FHL Tower Commercial Building

KA PROJET REFERENCE: 17281F
INDUSTRY: Commercial
DISCIPLINES: Hydraulic, Mechanical, Electrical and Fire System Engineering

PROJECT SUMMARY

CLIENT
China Railway First Group on behalf of Fijian Holdings Limited

LOCATION
Suva, Fiji

PROJECT TYPE
Commercial

YEAR COMPLETED
2022

PROJECT DESCRIPTION

The FHL Commercial Tower is an 18 Storey high rise "Green Building" situated in the middle of the Suva Business District. This iconic addition to the city of Suva consists of commercial space, offices and recreational functions hall at top storey.

Ecologically Sustainable Development (ESD) seeks to create buildings that lessen the environmental impacts of the built environment, that save money, and that result in healthier environments in which to live, work and learn. Achieving this relies on the whole life cycle of a building – its design, construction, commissioning, operation and eventual deconstruction – being considered from the earliest project stages. Buildings that embrace this approach are often called 'Green Buildings'.

The design of a green building involves selecting the most appropriate of these ESD initiatives as well as others that may arise, to create a cost effective, high performance, healthy building. The design intent for the Fijian Holding LTD (FHL) Tower project is to make this a green building that demonstrates good practice in sustainable design principles and meets several key environmental objectives which would reduce the overall life impact of the building on the environment. This includes reduction in overall carbon emissions and environmental impact, siting and structure design efficiency, energy efficiency, water efficiency, material efficiency and waste reduction.

PROJECT ROLE

Kramer Ausenco (Fiji) Ltd role on this project was the primary building services consultant and civil engineering. Kramer Ausenco was also engaged to provide environmentally sustainable engineering services through Green Star Accredited Professional for the entire project including as built design, construction, waste management, end user engagement and reporting. Our role was a traditional consultancy service from design through tender, construction and handover scheduled in 2022. Discipline services provided included:

- Electrical Engineering
- Mechanical Engineering
- Hydraulic Engineering
- Fire System Engineering

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PROJECT DATASHEET

Project Reference: 17281F
Industry: Commercial

ASSIGNMENT NAME:	APPROX. VALUE OF THE CONTRACT:
FHL Tower Commercial Building	FJD 67 Million
LOCATION & COUNTRY:	**DURATION OF ASSIGNMENT (MONTHS):**
Suva, Fiji	30 months
NAME OF FUNDING AGENCY:	**TOTAL NO. OF STAFF-MONTHS OF THE ASSIGNMENT:**
FHL Properties Ltd	75 person months
ADDRESS OF AGENCY:	**APPROX. VALUE OF THE SERVICES PROVIDED BY YOUR FIRM UNDER THE CONTRACT:**
VC3G+J9X, Suva - City Center, Fiji	FJD326,840
START DATE (MONTH/YEAR): COMPLETION DATE (MONTH/YEAR):	**NUMBER OF PROFESSIONAL STAFF-MONTHS PROVIDED BY ASSOCIATED CONSULTANTS:**
Start date: June, 2020 Completion date: Ongoing	N/A
NAME OF ASSOCIATED CONSULTANTS, IF ANY:	**NAME OF SENIOR PROFESSIONAL STAFF OF YOUR FIRM INVOLVED AND FUNCTIONS PERFORMED:**
N/A	Shane Harris - Lead Building Services Engineer Ricardo Apigo - Senior Hydraulics Engineer Nacani Korovulavula - Project Manger Manoa Vave - Senior Electrical Engineer

NARRATIVE DESCRIPTION OF PROJECT:

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The following engineering services highlights covers important green initiatives and environmentally sustainable designs to achieve the goals of a green building. The mechanical services design includes high indoor air quality, air tightness of building envelope, energy efficient controls and monitoring including building wide Building Management System (BMS) to monitor full controls and operations of the entire HVAC, lifts, electrical, lighting, power, hydraulics and fire system.

Moreover, the Hydraulic services has focused on the water efficiency methods to make this building more efficient and sustainable including water consumption monitoring and control. Fire engineering services considers both wet fire and dry fire systems including sustainable selection of materials, effective spatial management of assets, energy efficient modes of operation and water management. This is further achieved using fire hydrant system and water sprinklers combined within a common well engineered risers.

Electrical engineering services reduces energy consumption by balancing day lighting and energy efficient sensor lightings in designs. Also, all the electrical power will be monitored via the power energy meter and the BMS controls.

Compliance with Section J of the BCA (NCC 2019)

In additional to ESD initiatives built within the design elements the building also had a mandatory minimum compliance with Australia’s National Construction Code Section J which requires minimum levels of energy efficiency to be achieved for non-

residential buildings. This includes:

- Building Sealing
- Air-conditioning and ventilation performance
- Artificial lighting and power performance
- Building Fabric – Efficient thermal, roof and ceiling construction, roof lights, walls and floor, glazing, shading factors and treatments
- Heater water supply
- Facilities for energy monitoring

DESCRIPTION OF ACTUAL SERVICES PROVIDED BY YOUR STAFF WITHIN THE ASSIGNMENT:

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MECHANICAL SYSTEM DESIGN

The final selected air conditioning system has been arranged to minimise operational energy input. Typical spaces with extended operating hours and spaces located in the building which will experience similar cooling requirements are grouped/zoned on common fan coil unit or provided with dedicated systems.

- Building Management System: The building has Building Management System (BMS) that fully controls and monitor the operation of the HVAC system enhancing energy efficient operation. This enables the system to run in Auto Mode based on timer schedule and the cooling demand from the building. It also has the manual override mode to run the system on manual when the need arises such as during maintenance. Equipment run hours are monitored live and change sequence of operation will be automatically executed through pre-set programs and conditions.
- Air distribution system: The air-conditioning and air distribution system for office spaces is served via a variable air volume (VAV) system incorporating electronic VAV diffuser and room thermostats. The system will incorporate pressure sensors in its air distributive system to assist in economical operation of the pre-conditioner unit. The VAV is monitored and controlled by BMS. This is part of the ESD initiative.
- Indoor air quality management system: The proposed mechanical systems are designed to achieve high quality indoor air environment. This is achieved by providing fresh air from outside environment to the occupied spaces which reduces existing volatile organic compounds and other indoor pollutants from indoor air. This outdoor air is handled, by a dedicated outdoor air preconditioning air handing unit located on top floor of the building.
- Preconditioning AHU consists of high efficiency air filter, cooling coil and heat recovery wheel to treat outdoor air before it is being delivered indoors. The heat recovery wheel is one of the key components as it reduces overall energy required to pre-condition the outdoor air by recovering low temperature heat coming from building ablution exhaust air and utilizing recovered heat to precool the outdoor air before the air enters cooling coils.
- Air cooled chillers and Pumps: There are four (4) Air Cooled Chillers that will be operating on lead/lag mode during start up and shutting down according to the cooling demand and schedule of operating hours. The Chillers provides total cooling capacity of 2770kW. Primary and secondary pumps are provided to distribute this chilled water to air conditioning equipment of the building.
- Fire safety provisions: The mechanical services of the building also has provisions of fire safety. This consist of smoke exhaust and zone pressurization system. The smoke exhaust system is designed to remove smoke in fire from the fire affected floors. The zone pressurization system will work to pressurize all other non-fire affected floors to minimize infiltration of smoke to non-fire affected floors.
- Car Park ventilation: Basement floor car park has been provided with mechanical ventilation. This includes high speed Jet fans for make-up and ducted exhaust air system. The CO2 sensors are provided to monitor floor air quality, the ventilation system of car park only operates when the CO2 levels exceeds prescribed levels to removes exhaust air and replenishes with outdoor air.
- Air tightness testing: Specialized testing for building air tightness is specified for this project in which building envelope will be tested to quantify the air tightness quality of the construction and to measure air leakage rates through building envelope. This testing and certification are facilitated by specialized building air tightness professionals. This process is specialized and includes specific compliance requirements to ensure highest air quality and tightness standards are achieved. Benefits of building air tightness testing: - Detecting air leakage and rectifying building construction cracks eventually significantly lowering energy loss due to air leakage from building construction - Potentially harmful CO2 emissions are reduced, significantly increasing indoor air environment quality - Achieving compliance to building regulations

HYDRAULICS SYSTEM DESIGN

- As part of the Environment Sustainable Design (ESD) and green building initiative, rainwater harvesting and re-use has been used. Rainwater will be captured from the roof level and stored in the basement level. Capturing rainwater from roof to be used for flushing of water closets / urinals and irrigation, thus reducing water usage from mains supply. To allow for redundancy, mains water supply will act as a by-pass to the system and will topup the rainwater tank in an event of low rain. Rainwater will then be filtered and with the help of the booster pump, will be provided to all non-potable fixtures. Figure 7 Braithwaite Pressed Steel Tanks
- Incorporating water efficient fixtures in the building; e.g., WELS rating fixtures. The use of flow-controlled tap ware,

shower heads, water closet and urinal to conserve water usage.
- Using pipe work that are environment friendly; e.g., HDPE or PVC-U pipes.
- Separate pipeline for potable and non-potable water supply system. Potable water supplying hand basin, shower and sink. Non-potable water supplying water closet, urinals and hose tap.
- Both the rainwater pump and water booster pumps will be linked to a control panel. The control panels will be connected to the BMS for fault monitoring. Pump control panels will have a dry running protection connected to the float switch inside the water tanks located in the same level.
- Water tanks will have Hi/Lo level signals connected to a notification panel. From the panel, the signals will be connected to the BMS to enable the user to know the water level in the tanks.
- To maintain water quality, water from storage tanks have appropriately filtered via water filters (coarse and fine filters), chlorine dosing and UV-Filters.
- Minimizing the use of water location. All external location hose tap will be provided with lockable gate valve to control water usage.
- Monitoring system will be capable of capturing and processing from water meters.

FIRE SYSTEM DESIGN

- For cost effective solution, the fire hydrant system and sprinkler system are combined together with a common riser. As a primary supply of fire services, wet type sprinkler system is provided for each level with its performance based on the hazard type i.e. Light hazard for office areas, Ordinary hazard 2 for car park areas and ordinary hazard 3 for retail areas. The sprinkler system will consist of sprinkler control assembly in a lockable cabinet located in the fire stairs for each level. The sprinkler system is divided into two zones which will be supplied by separate pump sets. Fire hydrant, fire hose reel and extinguishers are also provided.
- For secondary supply, a standard booster cabinet and wet feeder assembly are provided to ensure supply to the local fire authority on-board fire water pumping appliance. There will be water by-pass from city mains supply to the fire brigade booster assembly and additional boost will be provided by relay electric pump for the high-rise zone.
- The two pump sets for sprinkler system consist of duty and standby configuration of which one will be electric and the other being diesel. An electric jockey pump will also be provided for the system for pressure maintenance. Fire hose reel pump is also provided. As a back-up for fire brigade booster assembly, fire relay pumps are provided to boost the water from 18 storey building

ELECTRICAL SYSTEM DESIGN

- We understand that the need to use natural lighting where possible. Internal lighting will be designed to suit this requirement by integrating natural lighting with artificial lighting via daylight & occupancy sensors. All lighting will be low glare louvered or diffused and to comply with minimum recommended light levels for the specific area. A maintenance factor of 0.8 has been allowed for to accommodate for dust and reduced lamp output over time and colour rendering.
- Since this is a Green Building, Sensors will control lighting in the toilets and offices. For service areas that have sufficient natural lighting, daylight sensor to control the operation of luminaires. All lighting will be diffused and to comply with minimum recommended light levels for the specific area. Lighting will be controlled via sensors, time delay switches, manual switches and controller as required.
- There are 4 transformers serving the proposed 18 storey building, two of which will serve the Essential and the Electrical Services and the other serving the Mechanical Services. This application also applies to the two Generators, which independently will provide 100% power to each dedicated Services.
- A Type Tested Form 4a Main Switchboard will be installed at the basement level that will serve the building and at each tenancy there will be a dedicated board with Power Energy Meter for BMS monitoring.
- The BMS system will monitor the power consumption for each tenant, Generator Diesel fuel tank Levels, lifts and Generators. For the electrical services the BMS only controls the lighting fixtures