AS2220 Series and AS2822.

Equipment noise levels shall not exceed 65dB (at high fan speed).

Vibrations due to plant shall not be structurally critical or unacceptable to the occupants. All mechanical equipment shall be isolated from the structure to minimize any transfer of vibration.

3.8 18.4 Painting Labelling and Identification

All installed, supplied and manufactured equipment such as plant, pipe work, equipment and apparatus that is externally or internally located and exposed to view shall be painted. Galvanised surfaces to be painted shall only be painted after cleaning and etch priming. Colours shall be in accordance with AS/NZS 3500 unless otherwise required.

All equipment shall be identified with nameplates. Markers to identify type of service and direction of flow shall comply with AS/NZS 3500. All valves shall be tagged, and details of these valves shall be recorded including numbering in the appropriate contract deliverables. Equipment identification description and numbers shall correspond with schedule identification description and numbers.

All plant and equipment shall have engraved metal “name plates” mechanically secured to readily observable areas of the item. Nameplate information shall include:

- Name of manufacturer, model number and serial number;
- Capacity of item;
- Electrical characteristics of item; and
- Supplementary data including refrigeration type, oil type, lamp type etc.

3.9 18.5 Weather Resistance

Special attention shall be given to the design details, construction methods and workmanship to ensure weather tightness of all HVAC components, with special emphasis placed on the serviceability of joint seals and penetrations under the design exposure conditions.

3.10 18.6 Provisions for Maintenance

All mechanical services plant shall be designed to allow adequate maintenance of the item and its various components. Ensure that sufficient isolating valves and demountable joints are supplied on reticulated water systems to isolate and remove individual items of plant whilst retaining operation of the remainder of the system. Plant requiring ongoing maintenance shall not be installed in ceilings.

Where access is through ceiling linings, it shall be in compliance with the Health and Safety Authority recommendations for the use of ladders. Where practicable, exhaust fans shall be mounted in windows.

APPENDIX A. Operational Specification

https://www.dropbox.com/s/r80qdywfuwwqmls/Operational%20Specification%20%20Fiji%20Airports%20Rev%207.pdf?dl=0

APPENDIX B. AHU Scope schedule

https://www.dropbox.com/s/o6iv8uoak0m0hy8/Improved%20Filtration%20Schedule%20by%20Air%20Handler.xlsx?dl=0

APPENDIX C. Base HVAC Installation: Operations and Maintenance Manuals and commissioning data

https://www.dropbox.com/s/nt0dbev8404vh3x/AFL-MSL-Mechanical%20-O%26M%20Rev%204.pdf?dl=0