

**SUPPLY & INSTALLATION
of the
TELECOMMUNICATIONS SERVICES
for the
LTA KARAVI WEIGHBRIDGE STATION
at
KARAVI, BA, FIJI ISLANDS**

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**TELECOMMUNICATIONS SERVICES
LAND TRANSPORT AUTHORITY KARAVI WEIGHBRIDGE STATION,
KARAVI, BA, FIJI ISLANDS**

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SECTION 1 GENERAL CONDITIONS OF CONTRACT

General Conditions of Contract shall be the Conditions of Contract for Land Transport Authority Karavi Weighbridge Station, Karavi, Ba and any other Amendments and Revisions up to date of issue, provided by the Principal Consultant.

SECTION 2 SPECIAL CONDITIONS OF CONTRACT

Special Conditions of Contract shall be the Conditions of Contract for Land Transport Authority Karavi Weighbridge Station, Karavi, Ba and any other Amendments and Revisions up to date of issue, provided by the Principal Consultant.

SECTION 3 PRELIMINARY AND GENERAL

Conditions of Contract shall be the Conditions of Contract for Land Transport Authority Karavi Weighbridge Station, Karavi, Ba and any other Amendments and Revisions up to date of issue, provided by the Principal Consultant.

SECTION 4 GENERAL

4.1 SCOPE OF WORKS

The scope of works comprises the supply, installation, cabling, connection, testing, commissioning, maintenance and defects liability service of the Telecommunications Services for the Land Transport Authority Karavi Weighbridge Station, Karavi, Ba.

This shall include all necessary work required to implement the intent and meaning of this Specification and the associated drawings.

Extent of Works

The works shall include but will not be limited to the following main items:-

- (a) Supply and installation of the main lead-in fibre optic cabling to the proposed Building Distributor.
- (b) Supply and installation of the Building Distributor.
- (c) Supply and installation of patch panels, network switches, and analog telephone adaptors.
- (d) Supply and installation of the Cat 6 cabling between the Building Distributor and the Telecommunications outlets.
- (e) Supply and installation of the Cat 6 cabling between the Building Distributor and the Weighbridge Scale.
- (f) Supply, installation and termination of the Telecommunications outlets and associated accessories.
- (g) Supply and installation of internal cable ducts, conduits, cable support systems, and associated accessories.

Additional Requirements

- (a) Co-ordination with Telecom Fiji Limited.
- (b) As installed drawings and Installation Manuals
- (c) Testing, commissioning, warranty and preventative maintenance of the complete installation

4.2 COMPLIANCE WITH REGULATIONS

The work carried out by the Telecommunications Sub-Contractor shall comply in all respects with this Specification and:-

- (a) Telecom Fiji Limited Regulations
- (b) AS/NZS 3084 - Telecommunications installations – Telecommunications pathways and spaces for commercial buildings
- (c) AS/NZS 3080 – Telecommunications installations – Generic cabling for Commercial premises
- (d) AS/NZS 3000 – [Electrical] Wiring Rules

4.3 DRAWINGS

The following drawings shall form part of the Contract:

SHEET NO.	DESCRIPTION	SCALE
T01	SCHEDULE OF DRAWINGS / LEGEND / LOCALITY PLAN / SPECIFICATION / SCOPE OF WORKS	NTS
T02	PROPOSED SITE PLAN – TELECOMMUNICATIONS RETICULATION	1:250 @ A3
T03	PROPOSED FLOOR PLAN – TELECOMMUNICATIONS LAYOUTS	1:100 @ A3
T04	PROPOSED TELECOMMUNICATIONS SCHEMATICS & DETAILS	NTS

4.4 SAMPLES

The Telecommunications Sub-Contractor will be required to submit for approval by the Services Engineer, samples of distributors, patch panels, outlets, cables and accessories and materials to be used in the works.

4.5 SHOP DRAWINGS & SAMPLES

Supply shop drawings in SI Metric to completely detail the works as follows:

ITEM	INFORMATION REQUIRED	SETS
Equipment and Cabling	Cable routes and equipment layout	3

Submission to the Principal Consultant in the first instance shall be made not less than two weeks prior to approval in principle is required.

Examination by the Engineer shall not diminish the Telecommunications Services Sub-Contractor's responsibility for co-coordinating and checking shop drawings nor the Telecommunications Service Sub-Contractor's responsibility for correctness of his work.

The Telecommunications Services Sub-Contractor shall submit samples or brochures with technical data of the following items for approval prior to installation:

- Rack enclosures
- Patch panel type
- Network switch type (if any)
- All cable types to be used;
- Telecommunications outlet type;

SECTION 5 MAIN LEAD-IN CABLING

Telecom Fiji Ltd will supply and install the main lead-in cabling. The Telecommunications Sub-Contractor shall allow for this cost.

The cable pits and conduits shall be supplied and installed by the Electrical Sub-Contractor.

SECTION 6 MAIN DISTRIBUTION FRAME

Telecom Fiji Ltd will supply and install the Main Distribution Frame for the installation.

The Telecommunications Sub-Contractor shall allow for this cost.

SECTION 7 STRUCTURED CABLING SYSTEM

7.1 GENERAL

The Telecommunications Sub-Contractor shall provide a comprehensive Category 6 Structured Cabling System to define the Telecommunications infrastructure (patch panels, frames, patch cords, cables, faceplates and outlets) necessary to build a uniform premises distribution system, which will function for a multi-media Telecommunications solution to support up to and beyond 1000Mbps transmission, and to provide a 20 year warranted system.

The solution should define the method(s) of flexible patching for the Telecommunications services to enable simple Moves, Adds & Changes, (MACs) without frequent rewiring of locations and re-training of staff. The solution should also provide easy to follow trouble shooting steps and procedures.

The latest versions of the following standards are to be complied with unless otherwise specified:

1. **AS/ACIF S008**
Requirements for Authorised Cabling Products
2. **AS/ACIF S009**
Installation Requirements for Customer Cabling (Wiring Rules)
3. **AS/NZS 3000**
SAA Electrical Wiring Rules
4. **AS/NZS 3080**
Integrated Telecommunications Cabling for Commercial Premises
5. **AS/NZS 3084**
Commercial Building Standard for Telecommunications Pathways and Spaces
6. **AS/NZS 3085.1**
Administration of Communications Cabling Systems – Basic Requirements
7. **AS/NZS 3086**
Telecommunications Cabling Systems for Small Office / Home office Premises
8. **AS/NZS 3087**
Testing of Balanced Communications Cabling
9. **AS/NZS 4117**
Surge Protective Devices for Telecommunication Applications
10. **ISO 11801 Ed 2**
Information Technology – Generic Cabling for Customer Premises
11. **TIA/EIA 568-B.1, 2 and 3**
Commercial Building Telecommunications Cabling Standard, Parts 1, 2 and 3
12. **TIA/EIA 568.B-2-1**
Transmission Performance Specification for 4 Pair 100 Ohm Category 6 Cabling

All copper products in the communications channel shall be capable of supporting the provision of power to the Data Terminal Equipment via the Media Dependant Interfaces as specified in the latest IEEE 802.3af “Power over Ethernet” standard.

7.2 WORK AREA SYSTEM

The Telecommunications Sub-Contractor shall supply and install the wiring or interconnections that connect active terminal devices to the telecommunication outlets. This includes patch cords, connectors, faceplates as well as the work area cable (terminal fly leads) needed to make connections.

7.2.1 Faceplate

- Must have a clear label for application of circuit identification
- Options for vertical style or horizontal style

7.2.2 Telecommunications Outlets (TO)

All copper telecommunication outlets supplied by the Telecommunications Sub-Contractor shall be KRONE or approved equivalent modular 8-position / 8-contact outlets, accepting standard modular RJ45 plugs.

The TO shall be:

- Capable of receiving 0.4 to 0.64mm diameter solid wires into insulation displacement contacts
- Surface or flush mounted, single or dual sockets are required as specified in the drawings
- Should have the ability to accept a dust cap to prevent dust and dirt getting into the socket
- Underwriter Laboratories (UL) listed and comply with CFR47 Part 68.500
- Made from high-impact, flame-retardant, UL94-VO rated thermoplastic material
- Meet or exceed AS/NZS 3080 Category 6 component requirements

The TO shall be able to support:

- 10/100/1000Mbps Ethernet as appropriate
- 4Mbps/16Mbps Token Ring applications
- ATM 155.5 Mbps
- ATM 622 Mbps
- Gigabit Ethernet
- Broadband Video

The TO shall provide Near End Crosstalk (NEXT) performance of:
≥54dB @100MHz, and ≥46dB @250MHz for CAT6.

The Insulation Displacement Connector (IDC) wiring termination shall have a minimum of 2 mechanical forces applied to the wire to provide a reliable and stress-free resistant connection.

The IDC termination must have a 45° angled configuration when connecting with the cable conductor to reduce the effect of metal fatigue.

The IDC contact element shall be special spring brass with silver plating to increase conductivity, angular arranged across the axis of conducting wire to maximize the gas tight connection. The contact range shall be 5µm silver-plated to ensure minimum oxidation impact.

The insulation displacement connectors of the outlets shall accept two insulated solid conductors 0.40 – 0.64mm diameter of the same size in the same slot.

The socket offered shall be marked to conform to the AS/NZS 3080, T568A or T568B wiring schemes.

The Telecommunications outlet shall meet the following electrical performances:

- RJ Interface resistance – 20mΩ
- Insulation resistance ≥100MΩ at 500Vdc
- Contact resistance of 20mΩ maximum. (1mΩ typical)
- Current rating of ≤2A at 20°C

The Telecommunications outlet shall meet the following mechanical performance:

- Insertion life of Level B reliability to 60603-7
- Plug/Jack contact force: >100g minimum per contact using a FCC – approved plug
- Plug retention force: 133N minimum
- Temperature range: -20°C to +75°C

7.2.3 Work Area Patch Cord

The Category 6 work area patch cords shall consist of KRONE or equivalent 4 pair stranded copper conductors patch cords terminated with RJ45 plugs at both ends.

They shall be factory terminated with length options of 1.2metres up to 15 metres.

The CAT6 patch cords shall have a flexible boot to provide strain relief. The boot material should be injection moulded into the plug to retain the position of the internal conductors.

7.3 HORIZONTAL CABLE SYSTEM

The Telecommunications Sub-Contractor shall supply KRONE or approved equivalent Category 6 horizontal 4 pair solid cable to connect each telecommunication outlet (TO) or consolidation point (CP) to the floor distributor (FD).

The type of horizontal cables used shall be 4-pair 100Ω high performance shielded twisted pairs UTP cable for CAT6 applications compatible with a bit error rate of less than 10^{-12} .

The UTP cable shall be of nominal 0.5mm diameter bare solid copper conductors insulated with high density insulation and a PVC sheath. The insulated conductors shall be twisted into pairs, with pairs balanced for maximum performance and foiled for alien crosstalk / noise reduction.

The 4-pair UTP cable shall be run using a star topology format from the crossconnect at the floor distributor (FD) on each floor to every individual Telecommunications outlet.

The 4-pair UTP cable must be able to meet AS/NZS 3080 Category 6 requirements. It must be tested to Class E to ensure performance for any application up to and including 1000Mbps from the floor distributor (FD) to the Telecommunications outlet at the work area.

All horizontal UTP cables must meet requirement specified for current and emerging standards such as IEEE 802.3, 10/100/1000 BASE T; IEEE 802.5, 4/16/100Mbps; ATM Forum 52/155/622/1200Mbps. Gigabit Networking.

Each run of cable from the crossconnect at the floor distributor (FD) to each Telecommunications outlet (TO) shall be continuous without any joints or splices. Consolidation points (CP) are permitted provided Class E channel performance is maintained.

The length of each individual run of fixed horizontal cable from the floor distributor (FD) to the Telecommunications outlet (TO) shall not exceed the distance set out in the tables and formulas in AS/NZS 3080 plus the appropriate length de-rating for maximum ambient temperatures above 20°C.

The 4-pair UTP cable should be Underwriter Laboratories (UL) listed as type CM, CMR or CMP.

The 4-pair UTP cable shall meet or exceed the following specifications:

- AS/NZS 3080 requirements for cable
- Conductor DC Resistance (Max): 9.38Ω/100m @ 20°C
- DC Resistance Unbalance (Max): 5%
- Insulation Resistance (Min): 5000MΩ/1Km @ 20°C
- Mutual Capacitance (Typical): 5.6nF/100m
- Characteristics impedance: 100Ω
- Worst Case Cable Skew: 45nsec/100Metres

7.4 TELECOMMUNICATIONS ROOM

7.4.1 General

The provisioning of services and facilities in the Telecommunications Rooms (TR) should be in accordance with AS/NZS 3084.

The Telecommunications Room (TR) shall contain rack mounted patch panels wall mounted rods or back mount frames to suit 8 or 25 pair modules for termination of the horizontal and/or backbone copper cables onto modules and outlets. The TR must also house the rack mounted or wall mounted fibre terminations unit for termination of optical fibre cable.

Patch cords shall be provided when patching is required at the cross-connections to facilitate Moves, Adds and Changes (MACs). The patch cords shall be able to support Class E applications.

The crossconnect module shall either be:

- KRONE or approved equivalent fibre-retardant, moulded plastic UL94 V0 rated, mounted horizontally for ease of termination, with
- KRONE or approved equivalent 8 pair or 25 pair disconnection contacts for incoming voice and/or data services, or
- Patch panels with KRONE Modular 8-way (KM8) outlets.

7.4.2 Termination Module

The termination module shall be able to accommodate over 200 repeated wire insertions without incurring permanent deformation.

The termination module shall be a KRONE CAT6 Ultim8 or approved equivalent disconnection module to allow test cords to isolate the cabling system for testing purposes.

The termination module shall be able to accommodate 0.4 – 0.64mm diameter copper conductors.

The termination module shall meet Category 6 performance.

The termination module shall be a CAT6 8-pair module with IDC contact elements to ensure ≥ 53 dB NEXT at 250MHz in a jumpered environment.

The IDC contact element shall be set at 45° and made from special spring brass with silver plating. The wire contact area shall have 5µm of silver-plating to ensure maximum reliability.

All components that are to be connected to a carrier's network must comply with the A-Tick requirements in accordance with the Telecommunications Labelling Notice.

7.4.3 Rack and Cabinet Mounted Copper Patch Panels

The modular outlet patch panel shall be KRONE or approved equivalent panel with KM8 sockets having a worst pair NEXT loss values for the outlet of ≥ 54 dB at 100MHz and ≥ 46 dB at 250MHz.

The patch panel shall be available in 24 port configurations in one Rack Unit height or 48 port in two rack unit height and shall fit into a 19" rack.

Patch panels with individual modular jacks shall have jacks that can be interchangeable with those modular jacks in the TO for easy maintenance purpose i.e. the faceplate can accept the same modular outlet for termination as the patch panel. Functional grouping can be achieved by different colours of modular jacks in the same panel and can be changed at any time.

The contact plating of the modular jacks shall have a minimum thickness of 1.3µm of hard gold in accordance with FCC CFR47 Part 68.5, over a minimum thickness of 2.0µm of nickel.

The modular patch panel will have a plug insertion life of Level B reliability to IEC 60603-7. KRONE or approved equivalent Patch Cord Minders shall be fitted so that there is one patch cord minder for every 2 x 24 port patch panels. The front and/or rear vertical rails of the cabinet shall be set back sufficiently to accommodate the patch cord minders.

7.4.4 Rack and Cabinet Mount Optical Fibre Termination Unit

The KRONE or approved equivalent 19" rack mount fibre termination unit shall provide crossconnect, interconnect or splicing capabilities.

The 19" rack mount fibre termination unit shall consist of a frame mountable housing for terminating and/or splicing fibre optic cables and allow for organisation of the fibre optic interconnects. The assembly shall have rear slots for cable entry, with grommet fibre retainers for holding buffered fibre in place and fibre storage guide for maintaining bend radius.

The 19" rack-mounting unit should be either 12 or 24 ports for one rack unit (1RU) and can be either a fixed position unit or have a slide or swing tray to improve access.

The adaptor plates are suitable for ST, SC simplex and SC duplex couplings, and the adaptor plates should be installed to angled through adaptors to the left or to the right of the panel to improve the patch cord management and provide safety from possible damage to the eyes from accidental exposure to active fibres.

7.4.5 Patch Cords

The Telecommunications Sub-Contractor shall supply KRONE or equivalent Category 6 patch cords for cross-connection and/or inter-connection of termination modules, patch panels, terminal equipment and fibre termination units.

Patch cords shall be 4 pair UTP cable with lengths of 1.2metres through to 15 metres.

Equipment cords shall be 4 pair with length and construction (stranded or solid) suited to the installation.

The type of patch and equipment cord shall suit the termination module used, i.e. 8-pair or 25-pair termination module or patch panel.

The patch cords shall have built in exclusion features to prevent accidental polarity reversals and split pairs. It shall have a latching mechanism to prevent accidental dislodging of the plug from the termination module or modular patch panel.

KRONE or approved equivalent Fibre Patch Cords shall:

- Consist of one or two single, tight buffered, multimode graded-index fibres with a 62.5 or 50 micron core or singlemode 9 micron core with 125 micron cladding to suit the installed fibre optic cabling
- Be used for optical fibre crossconnects and interconnects
- Have the fibre cladding covered by aramid yarn and a protective outer jacket
- Meet the following specifications:

a. Minimum bend radius	-	25mm
b. Operating temperature	-	-40 to +75°C
c. Loss	-	0.5dB per mated connector
d. Return Loss Maximum	-	-45dB
e. Cable OD	-	3mm
f. Tip material	-	Ceramic

7.5 BACKBONE SYSTEM

7.5.1 General

The backbone system shall include UTP multi pair cables and/or fibre optic cables for voice riser and high speed data networking in the intra-building wiring.

The backbone cables shall be run in a star topology, terminated in the Equipment Room (ER) or Building Distributor (BD) at one end, and in a Floor Distributor (FD) at the other end.

7.5.2 The UTP Copper Cables

Shall be marked CM or CMR or LSOH fire rated.

Shall consist of 0.5mm diameter, twisted pair copper conductor.

The UTP multi-pair cable shall meet the requirements of AS/NZS 3080 and AS/ACIF S008.

7.5.3 The Optical Fibre Cables

The multi-core optical fibre cable shall consist of multimode or singlemode fibre, color-coded for identification for multi-core fibre optic cable.

Consideration should be given to the use of Pre Terminated Optical Fibre Cable for faster and easier installation.

7.5.4 Optical Fibre Cable Types

Optical Fibre Cable types and installation shall comply with the following:

Underground Installations

Use KRONE or approved equivalent Outdoor/Underground Loose Tube moisture blocked OF cable for all directly buried or conduit buried underground applications. Moisture blocked Outdoor / Underground OF cable must pass the "Water Penetration Test" as referenced in AS/ACIF S008.

Outdoor/Underground Loose Tube cable may also be used for Indoor and Riser applications.

Outdoor Above Ground Installations

Use KRONE or approved equivalent Outdoor/Underground Loose Tube moisture blocked OF cable for all outdoor applications. Moisture blocked Outdoor/Underground OF cable must pass the "Water Penetration Test" as referenced in AS/ACIF S008.

The Outdoor/Underground Loose Tube OF cable must be protected from accidental mechanical damage if installed in exposed areas (eg. contain the OF cable in an UV-resistant conduit).

Outdoor/Underground Loose Tube OF cable may also be used for Indoor Riser applications.

Indoor Installations

Use KRONE or approved equivalent Tight Buffered Low Smoke Zero Halogen (LSOH) OF cable for all Horizontal and Riser applications, except as noted above.

Indoor Tight Buffered LSOH cable may be used for Outdoor applications under the following conditions:

- The cable may be installed in above ground situations only, and must be contained in weather-proof UV-resistant conduit for mechanical protection.

7.6 EQUIPMENT ROOM SYSTEMS

The provisioning of services and facilities in the Equipment Room (ER) should be in accordance with AS/NZS 3084.

The Equipment Room may contain Telecommunications equipment and other communications equipment such as CATV, Public Address, CCTV, Security, Fire Alarm, and Audio. The ER may also contain computers, small UPS equipment and other Building Automation Service (BAS) equipment.

7.7 BUILDING DISTRIBUTOR

The size, location and provisioning of services and facilities in the Building Distributor (BD) should be in accordance with AS/NZS 3084.

For copper voice circuits, the Telecommunications Sub-Contractor shall supply KRONE or approved equivalent 20 pair disconnects modules to terminate the incoming Service Provider cables, the outgoing Service Provider cables to the PABX, and the PABX Extension line/cables.

The Telecommunications Sub-Contractor shall supply KRONE overvoltage magazines complete with 230volts fail/safe overvoltage arrestors for all incoming copper pairs to protect the incoming Service Provider lines and any outside plant multi-pair copper cables against any overvoltage surge.

For lightning and overvoltage protection supply KRONE Comprotect maintenance free 5 point solid surge protection devices for voice applications and data applications up to and including 16Mbps.

Install 3-point surge protection devices for overvoltage protection of data applications above 16Mbps.

The electrical protection shall be either in 10 pair from or a single-pair protection unit.

The gas-tube protector units shall meet the following standards:

- DC Sparkover Voltage (at 100V/sec) 230V +/-20%
- Impulse Sparkover Voltage (at 100V/microsec) 500V (max)
- Impulse Sparkover Voltage (at 1KV/microsec) 650V (max)
- Insulation Resistance at 100Vdc 10000MΩ (min)
- DC Holdover Voltage 135V (max)
- Capacitance (1 MHz) 3.0pF (max)

The protection device and protector units shall be UL listed.

The Back Mount Frames and Profit Rod mounting systems, onto which the overvoltage protection is fitted is to be bonded to earth with a minimum 6mm² green/yellow earth wire up to 10m long maximum, and connected to the building earth system within the Entrance Facility, Telecommunications Room or Equipment Room where the overvoltage protection is located.

7.8 SYSTEM PERFORMANCE

7.8.1 General

Channel performance is the preferred acceptance criteria for all installations if possible. All permanent links are to be installed and all end-user patch cords, equipment cords and work area cords are to be in place, and left in the position where they were tested.

Where this is not practical, the Permanent Link performance will be the acceptance criteria for the installation.

7.8.2 Channel Performance

Permanent Links shall meet the minimum requirements of:

- AS/NZS 3080 for Class E (using CAT6 components) or
- ISO 11801 Ed 2 for Class E (using CAT6 components)

SECTION 8 INSTALLATION STAFF AND EXPERIENCE

The Telecommunications Sub-Contractor shall provide a list of their technical support staff and installation staff, together with their working experience in the relevant field.

The Telecommunications Sub-Contractor shall state the nearest location of their principal support centre. The centre shall have permanently stationed support staffs that are capable of providing technical support effectively and efficiently.

SECTION 9 APPLICATION ASSURANCE AND WARRANTY

The Telecommunication Sub-Contractor shall provide up to a 20 year Warranty for Class E Channel performance of the Cat 6 Channel Solutions and a 5 year Zero Bit Error Warranty for the channel, backed by the manufacturer's warranty from the date of successful completion of testing and commissioning of the Structured Cabling System.

The Telecommunications Sub-Contractor shall provide on-site warranty for one year for the Structured Cabling System from the certified practical completion date of the whole Contract.

The 20 year application assurance shall cover the failure of the offered cabling system to operate the applications that the system was initially designed to support i.e. those identified in the current (at the time of tendering) versions of the Cabling Performance Specifications (that is the AS/NZS 3080, ISO 11801 or TIA/EIA 568-B.2-1).

SECTION 10 ACCEPTANCE TEST

The Telecommunications Sub-Contractor must individually test 100% of the UTP cables and fibre optic cables after installation. Wherever possible, progress testing of copper Permanent Links or Channels is recommended to ensure errors or unacceptable installation practices are minimized on the site.

For Class E Performance (Cat 6 applications)

The Structured Cabling System must be tested by the Telecommunications Sub-Contractor to conform to the requirements specified in the latest AS/NZS 3080 for Class E performance using Level 3 testers in accordance with AS/NZS 3087 – Testing.

A certain percentage of the outlets may be chosen at random for the final acceptance testing by the end-user. The design data and the full results of all acceptance tests performed by the installer are to be fully documented and submitted to the end-user to hold for the period of the warranty.

The results must include 100% of total installation and provide full electronic data files for each cable run indicating the name of the person doing the testing, date, cable identification, cable length, insertion loss, NEXT, PSNEXT, ACR, PSACR, propagation delay, delay skew, ELREXT, PSELFEXT, and Return Loss.

The acceptance criteria shall be in accordance with the requirements set out in AS/NZS 3080 for the copper Permanent Link or Channel.

The acceptance criteria shall be the power loss budget as calculated in accordance with the losses set out in AS/NZS 3080 for the optical fibre components that make up the link.

Conduct the tests in accordance with the manufacturer's Testing Guidelines (eg. use mode stripping) using either LSPM or OTDR equipment. If conflict exists, correct testing with LSPM shall be taken as correct.

Test Result Documentation

A copy of the "Full Test" results for each copper cable run and each core of each optical fibre cable run shall be supplied on a CD in a 'Microsoft Windows' office application format.

SECTION 11 CUSTOMER ACCEPTANCE

At the conclusion of the installation a preliminary walkthrough with the Telecommunications Sub-Contractor will be performed to check for installation quality, accurate performance of the work and to verify engineering diagrams. Any modifications to the documentation or the installation that may be required shall be accomplished within a 2 week period. "Customer Acceptance" does not release the installation contractor from repairing any cabling errors or improperly labelled circuits caused by the Telecommunications Sub-Contractor that may be discovered at a later date.

SECTION 12 EQUIPMENT AND MATERIALS

All cabling and connection equipment and materials supplied shall be new products.

The Telecommunications Sub-Contractor shall check the surface finishes and paintwork around his area of installation and touch up or repair/replace all damaged parts after the installation of cabling and equipment.

The Telecommunications Sub-Contractor shall provide literature including data on maintenance and operation of all equipment installed. Relevant catalogues of all materials, instruments, equipment, components, to be supplied shall be included in this Tender.

All equipment and materials shall be permanently and legibly marked to indicate clearly the name of the manufacturer or the registered trademark.

SECTION 13 LABELLING

Each piece of equipment, patch panel and outgoing cable from the patch panels shall be labelled. Corresponding labelling and numbering shall also be provided on the Telecommunications outlets.

All cable labels are to be of clear wrap around self-adhesive type and each cable is to be labelled at each end 100 – 150mm from the termination point. Labelling is to be machine typed.

Telecommunications outlets are to be labelled with an approved label secured to the outlet faceplate/cover in a prominent position, firmly affixed.

Consolidation Points are to be labelled with the distance back to the FD, in metres.

MUTOs are to be labelled with the maximum allowable patch cord length in metres, as per the MUTO design.

SECTION 14 CABLE PRACTICE

All cables shall be run and installed in a workmanlike manner and in accordance with AS/ACIF S009 Wiring Rules. The recommendations in AS/NZS 3084 Pathways and Spaces should also be followed.

The Telecommunications Sub-Contractor shall plan the cabling system and routing ensuring adequate segregation from electrical and hazardous services, ensuring system integrity and performance, ensuring that it does not present problems of maintenance or access, and ensuring there is no conflict with the operation and maintenance of other systems.

The Telecommunications Sub-Contractor shall in his Tender submission, give full details of the type of cable to be used including the type of termination, colour scheme, identification method, method of installation and shielding (if required), limitations (if any) and any other relevant Telecommunications information.

Unless otherwise stated, the Telecommunications Sub-Contractor shall submit for approval one month prior to commencement of installations, drawings, showing the proposed wiring cable tray/catenary or conduit layout for the entire systems with all necessary dimensions and support details clearly indicated.

All cable trays and conduits required to complete the installation will be supplied and installed by the Electrical Sub-Contractor.

All necessary penetrations and access between floors is the responsibility of the Main Contractor. The Telecommunications Sub-Contractor shall ensure all penetrations and access holes are fully sealed to National Fire Authority requirements.

Support all cabling within the false ceiling space by steel cable tray. Supporting CAT6 cabling in J-Hooks or loops/bags/rings are not acceptable. The use of adhesive-fixed cable-tie anchors is not acceptable.

Group cables together in bundles not exceeding 24 cables per bundle for CAT6 applications. Do not arrange cables within bundles in straight lines but leave them in a random lay to help minimize crosstalk between the cables.

CAT6 Cables shall be secured with Velcro at least 10mm wide. Solid plastic zip ties are not acceptable. Use Velcro ties at 300mm spacing.

For safety reasons, maintain at all times a minimum of 50mm spacing from parallel runs of low voltage electrical cabling. If the run parallel to LV electrical cables is less than 50mm, separate the two with a durable insulation material (if metallic it shall be protectively earthed) for the entire length of run less than 50mm separation. Where Telecommunications cables cross electrical cables, this shall be at right angles to adhere to approved local regulations for separation/segregation.

For noise interference and performance reasons, the minimum separation should be increased as much as possible (>300mm) from power or fluorescent lights or halogen down light transformers. Special requirements will be needed in electrically noisy environments.

Provide adequate support for all cabling that is vertically installed, ensuring that the weight of the cables is sufficiently supported. Use Velcro ties at approx. 300mm spacing.

Before cable is installed and after installation, ensure that the tray is thoroughly clean of any extraneous material such as cable scraps, dust, dirt and construction debris.

Co-ordinate all cable tray and conduit work fully with other services on site as necessary.

Where cables exit a tray, provide adequate protection from the tray edges during the installation process and after completion. If necessary, all cable trays shall be earthed to a protective earth from the electrical distribution board on the floor where such cable tray is installed.

Allow for approx. 1-2 metres of slack in cable runs at the Floor Distributor and at the Telecommunications outlet. Place this slack in such a manner that it is fully supported and that the minimum bending radius is maintained. Where cabling is installed inside modular furniture partitions and similar enclosures, maintain the 50mm safety separation wherever possible as per AS/ACIF S009. Install cables in free spaces, free from protrusion of screws and similar sharp fasteners that may damage the cabling. Remove or cover all sharp edges.

Where cables are installed in partitions or false walls through sharp-edged metal studs, ensure bushings are secured in these fittings to protect cables.

Cables shall be installed so as not to exceed the maximum hauling tension of 11kg.

Restrict conduit runs to no more than 30m of continuous run inside a building.

Restrict any single pull to no more than two (2) x 90 degree bends, in space conduits or ducts.

SECTION 15 DOCUMENTATION

15.1 General

The Telecommunications Sub-Contractor shall provide complete documentation covering the installation and maintenance of the Structured Cabling System. This includes As Installed drawings showing the location of all installed equipment and racks in all Telecommunications Rooms, all main cable runs, cable trays, CPs, MUTOs and TOs – complete with outlet numbering.

15.2 Quantity

The Telecommunications Sub-Contractor shall provide three complete sets of documentation. As Installed drawings shall be provided within 14 days of completion of the project to the Project Manager showing all main cable runs, locations, identifications and destinations.

15.3 Printing and Binding of Documentation

The Telecommunications Sub-Contractor shall provide all documentation in suitably labelled, A4 sized binders. All binding shall be of a high quality to provide for a long and durable service.

15.4 Document and Drawing Sizes

All documentation shall be typed on either single or double-sided A4 pages. Drawings shall where practicable, be on A2 size.

15.5 Contents

The Installation manual shall cover the following areas:

1. A detailed overview of the building cabling system
2. Full description of the specific installation
3. Full schematics showing the overall layout of the installation
4. Floor layout drawings showing the location and designation of each outlet, location of cable trays and location of all connection frames.

APPENDICES

APPENDIX I TENDER FORM

**TELECOMMUNICATIONS SERVICES TENDER
LTA KARAVI WEIGHBRIDGE STATION
KARAVI, BA, FIJI ISLANDS**

We, the undersigned having examined the Drawings and Specification hereby offer to execute and complete the whole of the Works required to be done, as shown on the said Drawings and described by or referred to in the Specification and for the Fixed Lump Sum of:

.....

..... (FJD\$.....)

which includes all Contingency, Provisional and P.C. Sums and is a Fixed Lump Sum VAT inclusive without provision for fluctuations in the cost of labour and materials.

AS WITNESS OUR HANDS THIS.....day of.....2019

SIGNATURE OF TENDERER.....

OFFICE STAMP.....

ADDRESS.....

WITNESS [SIGNATURE AND BLOCK CAPITALS].....

ADDRESS.....

OCCUPATION.....

DATE.....

We confirm that our time for completion iscalendar weeks.

The Tender shall be open for acceptance for a period of sixty (60) days.

The Principal does not bind himself to accept the lowest or any Tender.

The documents must not be altered in any way. Any special observations should be made in a separate letter attached to this Tender. Please return documents with Tender.

Name of Tenderer_____

Signature_____ **Date**_____

APPENDIX II SUMMARY OF TENDER**PRINCIPAL:** LAND TRANSPORT AUTHORITY**SHEET 1 OF 1 SHEET****PROJECT:** LTA KARAVI WEIGHBRIDGE STATION
KARAVI, BA, FIJI ISLANDS**PROJECT NO:** 7835**SPECIFICATION:** TELECOMMUNICATIONS SERVICES**DATE:** MAY 2019**(To be completed and submitted with Tender)**

Item	Description	Price (VEP)
a)	Preliminary and General	\$
b)	Supply and installation of the main lead-in fibre optic cabling to the proposed Building Distributor.	\$
c)	Supply and installation of the Building Distributor.	\$
d)	Supply and installation of patch panels, network switches, and analog telephone adaptors.	\$
e)	Supply and installation of the Cat 6 cabling between the Building Distributor and the Telecommunications outlets.	\$
f)	Supply and installation of the Cat 6 cabling between the Building Distributor and the Weighbridge Scale.	\$
g)	Supply, installation and termination of the Telecommunications outlets and associated accessories.	\$
h)	Supply and installation of internal cable ducts, conduits, cable support systems, and associated accessories.	\$
i)	Testing and commissioning of the complete installation	\$
j)	Any other items not included above	\$
k)	Provision of Shop Drawings	\$
l)	Provision of As Installed Drawings and Manuals	\$
m)	Twelve (12) months Maintenance	\$
n)	Contingency Sum	\$5,000.00
	Total Tender Price (VEP)	\$
	VAT @ 9%	\$
	TOTAL TENDER PRICE (VIP)	\$

Name of Tenderer _____**Signature** _____ **Date** _____

APPENDIX III

**SCHEDULE OF TECHNICAL DATA
(To be completed and submitted with Tender)**

PRINCIPAL: LAND TRANSPORT AUTHORITY

SHEET 1 OF 2 SHEETS

PROJECT: LTA KARAVI WEIGHBRIDGE STATION
KARAVI, BA, FIJI ISLANDS

PROJECT NO: 7835

SPECIFICATION: TELECOMMUNICATIONS SERVICES

DATE: MAY 2019

Two loose copies of this Schedule are supplied with this Specification.

One copy shall be completed, signed by the Tenderer and returned with his Tender.
The other copy is for the Tenderer's retention.

A Tender shall be regarded as not complying with this Specification if the information required by this Schedule of Technical Data is not supplied with the Tender.

Tenders are to be based on equipment etc., as specified.

Alternatives may be submitted, but must be clearly described to receive consideration. For each alternative, an alternative tender price must be submitted.

Name of Proposed Sub Contractor/Supplier

Sub-Contract Equipment

1.
2.
3.
4.
5.
6.

Comparable Work Carried Out by the Tenderer and Approximate Value

1.....	\$.....
2.....	\$.....
3.....	\$.....
4.....	\$.....
5.....	\$.....
6.....	\$.....

APPENDIX III

**SCHEDULE OF TECHNICAL DATA
(To be completed and submitted with Tender)**

PRINCIPAL: LAND TRANSPORT AUTHORITY

SHEET 2 OF 2 SHEETS

PROJECT: LTA KARAVI WEIGHBRIDGE STATION
KARAVI, BA, FIJI ISLANDS

PROJECT NO: 7835

SPECIFICATION: TELECOMMUNICATIONS SERVICES

DATE: MAY 2019

1. BUILDING DISTRIBUTOR RACK ENCLOSURE

Manufacturer _____

Model Number _____

2. PATCH PANELS

Manufacturer _____

Model Number _____

3. NETWORK SWITCHES

Manufacturer _____

Model Number _____

4. INTERNAL CAT 6 CABLING

Manufacturer _____

Model Number _____

5. TELECOMMUNICATIONS OUTLETS

Manufacturer _____

Model Number _____

Name of Tenderer _____

Signature _____ **Date** _____

APPENDIX IV**SCHEDULE OF RATES
(To be completed and submitted with Tender)****PRINCIPAL:** LAND TRANSPORT AUTHORITY**SHEET 1 OF 1 SHEET****PROJECT:** LTA KARAVI WEIGHBRIDGE STATION
KARAVI, BA, FIJI ISLANDS**PROJECT NO:** 7835**SPECIFICATION:** TELECOMMUNICATIONS SERVICES**DATE:** MAY 2019

The following of rates shall be used as a basis to value variations (either additions or deletions) and progress claims for the Contract.

Rates shall include all overheads (including on and off site supervising staff, allowance etc.), profit and VAT.

Rates for equipment and materials are that delivered to site without installation.

Item	Description	Unit Price
1.	Licensed Technician	per hour \$
2.	Technician	per hour \$
3.	Unskilled Labour	per hour \$
4.	Internal Category 6 Cabling	per metre length \$
5.	18RU Rack Enclosure	per unit \$
6.	Patch Panel (Cat 6)	per unit \$
7.	Network Switch	per unit \$
8.	Telecommunications Outlet	per double outlet \$
9.	Multimedia Outlet	per outlet \$
10.	<u>On Cost Percentage Mark Up</u>	
	a) Labour	%
	b) Materials	%
	c) Plant	%

Name of Tenderer _____

Signature _____ **Date** _____

APPENDIX V**TENDER CHECKLIST****PRINCIPAL:** LAND TRANSPORT AUTHORITY**SHEET 1 OF 1 SHEET****PROJECT:** LTA KARAVI WEIGHBRIDGE STATION
KARAVI, BA, FIJI ISLANDS**PROJECT NO:** 7835**SPECIFICATION:** TELECOMMUNICATIONS SERVICES**DATE:** MAY 2019

Please ensure that you have provided the following information provided in the check list below:

ITEM	LIST	YES	NO
1	COMPLETELY FILLED APPENDICES I - TENDER FORM		
2	COMPLETELY FILLED APPENDICES II - SUMMARY OF TENDER		
3	COMPLETELY FILLED APPENDICES III - SCHEDULE OF TECHNICAL DATA		
4	COMPLETELY FILLED APPENDICES IV SCHEDULE OF RATES		
5	COMPLETELY FILLED APPENDICES V TENDER CHECK LIST		
6	TIME OF COMPLETION OF THE PROJECT IN CALENDAR WEEKS PROVIDED		
7	TENDER VALIDITY FOR 60 DAYS		
8	COST BREAKDOWN TO BE VAT EXCLUSIVE PRICE (VEP) AND FINAL COST IN VAT INCLUSIVE PRICE (VIP) FIJIAN DOLLARS		
9	EQUIPMENT SPECIFICATIONS TO BE PROVIDED IN THE TENDER DOCUMENTS SUCH AS:		
10	PERFORMANCE SPECIFICATIONS		
11	PHYSICAL PROPERTIES		
12	POWER REQUIREMENTS		
13	WORKING HOURS FOR THIS PROJECT PROVIDED		
14	WARRANTY STATED		
15	PAYMENT TERMS ON A PROGRESS BASIS ALLOWED FOR		
16	ACKNOWLEDGE NOTICE TO TENDERERS (NTT) PROVIDED (IF APPLICABLE)		

Name of Tenderer _____**Signature** _____ **Date** _____