



YYJ Network Replacement and Cybersecurity Upgrade

Technical Specifications – IFT Design

Version 1.0

PBX Project #: 250192

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PBX Engineering Ltd.***

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END OF SECTION

1.0 GENERAL

1.1 SECTION INCLUDES

- 1.1.1 This section of the Specifications forms part of the Contract documents and is to be read, interpreted and coordinated with all other parts.

1.2 RELATED SECTIONS

1.2.1 Master Municipal General Conditions

1.2.2 DIVISION 01 00 00 General Requirements

- (1) Section 01 11 00S – General Requirements
- (2) Section 01 33 00S – Submittal Procedures
- (3) Section 01 45 00S – Quality Control
- (4) Section 01 77 00S – Closeout Procedures
- (5) Section 01 78 00S – Closeout Submittals
- (6) Section 01 79 00S – Demonstration and Training
- (7) Section 01 91 13S – General Commissioning

1.2.3 DIVISION 03 00 00 Concrete

- (1) No Supplementary Specifications.

1.2.4 DIVISION 26 00 00 Electrical

- (1) Section 26 00 00S – Electrical Work Summary and General Requirements
- (2) Section 26 01 00S – Payment
- (3) Section 26 06 01S – Fibre Communications
- (4) Section 26 06 02S – Local Area Network
- (5) Section 26 06 03S – Data & Voice Cabling

1.2.5 DIVISION 31 00 00 Earth Works

- (1) No Supplementary Specifications.

1.2.6 DIVISION 32 00 00 Roads and Site Improvements

- (1) No Supplementary Specifications.

1.2.7 DIVISION 33 00 00 Utilities

- (1) No Supplementary Specifications.

1.2.8 DIVISION 34 00 00 Transportation

- (1) No Supplementary Specifications.

1.3 TERMS

- 1.3.1 "Electrical Works", in the context of the Master Municipal Construction Documents and this design, pertains to all engineering activities that effect the operation of any electrical or electronic device within the scope of the project. Including, but not limited to:
- (1) Fibre Optic Cabling
 - (2) Copper Communications Cabling
 - (3) Power Cabling
 - (4) Network Infrastructure Devices & Modules
 - (5) Network Infrastructure Racks & Cabinets
 - (6) Network Infrastructure Power Supplies & Distribution
 - (7) Network Software
- 1.3.2 "Network", when used in these specifications, refers to the data communications network, its associated management tools, and control software holistically.

1.4 SPECIFICATIONS FORMAT AND NUMBERING SYSTEM

- 1.4.1 The Supplementary Specifications follow the same format and numbering system as the Master Municipal Specifications but are differentiated from it by suffixing the letter "S" to the Section number.
- 1.4.2 00 00 XXS series of specifications contain information and clauses that are comprehensive in scope and apply to all Supplementary Specifications contained herein.
- 1.4.3 26 00 XXS series specifications define the scope, activity ownership, and accountability of Electrical Works conducted during this project.
- 1.4.4 01 45 XXS series specifications define quality control standards for all Electrical Works.
- 1.4.5 26 06 XXS series specifications define technical requirements for network infrastructure installations, testing, commissioning, and documentation.

1.5 MASTER MUNICIPAL CONSTRUCTION DOCUMENTS

- 1.5.1 These Specifications have been written to supplement, not replace, the Master Municipal Specifications contained in the Master Municipal Construction Documents, Platinum Volume II, Revised 2019.
- 1.5.2 The provided Supplementary Specifications must be read in conjunction with the Master Municipal Specifications.

1.6 ACTIVITY OWNER

1.6.1 All clauses, activities, and requirements defined within the Supplementary Specifications are direct instructions to the Contractor, except where explicitly stated otherwise by:

- (1) "The Owner shall..."
- (2) "The Engineer shall..."

2.0 PRODUCTS

2.1 NOT USED

2.1.1 Not Used

3.0 EXECUTION

3.1 NOT USED

3.1.1 Not Used

END SECTION

1.0 GENERAL

1.1 SECTION INCLUDES

- 1.1.1 Shop drawings and product data.
- 1.1.2 Samples.
- 1.1.3 Certificates and transcripts.

1.2 RELATED SECTIONS

- 1.2.1 Master Municipal General Conditions
- 1.2.2 DIVISION 01 00 00 General Requirements
 - (1) Section 01 77 00S – Closeout Procedures
 - (2) Section 01 78 00S – Closeout Submittals
 - (3) Section 01 79 00S – Demonstration and Training
- 1.2.3 DIVISION 26 00 00 Electrical
 - (1) Section 26 00 00S – Electrical Work Summary and General Requirements
 - (2) Section 26 06 02S – Local Area Network

1.3 ADMINISTRATIVE

- 1.3.1 All submissions shall be uploaded via Victoria Airport Authority (VAA) Sharepoint web portal into designated project repository.
- 1.3.2 Submit to Engineer submittals listed for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.
- 1.3.3 Work affected by submittal shall not proceed until review is complete.
- 1.3.4 Present shop drawings, product data, samples, and mock ups (if/where indicated) in SI Metric units.
- 1.3.5 Where items or information is not produced in SI Metric units, converted values are acceptable.
- 1.3.6 Review submittals prior to submission to Engineer. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and shall be considered rejected.

- 1.3.7 Notify Engineer, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- 1.3.8 Verify field measurements and that affected adjacent Work is coordinated.
- 1.3.9 Contractor's responsibility for errors and omissions in submission is not relieved by Engineer review of submittals.
- 1.3.10 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Engineer review.
- 1.3.11 Keep one reviewed copy of each submission on site.

1.4 REQUEST FOR EQUAL

- 1.4.1 Where items are specified they will be considered the equipment to be provided and installed unless a request for equal is submitted during the tender period.
- 1.4.2 All requests for equals shall be submitted for consideration no less than two (2) weeks prior to the close of the Tender.
- 1.4.3 Submission of request does not constitute acceptance of equipment. Any changes to the specifications will be documented and transmitted to all bidders.

1.5 SHOP DRAWINGS AND PRODUCT DATA

- 1.5.1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data, which are to be provided by Contractor to illustrate details of a portion of Work.
- 1.5.2 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Canada where applicable.
- 1.5.3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes, and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross-references to design drawings and specifications.
- 1.5.4 Allow five (5) days for Engineer's review of each submission.
- 1.5.5 Adjustments made on shop drawings by Engineer are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Engineer prior to proceeding with Work.
- 1.5.6 Make changes in shop drawings as Engineer may require, consistent with Contract Documents. When resubmitting, notify Engineer in writing of any revisions other than those requested.

- 1.5.7 Accompany submissions with transmittal letter containing:
- (1) Date
 - (2) Project title and number
 - (3) Contractor's name and address
 - (4) Identification and quantity of each shop drawing, product data and sample
 - (5) Other pertinent data
- 1.5.8 Submissions shall include:
- (1) Data and revision dates
 - (2) Project title and number
 - (3) Name and address of:
 - .1 Subcontractor
 - .2 Supplier
 - .3 Manufacturer
 - (4) Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - (5) Details of appropriate portions of Work as applicable:
 - .1 Fabrication
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances
 - .3 Setting or erection details
 - .4 Capacities
 - .5 Performance characteristics
 - .6 Standards
 - .7 Operating weight
 - .8 Wiring diagrams
 - .9 Single line and schematic diagrams
 - .10 Relationship to adjacent work
- 1.5.9 After Engineer's review, distribute copies.
- 1.5.10 Submit a single set of electronic copies in pdf format of each shop drawing including sections for each sub-system and each requirement requested in specification sections.
- 1.5.11 Submit electronic copies of product data sheets or brochures for requirements requested in specification sections and as requested by Engineer where shop drawings will not be prepared due to standardized manufacture of product.
- (1) Indicate exact model number and all options to be supplied on data sheet.
- 1.5.12 Submit electronic copy in pdf format of test reports for requirements requested in specification Sections and as requested by Engineer.

- (1) Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
 - (2) Testing must have been within 3 years of date of contract award for project.
- 1.5.13 Submit electronic copy in pdf format of certificates for requirements requested in specification Sections and as requested by Engineer.
 - (1) Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 - (2) Certificates must be dated after award of project contract complete with project name.
- 1.5.14 Submit electronic copy in pdf format of manufacturer's instructions for requirements requested in specification Sections and as requested by the Project Manager or Engineer.
 - (1) Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- 1.5.15 Submit electronic copy in pdf format of Manufacturer's Field Reports for requirements requested in specification Sections and as requested Project Manager or Engineer.
- 1.5.16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- 1.5.17 Submit electronic copy in pdf format of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Project Manager or Engineer.
- 1.5.18 Delete information not applicable to project.
- 1.5.19 Supplement standard information to provide details applicable to project.
- 1.5.20 If upon review by Engineer, no errors or omissions are discovered or if only minor corrections are made, transparency copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings; through same procedure indicated above; shall be performed before fabrication and installation of Work may proceed.
- 1.5.21 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.6 PHOTOGRAPHIC DOCUMENTATION

- 1.6.1 Submit electronic copy of colour digital photography in jpg format, minimum 4MP, every two weeks and as directed by Engineer.
- 1.6.2 Progress photo submissions shall outline construction progress, including all major installations.
- 1.6.3 Progress photo submissions taken every week shall outline construction progress, including all installations and removals.

1.7 CERTIFICATES AND TRANSCRIPTS

- 1.7.1 Immediately after award of Contract, submit Workers' Compensation Board status.
- 1.7.2 Submit transcription of insurance immediately after award of Contract.

2.0 PRODUCTS

2.1 NOT USED

- 2.1.1 Not used

3.0 EXECUTION

3.1 NOT USED

- 3.1.1 Not used.

END SECTION

1.0 GENERAL

1.1 SECTION INCLUDES

- 1.1.1 Inspection, testing, administrative, and enforcement requirements.
- 1.1.2 Equipment and system adjustment and balance.

1.2 RELATED SECTIONS

- 1.2.1 Master Municipal General Conditions
- 1.2.2 DIVISION 01 00 00 General Requirements
 - (1) Section 01 77 00S – Closeout Procedures
 - (2) Section 01 78 00S – Closeout Submittals
- 1.2.3 DIVISION 26 00 00 Electrical
 - (1) Section 26 00 00S – Electrical Work Summary and General Requirements
 - (2) Section 26 06 02S – Local Area Network
- 1.2.4 Current Canadian Electrical Code.
- 1.2.5 Current British Columbia Building Code.
- 1.2.6 Current EIA.TIA standards for data cabling and terminations.

1.3 INSPECTION

- 1.3.1 Allow Engineer access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- 1.3.2 Give timely notice requesting inspection if Work is designated for special tests, inspections, or approvals by Engineer instructions, or law of Place of Work.
- 1.3.3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections, or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- 1.3.4 Engineer may order any part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction.

1.4 REJECTED WORK

- 1.4.1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Engineer as failing to conform to Contract Documents. Replace or re-execute rejected work in accordance with Contract Documents.
- 1.4.2 Make good other Contractor's work damaged by such removals or replacements promptly.
- 1.4.3 If in opinion of Engineer it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner may deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which shall be determined by Engineer.

1.5 REPORTS

- 1.5.1 Electronically submit inspection and test reports to Engineer in PDF format.
- 1.5.2 Provide copies to subcontractor of work performing testing or inspections.

2.0 PRODUCTS

2.1 NOT USED

- 2.1.1 Not used

3.0 EXECUTION

3.1 NOT USED

- 3.1.1 Not used

END SECTION

1.0 GENERAL

1.1 SECTION INCLUDES

- 1.1.1 Administrative procedures preceding preliminary and final inspections of Work.

1.2 RELATED SECTIONS

- 1.2.1 Master Municipal General Conditions
- 1.2.2 DIVISION 01 00 00 General Requirements
 - (1) Section 01 45 00S – Quality Control
 - (2) Section 01 77 00S – Closeout Procedures
 - (3) Section 01 78 00S – Closeout Submittals
 - (4) Section 01 91 13S – General Commissioning
- 1.2.3 DIVISION 26 00 00 Electrical
 - (1) Section 26 00 00S – Electrical Work Summary and General Requirements
 - (2) Section 26 06 02S – Local Area Network

1.3 INSPECTION AND DECLARATION

- 1.3.1 The outlined inspections, the Declaration of Substantial Completion, and the Declaration of Total Completion shall be completed in the order outlined in Section 26 00 00S.
- 1.3.2 Contractor's Inspection: Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 - (1) Notify the Engineer in writing of the satisfactory completion of Contractor's inspection and that corrections have been made.
 - (2) Request the Engineer's inspection.
- 1.3.3 Engineer's Inspection: Engineer and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.
- 1.3.4 After completion of the Engineer's Inspection submit a written certificate confirming that the following have been performed:
 - (1) Work has been completed and inspected for compliance with Contract Documents.
 - (2) Defects have been corrected and deficiencies resolved.
 - (3) Equipment and systems have been tested, adjusted, and are fully operational.
 - (4) Operations of systems have been demonstrated to Owner's personnel.

(5) Work is complete and ready for final inspection.

- 1.3.5 Final Inspection: When items noted above are completed, request a Final Inspection of Work by the Owner and the Engineer. If the Owner and Engineer deem the Work incomplete, complete the outstanding items and request re-inspection.
- 1.3.6 Declaration of Substantial Completion: When the Owner and the Engineer consider the operational requirements of the Contract have been substantially completed, the Contractor may apply for a Certificate of Substantial Completion. The Declaration of Substantial Completion may only occur after the successful completion of the Site Acceptance Test (SAT).
- 1.3.7 Declaration of Total Completion: When the Owner and the Engineer consider deficiencies and defects have been corrected and it appears operational requirements of the Contract have been substantially performed, the Contractor may apply for a Certificate of Total Completion. The Declaration of Total Completion may only occur after the successful completion of the Site Acceptance Test (SAT) and correction of all deficiencies identified by the Owner and the Engineer.
- 1.3.8 Commencement of Lien and Warranty Periods: the date of the Owner's acceptance of the submitted Declaration of Substantial Completion shall be the commencement date for both the warranty period and the lien period, unless otherwise required by lien statutes of the Place of Work.
- 1.3.9 Final Payment: When the Owner and the Engineer consider final deficiencies and defects have been corrected and it appears requirements of Contract have been totally performed, make application for final payment. If Owner and Engineer deem Work is incomplete, complete outstanding items and request re-inspection.
- 1.3.10 Payment of Holdback: After issuance of the Certificate of Total Completion of Work, the Contractor may submit an application for payment of the holdback amount.

1.4 WARRANTY

- 1.4.1 Provide a minimum one (1) year warranty, commencing from date of Substantial Completion of each construction phase, as defined in Section 01 91 13S, for all labour and installation services.
- 1.4.2 If software updates or software configuration changes occur within the scope of warranty-related Works, the Contractor shall backup all software configurations:
 - (1) Backup shall include the current operational configuration of the affected systems;
 - (2) Backup shall be taken both prior to and immediately after any such Works.

- (3) Backup shall be submitted to the Owner after maintenance is completed.
- 1.4.3 Provide manufacturer's warranty on all applicable equipment as outlined within the specifications.
 - (1) All equipment warranties shall commence following the completion of the SAT as outlined in Section 01 91 13S.
 - (2) No early or provisional commencement shall be permitted.
- 1.4.4 Warranty services shall include on site assessment, troubleshooting, removal, replacement, and re-commissioning of any defective components or materials.
- 1.4.5 Acknowledge reported issues within eight (8) hours during normal working hours. A written response to the report shall constitute an acknowledgement of the issue.
- 1.4.6 Assess reported issues on site within one (1) business day of response. Where possible, undertake labour or material warranty repairs within 24 hours of site assessment, subject to the nature and severity of issue.
- 1.4.7 Spare equipment at the site may be used to correct equipment deficiencies but shall be replaced with new, equivalent equipment at no additional cost to the Owner.
- 1.4.8 Repair or replace faulty materials or components at the earliest possible opportunity.
- 1.4.9 Supplied equipment with manufacturer's warranties that exceed those identified above shall be provided to the Owner and supplied as part of the Closeout Submittals.
- 1.4.10 Warranty requirements specified in this section apply to all labour, components, and material delivered under this contract, unless explicitly stated elsewhere in the specifications.
- 1.4.11 If warranty obligations are not met within the specified timeframes, the Owner may engage Others to complete the Work.
 - (1) Costs associated with the repairs will be issued to the Contractor.
 - (2) Work by Others to correct warranty issues under these conditions shall not void the Contractor warranty.

2.0 PRODUCTS

2.1 NOT USED

- 2.1.1 Not used.

3.0 EXECUTION

3.1 NOT USED

3.1.1 Not used.

END SECTION

1.0 GENERAL

1.1 SECTION INCLUDES

- 1.1.1 As-built, samples, and specifications.
- 1.1.2 Equipment and systems.
- 1.1.3 Product data, materials and finishes, and related information.
- 1.1.4 Operation and maintenance data.
- 1.1.5 Spare parts, special tools, and maintenance materials.
- 1.1.6 Warranties and bonds.
- 1.1.7 Final site survey.

1.2 RELATED SECTIONS

- 1.2.1 DIVISION 01 00 00 General Requirements
 - (1) Section 01 77 00S – Closeout Procedures
 - (2) Section 01 79 00S – Demonstration and Training
 - (3) Section 01 91 13S – General Commissioning
- 1.2.2 DIVISION 26 00 00 Electrical
 - (1) Section 26 00 00S – Electrical Work Summary and General Requirements
 - (2) Section 26 06 02S – Local Area Network
 - (3) Section 26 06 03S – Data & Voice Cabling

1.3 SUBMISSION

- 1.3.1 Prepare instructions and data using personnel experienced in the maintenance and operation of the described products. Submit one (1) draft copy to the Owner and Engineer for review as outlined in Section 26 00 00S. The reviewed copy will be returned with comments from the Owner and the Engineer.
- 1.3.2 Revise the content of the documents as required by the review comments prior to final submittal.
- 1.3.3 Prior to Substantial Completion of the Work, as outlined in Section 26 00 00S, submit to the Owner one (1) soft copy of the Operating and Maintenance manuals in English.
- 1.3.4 Ensure that all maintenance materials and any special tools provided are new, undamaged, and of the same quality and manufacture as products supplied in the Work.

- 1.3.5 Furnish evidence as to the type, source, and quality of products provided, if requested by the Owner or the Engineer.
- 1.3.6 Defective products will be rejected, regardless of previous inspections.
- 1.3.7 Defective products shall be replaced at no additional cost to the Owner.
- 1.3.8 Pay all delivery costs associated with submittals.

1.4 OPERATING AND MAINTENANCE MANUALS

1.4.1 Format

- (1) Organize data in the form of a digital file.
- (2) Covers: Identify file with "Project Record Documents", include the project title and a summary of the file's contents.
- (3) Arrange content by systems using section numbers and the sequence of the Table of Contents.
- (4) Provide digital bookmarks for each separate product or system, with a typed description of the product and its major component parts.
- (5) Text may be manufacturer-provided or typewritten data where necessary.
- (6) Drawings: Appendix in digital file.
- (7) Provide a complete set of all documents as digital files uploaded to VAA Sharepoint portal.

1.4.2 Contents – Each Volume

- (1) Table of Contents:
 - .1 Title of project
 - .2 Date of submission
 - .3 Names, addresses, and telephone numbers of the Engineer and Contractor, including their representatives
 - .4 Indexed schedule of products and systems.
- (2) For each product or system: list names, addresses, and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- (3) Warranty: Include all relevant dates and specific contact information for project and materials warranty information.
- (4) Maintenance: Include all Owner supplied forms, full equipment lists with serial numbers, and manufacturer-recommended maintenance schedules.
- (5) Product Data: Mark each sheet to clearly identify specific products, component parts, and data applicable to the installation; delete inapplicable information.
- (6) Drawings: Supplement product data to illustrate relationships between component parts of equipment and systems, to show control and flow diagrams.

- (7) Typewritten Text: Where necessary, supplement product documentation with a logical sequence of instructions for each procedure, incorporating manufacturer's instructions.
- (8) Training: Refer to Section 01 79 00S – Demonstration and Training.

1.5 ADMINISTRATION AND MAINTENANCE LIST

- 1.5.1 Provide the Owner with digital softcopy lists of all information necessary to allow administration privileges and maintenance on all newly installed or reconfigured equipment and components, including network switches, firewalls, servers, monitoring appliances, and control modules. The lists shall include the following for all equipment and components:
 - (1) IP addresses
 - (2) Usernames
 - (3) Passwords
 - (4) SNMP strings
 - (5) Firmware or software versions.
- 1.5.2 IP addresses shall be provided for each discrete device with one-to-one mapping of device name and IP address.
- 1.5.3 Passwords shall be provided securely as directed by the Owner.

1.6 AS-BUILTS AND SAMPLES

- 1.6.1 Maintain one (1) up-to-date copy of the following documents at the site, available at all times for the Owner to view:
 - (1) Contract Drawings
 - (2) Specifications
 - (3) Addenda
 - (4) Change Orders and other modifications to the Contract
 - (5) Reviewed shop drawings, product data, and samples
 - (6) Field test records
 - (7) Inspection certificates
 - (8) Manufacturer's certificates.
- 1.6.2 Store record documents and samples in a secure field office location separate from documents used for construction. Provide labelled files, racks, and secure storage.
- 1.6.3 Label each document "PROJECT RECORD" in large, legible, printed letters and file them in accordance with Section number listings in the List of Contents of this Project Manual.
- 1.6.4 Maintain record documents in clean, dry, and legible condition. Do not use record documents for construction purposes.
- 1.6.5 Keep record documents and samples available for inspection by the Owner.

- 1.6.6 Such record documents shall be transferred to the Owner as part of the Closeout Submittals.
- 1.6.7 All as-built and sample documentation shall be submitted to the Engineer via the VAA Sharepoint portal.
 - (1) Drawings shall be submitted in both DWG and PDF format.

1.7 RECORDING ACTUAL SITE CONDITIONS

- 1.7.1 Record information on set of black line opaque drawings within a copy of the Project Manual.
- 1.7.2 Document record information using felt tip marking pens, maintaining separate colours for each major system.
- 1.7.3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- 1.7.4 Contract Drawings and shop drawings: legibly mark each item to record all deviations and actual construction details, including:
 - (1) Measured locations of internal installations and appurtenances, referenced to visible and accessible features of construction.
 - (2) Field changes of dimension and detail.
 - (3) Modifications made by change orders.
 - (4) Details not on original Contract Drawings.
 - (5) References to related shop drawings and modifications.
- 1.7.5 Specifications: Legibly mark each item to record actual construction, including:
 - (1) Manufacturer, trade name, and catalogue number of each product actually installed, with particular attention paid to optional items and substitute items.
 - (2) Changes made by Addenda and change orders.
- 1.7.6 Other Documents: Maintain manufacturer's certifications, inspection certifications, and field test records, as required by individual specifications sections.
- 1.7.7 Provide the Owner with a softcopy of all drawing records.

1.8 EQUIPMENT AND SYSTEMS

- 1.8.1 Each Item of Equipment and Each System: include a description of the unit or system, and its component parts.
- 1.8.2 The description shall include:
 - (1) Function
 - (2) Characteristics of normal operation
 - (3) Limiting conditions

- (4) Performance curves with engineering data and tests
 - (5) Complete nomenclature and commercial numbers of replaceable parts.
- 1.8.3 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- 1.8.4 Include installed colour coded wiring diagrams.
- 1.8.5 Operating Procedures: include start-up, break-in, and routine operation. Provide clear instructions for regulation, control, stopping, shutdown, and emergency scenarios. Where necessary, include summer, winter, and any special operating instructions.
- 1.8.6 Maintenance Requirements: include routine procedures and guides for the following:
 - (1) Troubleshooting
 - (2) Disassembly
 - (3) Repair
 - (4) Reassembly
 - (5) Alignment, adjustment, and balancing
 - (6) Checking.
- 1.8.7 Include printed copies of manufacturer's operation and maintenance instructions.
- 1.8.8 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- 1.8.9 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- 1.8.10 Include testing reports as specified in 01 91 13S.
- 1.8.11 Additional requirements: As specified in individual specification sections.

1.9 MATERIALS AND FINISHES

- 1.9.1 Restore any surfaces damaged or impacted by construction to their original finishes.
- 1.9.2 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.
- 1.9.3 Additional Requirements: as specified in individual specifications sections.

1.10 MAINTENANCE MATERIALS

- 1.10.1 Provide maintenance and extra materials, in quantities specified in individual specification sections.

- 1.10.2 Provide items of the same manufacture and quality as items in Work.
- 1.10.3 Deliver materials to the location as directed by the Owner; properly place and store.
- 1.10.4 Receive and catalogue all items. Submit inventory listing to the Owner. Include approved listings in Maintenance Manual.
- 1.10.5 Obtain receipt for delivered products and submit prior to final payment.

1.11 SPECIAL TOOLS

- 1.11.1 Provide special tools, in quantities specified in individual specification section.
- 1.11.2 Provide items with tags identifying their associated function and equipment.
- 1.11.3 Deliver materials to the location as directed by the Owner; properly place and store.
- 1.11.4 Receive and catalogue all items. Submit inventory listing to the Owner. Include approved listings in the Maintenance Manual.

1.12 STORAGE, HANDLING AND PROTECTION

- 1.12.1 Store spare parts, maintenance materials, and special tools in a manner that prevents damage or deterioration.
- 1.12.2 Store in original and undamaged condition with the manufacturer's seal and labels intact.
- 1.12.3 Store components susceptible to damage from weather in weatherproof enclosures.
- 1.12.4 Store paints and freezable materials in a heated and ventilated room.
- 1.12.5 Remove and replace damaged products at own expense and to the satisfaction of the Owner.

1.13 WARRANTIES AND BONDS

- 1.13.1 Provide minimum of 1 year materials and workmanship warranty commencing from date of formal completion of Site Acceptance Test (SAT) and acceptance by Engineer and Owner.
- 1.13.2 Separate each warranty or bond with index tab sheets keyed to the Table of Contents.
- 1.13.3 List the subcontractor (if applicable), supplier, and manufacturer, including the name, address, and telephone number of a responsible representative.

1.13.4 Obtain warranties and bonds, executed in duplicate by the subcontractor, supplier, or manufacturer, within ten (10) days of completing the applicable Work item.

1.13.5 Except for items put into service on-site with the Owner's permission, leave the commencement date of the warranty until the Date of Substantial Performance is approved and certified by Engineer and Owner.

1.13.6 Verify that documents are in proper form, contain full information, and are notarized.

1.13.7 Co-execute submittals where required.

1.13.8 Retain warranties and bonds until time specified for submittal.

2.0 PRODUCTS

2.1 NOT USED

2.1.1 Not used

3.0 EXECUTION

3.1 NOT USED

3.1.1 Not used

END SECTION

1.0 GENERAL

1.1 SECTION INCLUDES

- 1.1.1 Procedures for demonstration and instruction of equipment and systems to Owner's personnel and, where required, the Engineer's personnel.

1.2 RELATED SECTIONS

- 1.2.1 DIVISION 01 00 00 General Requirements
 - (1) Section 01 78 00S – Closeout Submittals
 - (2) Section 01 91 13S – General Commissioning
- 1.2.2 DIVISION 26 00 00 Electrical
 - (1) Section 26 00 00S – Electrical Work Summary and General Requirements
 - (2) Section 26 06 02S – Local Area Network

1.3 DESCRIPTION

- 1.3.1 Demonstrate operation and maintenance of equipment and systems to the Owner's personnel and Engineer.
- 1.3.2 Conduct operational training for equipment and systems for the Owner's personnel.
- 1.3.3 Conduct maintenance training for equipment and systems for the Owner's personnel.

1.4 QUALITY CONTROL

- 1.4.1 Where specified in individual Sections, the Contractor shall be required to demonstrate the operation of equipment and systems to the Owner's personnel.
- 1.4.2 The Contractor shall submit a written report that confirms that all required demonstrations and training have been completed.

1.5 SUBMITTALS

- 1.5.1 Submit proposed time and date for demonstration of each item of equipment and system, as outlined in Section 26 00 00S, for Owner approval.
 - (1) The Owner shall provide a list of personnel to attend the demonstration and will coordinate their attendance at agreed-upon times.
- 1.5.2 Submit proposed time and date for staff training sessions, as outlined in Section 26 00 00S, for Owner approval.

- (1) The Owner shall provide a list of personnel to attend the training and will coordinate their attendance at agreed-upon times.
- 1.5.3 Submit a report after each demonstration or training session confirming that they have been satisfactorily completed.
 - (1) Include the time and date of each demonstration or training session, with a list of attendees.
- 1.5.4 All training material and manuals shall be submitted to the Owner and Engineer for review and comment prior to the training as outlined in Section 26 00 00S.
 - (1) Revise the content of the documents as required by the review comments prior to the start of the Training Sessions.
- 1.5.5 Prepare and insert additional data into the Operating and Administration Manuals when the need for additional data becomes apparent during the instruction, demonstration, or review activities prior to final submission of the Manuals.
 - (1) Additional data may include undocumented procedures, modified settings, necessary troubleshooting steps, or other technical information.

1.6 CONDITIONS FOR DEMONSTRATIONS

- 1.6.1 Prior to any demonstration or training:
 - (1) Equipment shall be inspected and put into operation in accordance with individual specifications sections
 - (2) Tests and adjustments shall be performed in accordance with Section 26 00 00S.
 - (3) Copies of completed Operating and Administrative Manuals for use in demonstrations or training shall be provided to the Owner.

1.7 SCHEDULE AND COORDINATION

- 1.7.1 Aruba Central Operational User Training
 - (1) The course shall cover but is not limited to operational user training of all aspects of Aruba Central and the particularities of its implementation in this project. The course shall cover but is not limited to the following:
 - .1 A detailed review of the Operating Manual to explain all aspects of network operation and monitoring.
 - .2 Training shall be provided on system operation, monitoring, diagnostic, and troubleshooting.
 - .3 Dashboard Navigation and Site Management: Training on using the Aruba Central interface to monitor and manage multiple physical and logical network zones, with a focus on device health, alerts, and network status.

- .4 Device Configuration and Group Policies: Instruction on provisioning and applying consistent configuration templates and policies to Aruba access points, switches, and gateways across Owner's zones.
- .5 Client and Application Visibility: Hands-on use of tools to analyze client behavior, application usage, and bandwidth consumption.
- .6 Troubleshooting and Reporting Tools: Guidance on using insights, event logs, and diagnostic utilities to identify and resolve network issues, and generating compliance and performance reports.
- (2) Coordinate and accommodate for two (2) 4-hour training sessions, with up to eight (8) attendees, to be held on-site at the Owner's facility.
- (3) The Operational User Training sessions shall be video and audio recorded to allow for Owner re-use.

1.7.2 Aruba Central Administrator Training

- (1) Administrator training shall cover all aspects of administration. The course shall cover but is not limited to the following:
 - .1 A detailed review of the Administration Manual to explain all aspects of network administration and management.
 - .2 Instruction for Owner personnel in all phases of proposed shutdown, startup, backup, failover, and restore procedures.
 - .3 Training shall be provided on system administration, monitoring, recovery, and reconfiguration.
 - .4 Advanced Network Configuration and Policy Management: Training on creating and managing global configurations, access control policies, and network segmentation tailored to Owner's operations.
 - .5 Role-Based Access and Multi-Tenant Management: Instruction on setting up administrative roles and permissions within Aruba Central to delegate responsibilities across Owner's personnel.
 - .6 Integration with Fortinet Security Fabrics: Training on integrating Aruba Central with Fortinet Security Fabric and external syslog servers.
 - .7 Automation and Firmware Lifecycle Management: Guidance on using Zero Touch Provisioning (ZTP), scheduling firmware upgrades, and automating configuration rollouts for new switches and access points.
- (2) Coordinate and accommodate for two (2) 4-hour training sessions, with up to four (4) attendees, to be held on-site at the Owner's facility.
- (3) The Administrator training sessions shall be video and audio recorded to allow for Owner re-use.

1.7.3 Fortinet Security Fabric Administrator and Operations Training

- (1) Security Fabric Administrator training shall cover all aspects of administration and operation of the Fortinet Security Fabric implementation at the Owner's facility. The course shall cover but is not limited to the following:
 - .1 Instruction for Owner personnel in all phases of proposed security fabric shutdown, startup, backup, failover, and restore procedures.
 - .2 Firewall Configuration and Policy Management: Training on setting up and managing firewall rules, NAT policies, and zone-based security tailored for airport network segmentation (e.g., separating public Wi-Fi, baggage systems, and airside operations).
 - .3 Threat Detection and Response: Hands-on instruction in using FortiGate features like IPS, antivirus, application control, and (if required) FortiSIEM integration to detect, log, and respond to potential cybersecurity threats across Owner systems.
 - .4 Incident and Event Monitoring, Collection, and Logging: Hands-on instruction in configuring and operating FortiSIEM, including event ingestion, trend and metric interpretation, and log collection, reporting, and export.
 - .5 High Availability and Redundancy Planning: Training on configuring FortiGate in HA mode to ensure network continuity and failover capabilities.
 - .6 User Authentication and VPN Management: Instruction on secure remote access using IPsec/SSL VPNs and integrating user authentication with airport directory services for role-based access control.
- (2) Coordinate and accommodate for two (2) 8-hour training sessions, with up to four (4) attendees, to be held on-site at the Owner's facility.
- (3) The Administrator training sessions shall be video and audio recorded to allow for Owner re-use.

1.7.4 Verify that conditions for demonstration and instructions comply with requirements.

1.7.5 Verify that designated personnel are present.

1.7.6 All training sessions shall be video and audio recorded to allow for Owner re-use.

1.8 DEMONSTRATION

1.8.1 Demonstrate start-up, operation, control, adjustment, troubleshooting, servicing, and maintenance procedures of each item of equipment installed at the facility and at times coordinated with the Owner.

1.8.2 Demonstrate to the Owner and Engineer all phases of system shutdown and startup procedures.

- 1.8.3 Demonstrate to the Owner and Engineer the function of all network infrastructure equipment installed as part of the project.
- 1.8.4 Instruct personnel in all phases of operation and maintenance using manufacturer's manuals and training materials as the basis of instruction.
- 1.8.5 Review contents of manuals in detail to explain all aspects of operation and maintenance.
- 1.8.6 Prepare and insert additional data into the Operating and Administration Manuals if the need for additional data becomes apparent during demonstrations or instructions.

1.9 TRAINING MATERIALS

- 1.9.1 Training materials shall be platform specific documents custom produced by the Contractor for the Owner as outlined in this section. The documents shall make specific reference to how the Network, Aruba Central, and Fortinet Security Fabric is configured and shall include screen captures from the live system where appropriate.
- 1.9.2 The Network shall be supplied with a site-specific user manual that provides a clear overview of all user screens and functions, as they are configured for the site.
 - (1) The user manual shall be accompanied by comprehensive cheat sheets summarizing functions, commands, and operations that are expected to be leveraged frequently.
 - (2) The Contractor shall prepare draft cheat sheets and submit to the Owner and Engineer for review. The reviewed copy will be returned with comments from the Owner and the Engineer.
 - (3) Revise the content of the document(s) as required by the review comments prior to final submittal.
- 1.9.3 The Network shall be supplied with a site-specific Administration Manual that clearly outlines all administration functions including:
 - (1) Installation and setup
 - (2) Configuration and Modifications
 - (3) End point provisioning as they relate to the site.
- 1.9.4 The Network shall be supplied with a site-specific Maintenance Manual that includes:
 - (1) A clear overview of the maintenance activities and their frequency, nature, and documentation process.
 - (2) Instructions which clearly outline the shutdown and startup procedures of the Network and its components.
 - (3) For all Network components with integral expiry dates, a schedule of license and certificate renewal dates with the associated renewal procedure.

1.9.5 The Network shall be supplied with a site-specific as-built Configuration Manual that documents all settings for all components, including, but not limited to:

- (1) IP Matrices
- (2) VLAN descriptions
- (3) Virtual Interfaces
- (4) Management Interfaces
- (5) Firewall Rules
- (6) SNMP and Logging settings
- (7) Authentication, Authorization, and Account integrations
- (8) DNS ranges
- (9) Licensing Information

1.9.6 All training courses shall include a syllabus and an overview PowerPoint presentation.

1.9.7 Training materials shall be made in a PDF digital format.

2.0 PRODUCTS

2.1 NOT USED

2.1.1 Not used.

3.0 EXECUTION

3.1 NOT USED

3.1.1 Not used.

END SECTION

1.0 GENERAL

1.1 SECTION INCLUDES

- 1.1.1 Includes general commissioning planning, submittals, execution, evidence capture, deficiency correction, and acceptance for the Network Replacement & Cybersecurity Upgrade.
- 1.1.2 Includes Pre-Installation Check-Out (PICO), Factory Acceptance Testing (FAT), cutover readiness and execution evidence, Site Acceptance Testing (SAT), burn-in, and handover.

1.2 RELATED SECTIONS

- 1.2.1 DIVISION 01 00 00 General Requirements
 - (1) Section 01 33 00S – Submittal Procedures
 - (2) Section 01 45 00S – Quality Control
 - (3) Section 01 77 00S – Closeout Procedures
 - (4) Section 01 78 00S – Closeout Submittals
 - (5) Section 01 79 00S – Demonstration and Training
- 1.2.2 DIVISION 26 00 00 Electrical
 - (1) Section 26 00 00S – Electrical Work Summary and General Requirements
 - (2) Section 26 06 01S – Fibre Communications
 - (3) Section 26 06 02S – Local Area Network
 - (4) Section 26 06 03S – Data & Voice Cabling

1.3 DEFINITIONS

- 1.3.1 PICO: Pre-Installation Check-Out; visual and power-on checks to confirm equipment, labelling, and readiness before FAT.
- 1.3.2 FAT: Factory Acceptance Testing; scripted verification of functionality and resiliency before site cutover. Demonstration to Owner and Engineer at Contractor's facility.
- 1.3.3 SAT: Site Acceptance Testing; scripted onsite verification of the installed network against design intent, including a continuous 14-day incident-free operation.
- 1.3.4 Burn-in: The 14-day incident-free operating period within SAT required for acceptance.
- 1.3.5 TRR: Test Readiness Review; meeting to confirm prerequisites, windows, evidence templates, and rollback before SAT.

1.4 COMMISSIONING OBJECTIVES

- 1.4.1 Demonstrate that the installed network meets the design's performance, availability, cybersecurity, and manageability requirements, including the architecture: Access-to-Distribution (L2 only)-to-Core (VSX/L3 gateway) with Next-Generation Firewalls (NGFWs) in HA. Distribution shall not host SVIs.
- 1.4.2 Verify dual-homing: Distribution uplinks to both core rooms B112 and B109, and Access uplinks to diverse Distribution, except where single-homing is explicitly permitted by the design.

1.5 SUBMITTALS

- 1.5.1 Commissioning Plan: roles, schedule, outage windows, decision points, rollback strategies, evidence templates, and communications matrix. Include alignment to cutover phases and go/no-go gates.
- 1.5.2 PICO Package: completed checklists, deficiency log, and photos; request Engineer confirmation to proceed to FAT.
- 1.5.3 FAT Test Specification & Report: script set with IDs, step-by-step procedures, expected outcomes, quantifiable pass/fail criteria, and captured evidence; submit minimum 10 business days before FAT.
- 1.5.4 Cutover Plan & Live Cutover Log: block-by-block steps, validation points, time stamps, screenshots/CLI outputs, interface/route snapshots, photos of re-patching; submit final Cutover Report within five (5) business days of completion.
- 1.5.5 SAT Procedures (including 14-day burn-in criteria) and SAT Report: prerequisites, test sequence, acceptance criteria, and full evidence bundle.
- 1.5.6 As-built Configurations & Inventory: models, serials, firmware, labelling and photo evidence; promote final running configs to "as-built" baselines.

1.6 QUALITY ASSURANCE

- 1.6.1 Contractor's commissioning lead: minimum 5 years enterprise switching/firewall commissioning; Aruba AOS-CX and Fortinet HA experience.
- 1.6.2 Test equipment calibrated within 12 months.
- 1.6.3 Witnessing: Engineer/Owner may witness any test phase.
- 1.6.4 The Contractor shall maintain a single deficiency log and track re-tests to close.

1.7 COORDINATION, WINDOWS & RISK CONTROLS

- 1.7.1 Coordinate outage windows with Owner minimum 5 days in advance; default 3-hour change blocks with final 60 minutes reserved for validation/rollback.

- 1.7.2 Decision points: Go/No-Go #1 before enabling Core SVIs; Go/No-Go #2 before changing the Core default route to Fortinet.
- 1.7.3 Schedule business-critical VLAN migrations (e.g., PA/FIDS/ACS/CCTV) in lowest-impact windows as per Owner's direction.

1.8 SITE INFORMATION

- 1.8.1 Existing equipment details for specified locations (Boardroom 2053, Field Equipment Compound, NPSV Hut, Powerhouse) will be provided prior to commissioning to support PICO/FAT/SAT planning.

2.0 PRODUCTS

2.1 TEST & COMMISSIONING TOOLS

- 2.1.1 Traffic generation, link monitoring, and log capture tools suitable to demonstrate design performance and resiliency (e.g., LACP/MC-LAG, MSTP roles, VSX health).
- 2.1.2 Photo documentation devices to capture labelling, terminations, rack elevations, and patching.

3.0 EXECUTION

3.1 PRE-INSTALLATION CHECK-OUT (PICO)

- 3.1.1 Perform visual inspection; then energize equipment to confirm POST success and absence of hardware alarms. Document discrepancies and re-PICO affected items. Submit completed PICO checklists to Owner/Engineer for confirmation to proceed to FAT.

3.2 FACTORY ACCEPTANCE TEST (FAT)

- 3.2.1 Develop a detailed FAT Test Specification with case IDs, objectives, pre-conditions, step-by-step procedures, expected outcomes, quantified pass/fail, evidence capture, and accountability; submit minimum 10 business days prior to FAT for review and incorporation of comments.
- 3.2.2 Include resiliency scenarios (Distribution/Core fail-over) and realistic traffic loading.
- 3.2.3 FAT must be accepted with a signed Report; red-line test scripts shall be promoted to SAT versions.

3.3 INSTALLATION VERIFICATION & CUTOVER PREPARATION

- 3.3.1 Verify that all hardware is installed per Drawings; label per the Drawing convention; photograph front/rear views and cabling.

- 3.3.2 Confirm architecture constraints: Distribution remains L2-only (no SVIs/IPs); Core VSX will provide all L3 gateway functions.
- 3.3.3 Maintain a live Cutover Log with timestamps, commands, screenshots, snapshots, and patching photos; update the YYJ Network Patching Schedule and port descriptions after each block; submit a consolidated Cutover Report within five (5) business days.
- 3.3.4 Observe the phased approach and rollback strategies identified in 26 06 02S (e.g., staging Distribution L2-only, staging Core/NGFW offline, enabling SVIs during routed cut).

3.4 TEST READINESS REVIEW (TRR)

- 3.4.1 Prior to SAT, conduct a TRR with Owner/Engineer to confirm:
 - (1) Approved outage windows and notices
 - (2) Accepted FAT Report and SAT procedures
 - (3) Frozen configurations and recorded firmware
 - (4) Proven rollback for each test block
 - (5) Completed installation, labelling, and photo documentation
 - (6) Verified Owner admin access to Aruba Central, Fortinet Security Fabric/UTP, and FortiSIEM

3.5 SITE ACCEPTANCE TEST (SAT) – EXECUTION

- 3.5.1 General: Perform SAT after successful FAT and TRR. SAT demonstrates design compliance and shall run for a continuous fourteen (14) calendar days without incidents to achieve acceptance.
- 3.5.2 Sequencing (order of execution):
 - (1) Access layer tests room-by-room on the new Distribution (L2-only)
 - (2) Distribution layer tests (uplinks to both cores)
 - (3) Core VSX & L3
 - (4) Firewall HA and policy pathing
 - (5) End-to-end services & performance
 - (6) Resiliency/failover.
- 3.5.3 Dual-path verification: Demonstrate Distribution uplinks to both cores in rooms B112 and B109 and traffic forwarding via each core.
- 3.5.4 Physical/Power/Inventory: Verify device models, serials, optics/PSUs/fans/firmware, confirm A/B power feeds and clear alarms; photograph racks and cabling. Acceptance: no critical alarms; inventory complete; photos stored.
- 3.5.5 Labeling & Patching: Check 100% label compliance with Drawing convention; verify patching against the YYJ Network Patching Schedule; log/rectify deviations. Acceptance: 100% compliant.

- 3.5.6 Layer 2 (Access/Distribution): Validate dual uplinks, LACP/MC-LAG, VLAN allow-lists (no native VLAN), MSTP role (root at Core), DHCP Snooping/DAI, and PoE budgets; confirm security events log to FortiSIEM/Aruba Central. Acceptance: trunks up/error-free; correct STP; protection features effective with logs present.
- 3.5.7 Layer 3 & Core VSX: Confirm no SVIs on Distribution; Core VSX provides all L3 gateways (Active Gateway), DHCP helpers, inter-VLAN routing, and routing to external networks as designed; verify VSX health and vLAGs.
- 3.5.8 Security Fabric & Observability: Confirm NGFW HA status, monitored interfaces, policy pathing; ensure syslog/SNMPv3/NTP and management ACLs per design are in effect; confirm Owner admin access to NMS/SIEM/security fabric.

3.6 DEFICIENCIES, RE-TEST, AND EVIDENCE

- 3.6.1 Record all deviations, alarms, or incidents in the SAT log with timestamps and evidence.
- 3.6.2 Correct deficiencies and re-test until acceptance criteria are met.
- 3.6.3 Maintain and submit the consolidated SAT Report and evidence bundle on completion.

3.7 ACCEPTANCE, CLOSEOUT & WARRANTY

- 3.7.1 Acceptance: SAT is accepted when the network operates for fourteen (14) continuous days without incident and all test cases meet acceptance criteria.
- 3.7.2 Proceed with closeout deliverables as per Section 01 78 00S and 01 77 00S (including final configurations, O&M, warranties, and training artifacts as per Section 01 79 00S).
- 3.7.3 Warranty periods and lien timing shall follow Section 01 77 00S; manufacturer warranties commence after successful SAT.

END SECTION

1.0 GENERAL

1.1 SECTION INCLUDES

- 1.1.1 This Section covers items common to Sections of Division 26.
- 1.1.2 Title and description of Work.
- 1.1.3 Work by others.
- 1.1.4 Work sequence.
- 1.1.5 Contractor use of premises.
- 1.1.6 Owner occupancy.
- 1.1.7 Electrical Work requirements for the following:
 - (1) Product quality, availability, storage, handling, protection and transportation.
 - (2) Manufacturer's instructions.
 - (3) Quality of Work, coordination and fastenings.
 - (4) Existing facilities.
- 1.1.8 This Section of the Specifications forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 RELATED SECTIONS

- 1.2.1 DIVISION 01 00 00 General Requirements
 - (1) Section 01 91 13S – General Commissioning
- 1.2.2 DIVISION 26 00 00 Electrical
 - (1) Section 26 06 01S – Fibre Communications
 - (2) Section 26 06 02S – Local Area Network
 - (3) Section 26 06 03S – Data & Voice Cabling

1.3 REFERENCE STANDARDS

- 1.3.1 Except where specifically modified within this specification, the installation shall, as minimum, comply with the latest issues of the following VAA standards.
 - (1) VAA FRM 2025-04-07 Hot-Work-Permit
 - (2) VAA FRM 2025-04-07 Red Tag Permit
 - (3) VAA GDL 2025-08-11 Contractor Coordination Program
 - (4) PLN 2023 Confined Space Plan
 - (5) VAA Contractor Orientation Form 2024

1.4 ELECTRICAL WORK COVERED BY CONTRACT DOCUMENTS

- 1.4.1 Work of this Contract comprises the redesign and upgrade of the Owner's existing IP network infrastructure, including the removal and replacement of End-of-Life equipment, the supply and installation of new network hardware and software, deployment of a centralized Security Information and Event Management (SIEM) platform, and integration of a holistic Network Management System (NMS) to enable unified network visibility and management. The Work includes implementation of network architecture improvements and cybersecurity enhancements identified in the Owner's Network Master Planning exercise and Integrated Development Initiative (IDI), including new fibre optic cabling, improved physical redundancy, and high availability next-generation firewalls, along with the delivery of operational training for the Owner's IT personnel to support long-term maintenance and stewardship.
- 1.4.2 The work includes, but is not limited to, the following:
- (1) Supply and installation of communication and power conduit.
 - (2) Supply and installation of network communication racks.
 - (3) Supply and installation of all network cabling, including copper and fibre optic cabling and patch cords where required.
 - (4) Supply and installation of cable and wire management.
 - (5) Supply and installation of copper and fibre optic patch panels.
 - (6) Supply and installation of network equipment, including core switches, distribution switches, access switches, firewalls, wireless access points, and supporting infrastructure such as patch panels and structured cabling components.
 - (7) Supply, installation, and configuration of network management software, firmware, monitoring tools, and all required licenses (term-based or perpetual).
 - (8) Supply and installation of cable and device labelling.
 - (9) Relocation of existing network equipment.
 - (10) Relabelling of existing network equipment.
 - (11) Decommissioning of existing network equipment, turnover to Owner, and disposal of existing network equipment where required.
 - (12) Configuration of IP addressing, VLANs, virtual interfaces, routing protocols, and security policies (e.g., ACLs, firewall rules).
 - (13) Integration with existing systems, where they will be staying in operation, including Active Directory and logging solutions.
 - (14) Setup and execution of Factory Acceptance Testing at Contractor's facility.
 - (15) Migration and cutover of network services from legacy equipment to new equipment, including coordination of changeovers to minimize service disruption.

- (16) Coordination with third-party vendors, service providers, and stakeholders performing work or installing equipment within the project limits.
 - (17) Testing and commissioning of all network infrastructure to validate operational performance and redundancy, including setup and execution of Site Acceptance Testing at the Owner's facility.
 - (18) Testing and validation of system reliability, traffic throughput, and latency according to product and contract specifications.
 - (19) Delivery of Network Operation and Maintenance training to the Owner as outlined in Section 01 79 00S.
 - (20) Decommissioning and recovery of all network equipment and associated components that are not otherwise reused in the new design.
 - (21) Development and submittal of all documentation, configuration records, drawing markups, warranty statements, and close-out documentation as specified in Section 01 78 00S.
- 1.4.3 Specific port allocations for network equipment as well as assigned IP addresses, subnet masks, default gateways, and virtual interfaces shall be provided by the Owner and Engineer in the form of an IP Assignments Matrix and Port Allocation Schedule. The installation and configuration of equipment shall be in strict accordance with these documents.
- 1.4.4 Day-0 configurations shall be applied to all Network equipment in accordance with Design, which includes:
- (1) Unboxing, rack-mounting, grounding and powering up the device.
 - (2) Setting the hostname and system clock or NTP.
 - (3) Configuring the management IP address and dedicated SVIs.
 - (4) Configuring remote access protocols as directed.
 - (5) Setting local Administration credentials.
 - (6) Disable unnecessary services.
 - (7) Setup login banners and legal statements.
 - (8) Enable Spanning Tree Protocol and set root bridge priorities where applicable.
 - (9) Enable IP routing.
 - (10) Configure logging levels and buffer sizes in accordance with design.
 - (11) Write the configuration to the device.
 - (12) Backup the configuration and submit all backups to the Owner.

1.5 PRODUCTS SCOPE OF WORK

- 1.5.1 The Contractor shall have the opportunity to view the work site during the pre-construction meeting. Any subsequent site visits shall be coordinated with the Owner and shall be requested a minimum of five (5) days before the tender close date.

- 1.5.2 It is the Contractor's responsibility to view the site and satisfy himself that all existing site conditions with respect to access, location, conditions, existing civil works, existing utilities, existing equipment, and any other site conditions are understood and sufficiently accounted for in the bid price.

1.6 WORK SEQUENCE

- 1.6.1 Conduct Work in stages to accommodate the Owner's continued use of premises during cutover and to minimize downtime of the network services.
- 1.6.2 Develop the Cutover Schedule in collaboration with the Owner.
- (1) The Contractor shall provide the Owner with a Cutover Schedule which includes the order in which rooms will be affected, at least 2 weeks prior to the start of the Work, as outlined in Section 26 06 02S.

1.7 SECURITY CLEARANCE

- 1.7.1 The Contractor is required to apply for and successfully obtain a Restricted Area Identity Card (RAIC) for all Contractor personnel who will be working on-site.
- (1) Any and all labour/wage costs associated with obtaining RAICs for Contractor personnel shall be borne by the Contractor and not reimbursable by the Owner.

1.8 WORK RESTRICTIONS

- 1.8.1 The Contractor is expected to read, understand, and comply with all standards outlined in clause 1.3.1 of this section (Section 26 00 00S).
- 1.8.2 The Contractor shall work to minimize interruptions to the Owner's network services and operational systems, and schedule disruptions outside of normal operation hours.
- 1.8.3 At no time shall is the Contractor permitted to connect any Contractor equipment to live or production Owner network equipment.
- 1.8.4 Configuration of all network equipment in the Contractor's facility shall be performed by using sanitized and cybersecure computer equipment with no Internet access.
- (1) Perform scans of any and all workstations/notebook computers that are to be connected to the network hardware for configuration purposes.
- (2) Provide scan results to Engineer prior to connection.
- (3) Proceed with connection of configuration machine to network only upon approval from Engineer.
- 1.8.5 Interruptions to the Network with a maximum anticipated duration of three (3) hours may occur as required, only with express approval from the Owner.

- (1) Activities planned within these engineering windows must include adequate time to roll back to the unchanged state if the cutover activity is to fail.
 - (2) The Network shall be in a fully operational state one hour before the engineering window closes. This final hour shall be used to test the operation of the changed portion of the network and provide time for roll-back should the system fail the test.
- 1.8.6 If any activities are anticipated to require an interruption exceeding the duration of three (3) hours, they shall be raised to the attention of the Owner at least four (4) weeks before they are intended to be conducted.
- 1.8.7 The Contractor shall adhere to the Owner contractor requirements.
- 1.8.8 The Contractor shall complete and submit an Outage Request Form to the Owner for review at least two weeks prior to the proposed time and date for the Work(s).
- 1.8.9 Work shall not be permitted until the Outage Request Form is reviewed and approved by the Owner.
- 1.8.10 The Outage Request Form shall contain the following information:
 - (1) Details of the affected rooms, systems, equipment, and communication infrastructure.
 - (2) A schedule of the activities to be carried out during the outage.
 - (3) The anticipated duration of each activity.
 - (4) The course of action for rolling back, if necessary.

1.9 CONTRACTOR USE OF PREMISES

- 1.9.1 The Contractor has restricted use of the Owner site.
- 1.9.2 The Contractor shall limit and control use of the premises to ensure:
 - (1) Continued Owner operations, as far as possible.
 - (2) Uninterrupted Owner occupancy.
 - (3) Concurrent Work by other third parties.
 - (4) Ongoing access and usage by the public.
 - (5) Adherence to site security requirements.
- 1.9.3 Coordinate use of premises under direction of the Owner and Engineer.
- 1.9.4 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.

1.10 OWNER OCCUPANCY

- 1.10.1 The Owner will occupy the project premises during entire project period for execution of normal operations.

- 1.10.2 The Contractor shall cooperate with the Owner in scheduling Work to minimize conflict and to facilitate normal operations as much as is practicable.

1.11 SECURITY

- 1.11.1 Connection of Contractor equipment to the Owner's network is prohibited at all times.
- 1.11.2 Ensure that the security of the Owner's operations is maintained at all times and security policies are complied with fully by all Contractor personnel.
- 1.11.3 Ensure all project-related Drawings, Specifications, Field Instructions, Product Data Sheets and other documents are stored in a secure, lockable location that is not-visible to the public or visitors.
- (1) Project Drawings and documents shall not be stored in unattended vehicles.
 - (2) Project Drawings and documents shall not be stored in non-secure areas during construction off-hours.

1.12 CONTRACTOR QUALIFICATIONS

- 1.12.1 All electrical work to be performed by a Registered Electrical and Inspection Contractor under provisions of British Columbia Electrical Safety Act.
- 1.12.2 All Works that manipulate network services are to be conducted by sufficiently competent and/or certified network technicians, engineers or administrators. The following constitutes the manipulation of network services:
- (1) Installing, configuring, or modifying network hardware or software.
 - (2) Assignment or alteration of network addresses or segments.
 - (3) The implementations or modification of network security policies or access configurations.
 - (4) Connection or disconnection of devices to the operational network.

1.13 WORK REGULATIONS

- 1.13.1 Work to conform to all applicable regulations of Workers' Compensation Board (WCB). If required, submit Notice of Project Form 52E49 prior to commencing construction. Confirm compliance with the following:
- (1) WCB form 30M33 to be completed prior to working in vicinity of overhead power lines.
 - (2) Notice of construction projects, WCB Industrial Health and Safety Regulations, Section 34.16(3).

1.14 DRAWING NOTES

- 1.14.1 All notes on Drawing E005 – Legend, Notes, and Nomenclature shall apply to the work.

1.15 DRAWING NOTATION

- 1.15.1 The Electrical Work includes the installation of new network equipment and the removal, re-use or relocation of some existing equipment. Unless specifically indicated otherwise, the Contractor shall assume that it has to supply and install all network equipment.
- 1.15.2 The Drawings for this design have a consistent colour-coding system to indicate the nature of the work to be done for a particular piece of equipment or communication media.
- (1) RED identifies new equipment for installation, configuration, testing, and commissioning.
 - (2) BLUE identifies relocated or to-be-relocated equipment, as well as re-labelled equipment.
 - (3) GREEN identifies equipment to be decommissioned and uninstalled.
- 1.15.3 Written notations may also be used on the Drawings to assist the Contractor in identifying what work needs to be done. These standard notations (in brackets) are defined as follows:
- (1) "All equipment is proposed unless noted otherwise" – indicates that equipment shown is to be supplied and installed by the Contractor.
 - (2) "All equipment is existing unless noted otherwise" – This notation is used on Drawings where the majority of the equipment is existing, indicating that the Contractor shall perform only the work identified.
- 1.15.4 Unless otherwise specified, the contractor is responsible for conducting all Work shown in the Drawings. Callouts may be used to indicate the type of work to be completed by the Contractor and is summarized as follows:
- (1) "Install" – The Contractor shall supply and install the equipment.
 - (2) "Remove" – The Contractor shall remove and dispose of the equipment. Equipment to be re-used or returned to the Owner shall be refurbished as per the Specifications.
 - (3) "Remove and Replace" – The Contractor shall remove and dispose of the specified equipment. The Contractor shall supply and install the replacement device with the new model and requirements as detailed in the Specifications.
 - (4) "Modify" – Equipment shall be modified as per the Drawings and specifications.
 - (5) "Relocate" – Equipment shall be removed, refurbished, and re-installed in the new location listed.
 - (6) "Relocated" – Equipment relocated from a former location shall be installed.
 - (7) "Reconnect" – The Contractor shall connect existing cabling to new or existing equipment as defined.
 - (8) "Denotes equipment to be removed" – The Contractor shall remove and dispose of the equipment. Equipment to be re-used or returned to the Owner shall be refurbished as per the specifications.

1.15.5 Drawings indicated as "For Information Only" (F.I.O) do not contain work items. These are provided for reference and may assist the Contractor in carrying out the Electrical Work. The Contractor is solely responsible for ascertaining and verifying information shown on these Drawings that relates to and/or directly affects the Electrical Work.

1.15.6 The Contractor is solely responsible for comprehending the work to be performed as it is described in the Drawings.

- (1) Information found to be confusing, ambiguous, or conflicting shall be raised in writing as soon as possible.
- (2) Misinterpretation of the drawings will not justify incomplete or inaccurate Work.

1.16 STANDARD OF ACCEPTANCE

1.16.1 The Standard of Acceptance provided in the Specification and Drawings have been determined through a combination of pre-testing, functional requirements verifications, and system compatibility confirmations.

1.16.2 Alternate products other than the Standard of Acceptance shall not be accepted unless submitted to the Owner and Engineer for approval two weeks prior to bid closing. Alternate products shall be reviewed and approved or rejected at the sole discretion of the Owner and Engineer.

1.17 EQUIPMENT REMOVALS

1.17.1 The Contractor shall remove all redundant network equipment on the project unless noted otherwise herein or on the Drawings. Not all existing electronic and network equipment is shown on the Drawings. The Contractor shall visit the project site to become familiar with the existing electrical and electronic facilities.

1.17.2 The Contractor shall obtain permission from the Owner prior to removing any electrical or electronic equipment.

1.17.3 Removal of existing redundant equipment shall be permitted only after explicit written approval by Owner, or after written approval by Owner once suggested by Integrator, and shall generally include, but is not limited to the following:

- (1) Removal of existing network hardware, including switches, routers, firewalls, wireless access points and associated mounting hardware.
- (2) Removal of obsolete patch panels, structured cabling components, and cable management infrastructure no longer required.
- (3) Removal of legacy labels, signage, and documentation holders that pertain to decommissioned network equipment.

1.17.4 Dispose of all removed material except for the following which shall be returned to the Owner, unless directed otherwise by the Owner:

- (1) Firewalls,

- (2) Switches,
- (3) Wireless Access Points,
- (4) Transceivers.

1.17.5 After removal, reinstate the Site to its original condition to the satisfaction of the Owner.

1.17.6 Removal and disposal includes disassembly, packaging, loading, off-loading, transportation, and disposal costs.

1.17.7 Equipment not to be disposed of shall be fully disassembled, bundled and packaged, clearly labelled and with a packing slip. The Contractor shall repair or replace any equipment damaged as a result of removal or shipping.

1.18 MATERIALS AND EQUIPMENT SUPPLIED BY THE CONTRACTOR

1.18.1 Provide materials and equipment in accordance with these specifications.

1.18.2 Equipment and material to be CSA (or equal) certified for installation in British Columbia. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Inspection Department or certified testing agency. Obtain approval from the Owner for alternative certification.

1.18.3 All materials of a similar type must be from a single manufacturer. The Contractor shall replace all material damaged in shipping at no additional cost to the Owner.

1.18.4 Provide a minimum of four (4) sets of original equipment manufacturer's data sheets or manuals for all network equipment supplied.

1.18.5 Pay costs of transportation of products required in performance of Work.

1.19 MAINTENANCE AND OPERATION OF EXISTING SYSTEMS

1.19.1 Ensure that existing fibre, LAN, security, operational and surveillance systems are kept operational at all times unless approved by the Owner and as set out in the Work Restrictions above.

1.19.2 Keep all signs clean and readable during construction.

1.19.3 Maintain power to meet the requirements of this Section. Temporary power may be used to satisfy the requirements of this Section.

1.20 EXISTING SERVICES

1.20.1 Notify the Owner and utility companies of intended interruption of services and obtain required permission.

1.20.2 Where work involves breaking into or connecting to existing services, give Owner 48 hours' notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions to a minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.

1.20.3 Provide for pedestrian and vehicular traffic.

1.21 INSPECTIONS

1.21.1 Cooperate with all third-party jurisdictions to ensure that all requirements are met.

1.22 FINISHES

1.22.1 Clean and touch-up surfaces of shop-painted equipment scratched or marred during shipment or installation to match original paint.

1.22.2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

1.23 EQUIPMENT IDENTIFICATION

1.23.1 Communication racks or cabinets shall be identified with labels adhering to one of the following specifications, unless explicitly stated otherwise:

- (1) Laser engraved stainless steel mechanically attached with self tapping stainless steel screws with text height of 25 mm.
- (2) Embossed plastic labels mechanically attached with self tapping stainless steel screws with a 6 mm text height.

1.23.2 Contents and convention of labels shall be adhered to as they are laid out within the Drawings.

1.24 MANUFACTURERS' AND CSA LABELS

1.24.1 Shall remain visible and legible after equipment is installed.

1.25 MANUFACTURERS' AND EQUIPMENT APPROVAL LABELS

1.25.1 Shall remain visible and legible after equipment is installed.

1.26 FIELD QUALITY CONTROL

1.26.1 All electrical work to be carried out by qualified, licensed electricians or apprentices as per the conditions of the Provincial Act respecting manpower vocational training and qualification. Employees registered in a provincial apprentices program shall be permitted, under the direct supervision of a qualified licensed electrician, to perform specific tasks - the activities

permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.

1.26.2 Carry out tests in the presence of the Owner unless otherwise permitted in writing.

1.26.3 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

1.26.4 Submit test results for the Owner's review.

2.0 PRODUCTS

2.1 QUALITY

2.1.1 Products, materials, equipment and articles (hereinafter referred to as 'Products') incorporated in work shall be:

- (1) New, not damaged or defective,
- (2) Of the highest quality appropriate for the intended purpose and compatible with specifications.
- (3) Supplied with evidence as to type, source and quality when requested by the Owner.

2.1.2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections or approvals.

- (1) Inspections do not relieve the Contractor of responsibility but are a precaution against oversight or error.
- (2) Defective products shall be removed and replaced at the Contractor's expense and the Contractor shall be liable for delays and expenses caused by rejection.

2.1.3 Should any dispute arise as to the quality or fitness of products, decision rests strictly with the Owner based upon requirements of Contract Documents.

2.1.4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.

2.1.5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms. Labels must be visible after installation of equipment.

2.2 AVAILABILITY

2.2.1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, notify the Engineer of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.

- 2.2.2 In the event of a failure to notify the Engineer at commencement of Work and should it subsequently appear that Work may be delayed for such reason, the Engineer reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

3.0 EXECUTION

3.1 STORAGE HANDLING AND PROTECTION

- 3.1.1 Handle and store all products in a manner that prevents damage, contamination, deterioration, or electrostatic discharge damage, and in accordance with manufacturer's instructions when applicable.
- 3.1.2 Store packaged or bundled equipment in original condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- 3.1.3 Store products sensitive to environmental conditions in weatherproof enclosures with the appropriate climate controls and static protection, as per the manufacturers' guidelines.
- 3.1.4 Store cable reels, trays and conduits on flat, solid supports and keep clear of ground. Ensure cables are protected from physical deformation and environmental exposure.
- 3.1.5 Remove and replace damaged products to the satisfaction of the Owner, at no additional cost to the Owner.

3.2 TRANSPORTATION

- 3.2.1 Pay costs of transportation of products required in performance of Work.
- 3.2.2 Transportation cost of products supplied by the Owner will be paid for by the Owner. Unload, handle and store such products in accordance with Section **Error! Reference source not found..**

3.3 MANUFACTURER'S INSTRUCTIONS

- 3.3.1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturer.
- 3.3.2 Notify the Owner in writing, of conflicts between specifications and manufacturer's instructions, so that the Owner may establish the course of action.
- 3.3.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes the Owner to require removal and re-installation at no increase in Contract Price or Contract Time.

3.4 QUALITY OF WORK

- 3.4.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed.
- 3.4.2 Do not employ anyone unskilled in their required duties. the Owner and the Owner reserves right to require dismissal from site, workers deemed incompetent or careless.
- 3.4.3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with the Owner, whose decision is final.

3.5 COORDINATION

- 3.5.1 Ensure cooperation of all workers (including employees and subcontractors) in laying out Work.
- 3.5.2 Maintain efficient and continuous supervision of Work activities.
- 3.5.3 Be responsible for coordination and placement of cable routing paths, conduits, trays, and network equipment mounting hardware.

3.6 REMEDIAL WORK

- 3.6.1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable at no increase in the Contract Price or Contract Time. Coordinate adjacent affected Work as required.
- 3.6.2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

3.7 LOCATION OF EQUIPMENT

- 3.7.1 If any product cannot be installed in the locations shown on the Drawings, contact the Engineer or Owner for approval of a change in the location.
 - (1) The Owner and Engineer will instruct on the course of action to install the affected product(s).

3.8 PROTECTION OF WORK IN PROGRESS

- 3.8.1 Prevent overloading of any part of buildings and structures at all times.
- 3.8.2 Do not cut, drill or sleeve any load bearing structural member, unless specifically indicated, without written approval of the Owner.

3.9 EQUIPMENT STAGING

- 3.9.1 The Contractor shall be responsible for delivery of the Project including, but not limited to, the following:
 - (1) Procurement of supplies (including temporary storage).

- (2) Initial pre-commissioning provisioning of network devices.
 - (3) Factory Acceptance Testing (FAT) the equipment.
 - (4) This shall be conducted in a wholly separate facility to the Work Site.
- 3.9.2 Repackaging and transporting the equipment to site after completion of the FAT.
- (1) In accordance with Section 3.1.
- 3.9.3 While Contractor is undertaking the Work at the Work Site, they shall be entirely responsible for the maintaining the security of the Work Site, in accordance with the Owner-specified security level of the area of the work.
- (1) Airside Restricted Access
 - (2) Landside Private Access
 - (3) Custom Private Access
- 3.9.4 The purview of Work Site security includes: all tools, materials (new and existing), and equipment. All items stored within the approved areas of the work site shall be secured, to prevent theft or relocation of these items.
- 3.9.5 Use of Work Areas
- (1) The work site is as shown or specified in the contract documents and shall only be used for the purposes of the work.
 - (2) The work site will be made available by the Owner to the contractor for its non-exclusive use, free of charge, for the duration of the work unless otherwise provided in the contract documents.
 - (3) The Contractor shall, at its cost, provide any additional storage areas elsewhere that it may require.

3.10 PHOTOGRAPHIC DOCUMENTATION

- 3.10.1 Photographs shall be taken by the Contractor to capture the following information:
- (1) Existing pre-commissioning state of the site.
 - (2) Post-commissioning state of the site.
- 3.10.2 All photographs shall clearly demonstrate labeling of equipment or cabling.
- 3.10.3 As open equipment is installed, photographs shall be taken of the following, if applicable:
- (1) Close-up of each piece of equipment once installed.
 - (2) Wide field-of-view showing the equipment, installed conduit (where applicable), and surrounding area.
 - (3) The Engineer and Owner will review photographs and provide direction for equipment adjustments, as necessary. Provide secondary photographs to the Engineer of equipment if adjustments were required until installation is satisfactory. Allow five (5) days for the Engineer and Owner review of photographs.

- 3.10.4 As cabling or covered equipment is installed, photographs shall be taken of the following, if applicable:
- (1) Close-up of network equipment racks, cabinets, and corresponding labeling.
 - (2) Wide-angle views showing the equipment and surrounding area.
 - (3) Close-up of internal wiring of enclosures, junction boxes and areas that will be covered.
 - (4) Close-up of each device and corresponding labeling housed within enclosures.
 - .1 Photographs shall clearly capture the cable terminations and port labelling where applicable.
 - .2 Where applicable, patch panel ports, terminal blocks, device model numbers, and corresponding labelling shall be clearly identified in each photograph.
 - (5) The Engineer and Owner will review photographs and provide direction for adjustments, as necessary.
 - .1 Enclosures, cabinets, or cable management deemed to be disorganised by the Owner or Engineer shall be modified by the Contractor and secondary photographs shall be taken and provided to the Engineer.
 - .2 Allow five (5) days for the Engineer and Owner review of photographs.
- 3.10.5 Photographs shall be taken that show the newly installed equipment, as and when cutovers take place.
- 3.10.6 Submit an electronic copy of colour digital photography in jpg format, minimum 4MP resolution, and frequency as directed by the Engineer, and as identified within the Specifications.
- 3.10.7 All photographs shall be organized in a parent folder with the room name, with sub-folders for each network rack. All image file names shall include the date of capture and a description of the image.
- 3.10.8 Photo submissions shall be made within three (3) working days of the cutover.

END OF SECTION

1.0 GENERAL

1.1 PAYMENT GENERAL

- 1.1.1 This Section provides the description and measurement for payment for the Electrical Work described herein and as shown on the Drawings and Specifications. Include all Work considered incidental to the Contract within the applicable payment clauses.
- 1.1.2 This Section of the Specifications forms part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.
 - (1) These Supplementary Specifications are to be read with the MMCD (Platinum Volume II, 2019).
 - (2) Where conflicts exist, MMCD General Conditions govern.
- 1.1.3 All Work shown on the Drawings and Specifications that is not specifically defined in the payment items described within this section shall be considered incidental to the Work. No extra payment will be made. The Contractor is required to provide all labour, equipment, materials, and supervision necessary to provide a complete working system and complete the Work.
- 1.1.4 Payment for an item shall cover all costs of labour, equipment, material, and supervision to satisfactorily complete the Work indicated on the Drawings and described in the Specifications, and shall cover all costs of mobilization, access arrangements, security clearance, orientation, demobilization, cleanup, coordination with Owner, disposal, coordination with others, quality controls, and all incidental or other Work required to complete the item of Work to the satisfaction of the Engineer and Owner.

1.2 SCHEDULES OF QUANTITIES AND PRICES (SOQP)

- 1.2.1 Bid Submission Requirement:
 - (1) The Contractor shall submit a detailed Schedule of Quantities and Prices (SOQP) with the Bid. Bids may be deemed non-compliant if a SOQP is not provided in accordance with this Section. The SOQP will be used by the Owner and Engineer to evaluate pricing and staging prior to award.
- 1.2.2 Format:
 - (1) The Contractor shall provide the SOQP as PDF and editable XLSX formats. Each line shall include, at minimum:
 - .1 Item No.
 - .2 Item/Milestone Description
 - .3 Drawing/Room/Rack Block (e.g., ATB-B112-R01)
 - .4 Unit (LS/Ea/m)
 - .5 Quantity
 - .6 Unit Price

- .7 Extended Price.
 - (2) Totals shall reconcile to the Bid Form.
- 1.2.3 Granularity:
 - (1) Break out the Contract Price as Lump Sums aligned with the payment descriptions outlined in part 1.3.
- 1.2.4 Staged Milestones Within Items:
 - (1) Where part 1.3 defines staged payments, show sub-lines under the item (e.g., "2a Materials on Hand (50%)", "2b PICO-Ready (50%)"). Sub-lines are for valuation and schedule transparency only and do not change the Lump Sum for the parent item.
- 1.2.5 Unit-Rate Schedule (for Changes):
 - (1) Include with the SOQP a Unit-Rate Schedule (separate tab) listing: labour classifications with regular/OT hourly rates; commonly used small tools/equipment rates; and typical material unit prices (e.g., fibre terminations, patch cords by length, SFP/SFP+/QSFP by form factor). Unit rates are for evaluation and change-order negotiation only; the Contract remains Lump Sum except where adjusted by Change Order.
- 1.2.6 Cross-Reference to Measurement for Payment:
 - (1) Each SOQP line shall reference the corresponding Measurement for Payment item in part 1.3 and acceptance evidence (e.g., "Cut-over Report", "SAT Report", "14-day burn-in complete") to support progress valuations.
- 1.2.7 Owner's Right to Adjust Scope:
 - (1) Reservation of rights:
 - .1 The Owner reserves the right, after receipt of Bids and during negotiation with the Selected Contractor, to reduce or remove portions of the Work, delete SOQP line items in whole or in part, consolidate or defer "block" scopes, and/or make a partial award to align with budgetary or operational constraints.
 - (2) Commercial terms:
 - .1 If exercised prior to award, the Selected Contractor shall accept such adjustments without change to unit prices, mark-ups, or other commercial terms offered in the Bid. The Contract Price will be the sum of accepted SOQP lines at the Bid values.
 - (3) Valuation mechanics:
 - .1 For partial reduction of composite lines, the reduction will be valued using the corresponding SOQP sub-lines shown in the Bid; where sub-lines are not provided, pricing will be derived from the Unit-Rate Schedule submitted with the Bid. No separate compensation is payable for anticipated profits or head-office overhead on deleted Work.
 - (4) Post-award deletions:

- .1 Any further scope reductions after award will be processed under MMCD, using the accepted SOQP and, where applicable, the Unit-Rate Schedule.
 - (5) Schedule impacts:
 - .1 The Contractor shall promptly re-baseline the schedule to reflect deletions. No delay costs are payable for deletions alone. Time adjustments, if any, are limited to demonstrable critical-path impacts accepted by the Engineer and Owner.
 - (6) Allowances/Alternates:
 - .1 Affected Allowances and Alternates, if required, will be adjusted correspondingly.
 - (7) SOQP balance:
 - .1 The Owner may require reasonable re-allocation of the remaining SOQP to maintain balance and avoid front-loading, without changing the Bid total for the accepted scope.
- 1.2.8 Front-Loading Control:
- (1) The SOQP must be balanced and proportionate to the Work. Mobilization, overhead, initial submittals, and markup shall cumulatively not exceed 15% of the Contract Price. The Owner may require re-allocation of the SOQP prior to award without changing the Bid Price.
- 1.2.9 Post-Award Reconciliation:
- (1) Within 5 business days after award, submit an administrative SOQP identical to the Bid SOQP or updated only to incorporate any Owner-directed re-allocation per clause 1.2.8 (no change to Contract Price).

1.3 MEASUREMENT FOR PAYMENT DESCRIPTIONS

1.3.1 **Mobilization, Health & Safety, Project Controls, and Initial Submittals**

- (1) Payment shall be made at the Lump Sum Price tendered in the schedule.
- (2) The Lump Sum Price shall include all costs for the following:
 - .1 Mobilization plan, site access/clearance coordination, logistics, storage, laydown.
 - .2 Health & Safety Plan; task-specific hazard assessments; emergency contacts; hot-work/LOTO procedures.
 - .3 Project controls setup: master schedule (with cut-over windows), RFI log, submittal register, risk register.
 - .4 Initial submittals: shop drawings list, product data, certificates, sample labels, cable schedule framework.
 - .5 All other labour, materials, and equipment required to complete the Work.
- (3) Evidence/Acceptance:
 - .1 Approved initial submittal package; minutes confirming H&S acceptance; project controls templates in use.
- (4) Payment: 100% upon acceptance.

1.3.2 Network Hardware

- (1) Payment shall be made at the Lump Sum Price tendered in the schedule.
- (2) The Lump Sum Price shall include all costs for the following:
 - .1 Supply of all network hardware, including core/distribution/access network switches, NGFW appliances, transceiver modules, stacking cables, PDUs, grounding cabling, power cabling, racks, rack mounts, patch panels, patch cords, cable managers, labelling, terminations, and all other equipment as indicated on the Drawings and outlined in the Specifications.
 - .2 Factory order tracking, lead-time management, substitution control, and anti-counterfeit/anti-tampering measures.
 - .3 Receiving, inspection, safe storage, and insurance while under Contractor custody.
 - .4 Inventory register with model, serial, MAC address, license entitlement, location assignment.
 - .5 All other labour, materials, and equipment required to complete the Work.
- (3) Evidence/Acceptance (Stage A: Materials on Hand 50%):
 - .1 The Contractor may charge up to 50% of the materials costs when the equipment arrives at the Contractor Facility for use during the Factory Acceptance Testing (FAT) as long as proof of equipment arrival is provided. Proof of arrival constitutes photographs of the equipment at the Contractor facility and/or packing slips from the shipment.
- (4) Evidence/Acceptance (Stage B: PICO-Ready 50%):
 - .1 The remainder of the Network Hardware costs may be charged once the Network Hardware has been installed at YYJ:
 - .1 Equipment installed in designated racks; power applied; no hardware alarms; label set applied; PICO checklists submitted.
- (5) Payment: 50% at Stage A, 50% at Stage B.

1.3.3 Software Licensing

- (1) Payment shall be made at the Lump Sum Price tendered in the schedule.
- (2) The Lump Sum Price shall include all costs for the following:
 - .1 Procurement and activation of network licenses, subscriptions (term lengths as outlined in the Specifications) feature keys, SMA/support entitlements.
 - .2 Application of demo/temporary licenses to staged devices; account associations (vendor portals) transferred to Owner at closeout. Activation of production licensing only upon completion and acceptance of SAT.
 - .3 NMS, SIEM, and Security Fabric entitlement and onboarding readiness.
 - .4 All other labour, materials, and equipment required to complete the Work.

- (3) Evidence/Acceptance:
 - .1 License summary with SKUs, terms, and device bindings; activation screenshots; SMA/contract numbers; support contact paths.
- (4) Payment: 50% upon activation of demo/temporary licensing to staging, 50% when devices are in service post-cut-over.

1.3.4 Pre-Installation Check-Out (PICO)

- (1) Payment shall be made at the Lump Sum Price tendered in the schedule.
- (2) The Lump Sum Price shall include all costs for the following:
 - .1 Visual checks: mounting, grounding, clearances, labeling, cable management, PDU identification, device factory defects.
 - .2 Power-on checks: dual PSU feeds where applicable; fan/temperature status; no critical alarms.
 - .3 Documentation: front/back rack photos; device inventory sheet; PICO checklists by device type.
 - .4 All other labour, materials, and equipment required to complete the Work.
- (3) Evidence/Acceptance:
 - .1 Engineer acceptance of PICO package (complete, correct, no critical deficiencies).
- (4) Payment: 100% upon acceptance.

1.3.5 Factory Acceptance Testing (FAT)

- (1) Payment shall be made at the Lump Sum Price tendered in the schedule.
- (2) The Lump Sum Price shall include all costs for the following:
 - .1 FAT Test Specification: case IDs, objectives, pre-conditions, detailed steps, expected results, pass/fail, evidence plan.
 - .2 Unpackaging, setup, and FAT configuration of all network equipment as per the Drawings and Specifications.
 - .3 Functional tests: L2 (VLANs, trunks, LACP/MC-LAG), STP/MSTP role/priority, management access, and as detailed in the Specifications.
 - .4 Core VSX formation/health, SVI templates (admin-down), performance sanity checks, and as detailed in the Specifications.
 - .5 Firewall HA formation, policy pathing on sample flows, logging to NMS/SIEM, backup/restore of configurations, and as detailed in the Specifications.
 - .6 Owner and Engineer Demonstration and Test Run Sessions; test deviations recorded; redlines promoted to SAT.
 - .7 All other labour, materials, and equipment required to complete the Work.
- (3) Evidence/Acceptance:
 - .1 Signed FAT Report with log excerpts/screenshots; closure of FAT deficiencies or approved carry-forward list.

- (4) Payment: 100% upon acceptance.

1.3.6 Installation & Migration – By Room/Rack “Blocks”

- (1) Payment shall be made at the Lump Sum Price tendered in the schedule.
- (2) The Lump Sum Price shall include all costs for the following: (for each defined block, e.g., ATB-B112-R01; ATB-B109-R10; ASC-110-R01; AOC-32-R01):
 - .1 Installation of all network hardware, including core/distribution/access network switches, NGFW appliances, transceiver modules, stacking cables, PDUs, grounding cabling, power cabling, racks, rack mounts, patch panels, patch cords, cable managers, labelling, and terminations as shown on the Drawings and outlined in the Specifications.
 - .2 Relocation and relabeling of existing equipment as shown on the Drawings.
 - .3 Reconnection of existing patch cords and power cabling as required to facilitate relocation of existing equipment as shown on the Drawings.
 - .4 Configuration: device bootstrap, management addressing, NTP/SNMP/syslog targets; Distribution L2-only; access port profiles.
 - .5 Validation: link light/error counters, PoE budgets, trunks, LACP state, MSTP roles; representative endpoint pings.
 - .6 Documentation: photo log (front/back/patch), updated port descriptions, patch schedule updates pushed to Cut-over Log.
 - .7 All other labour, materials, and equipment required to complete the Work.
- (3) Evidence/Acceptance (per block):
 - .1 Block sign-off sheet; zero critical deficiencies; photo and patching updates submitted.
- (4) Payment: 100% per block upon acceptance.

1.3.7 Test Readiness Review (TRR)

- (1) Payment shall be made at the Lump Sum Price tendered in the schedule.
- (2) The Lump Sum Price shall include all costs for the following:
 - .1 Confirmed outage windows and communications; change freeze scope; escalation tree.
 - .2 Accepted FAT Report; approved SAT procedures and evidence templates.
 - .3 Configuration freeze documented (hashes/versions); golden backups captured; firmware versions recorded.
 - .4 Rollback plans proven, logistics/access verified; Owner administrative access to NMS/SIEM/Security Fabric confirmed.
 - .5 All other labour, materials, and equipment required to complete the Work.
- (3) Evidence/Acceptance:

- .1 TRR minutes with Go to SAT decision; readiness checklist signed by Contractor and Engineer.
- (4) Payment: 100% upon TRR acceptance.

1.3.8 Core L3 Cut-over & Firewall HA Insert

- (1) Payment shall be made at the Lump Sum Price tendered in the schedule.
- (2) The Lump Sum Price shall include all costs for the following:
 - .1 Core L3 enablement (Go/No-Go #1).
 - .2 Routing activation: inter-VLAN, helpers, default route temporarily to legacy firewall.
 - .3 Firewall HA insert (Go/No-Go #2).
 - .4 Validation: multi-VLAN gateway tests; north-south/east-west policies; logging/alerts verified.
 - .5 Deliverance of Cut-over Report within 5 business days (timeline, evidence, deviations, final state).
 - .6 All other labour, materials, and equipment required to complete the Work.
- (3) Evidence/Acceptance:
 - .1 Signed Go/No-Go forms; Cut-over Report accepted; legacy devices out of forwarding path (except emergency rollback where approved).
- (4) Payment: 100% upon acceptance.

1.3.9 Site Acceptance Testing (SAT) & Burn-In

- (1) Payment shall be made at the Lump Sum Price tendered in the schedule.
- (2) The Lump Sum Price shall include all costs for the following:
 - .1 SAT execution per approved plan and as outlined in the Specifications.
 - .2 Resiliency: link/node failover, VSX role fail, HA firewall fail, power feed loss tests.
 - .3 Monitoring/observability: alarms, thresholds, syslog/SNMP traps, dashboards; NTP accuracy; time-correlated evidence.
 - .4 Burn-in: continuous 14-day incident-free operations; incident logging/triage; re-tests after any required fixes.
 - .5 All other labour, materials, and equipment required to complete the Work.
- (3) Evidence/Acceptance:
 - .1 SAT Report with pass matrix and evidence bundle; burn-in log; sign-off by Engineer.
- (4) Payment: 100% upon SAT acceptance and completion of burn-in.

1.3.10 Training

- (1) Payment shall be made at the Lump Sum Price tendered in the schedule.
- (2) The Lump Sum Price shall include all costs for the following:
 - .1 Preparation of all required Training Materials as outlined in the Specifications.

- .2 Delivery and execution of Training Sessions as outlined in the Specifications.
- .3 Recording of all Training Sessions for Owner re-use.
- .4 All other labour, materials, and equipment required to complete the Work.
- (3) Evidence/Acceptance:
 - .1 Attendance sheets; training materials submitted in editable and PDF formats; Q&A log; feedback summary.
- (4) Payment: 100% upon delivery and acceptance.

1.3.11 Closeout Deliverables & As-Builts

- (1) Payment shall be made at the Lump Sum Price tendered in the schedule.
- (2) The Lump Sum Price shall include all costs for the following:
 - .1 "As-built" configurations promoted to baseline; secure backups (text and encrypted) with load/restore instructions.
 - .2 Updated patching schedules, labeled port-maps per rack, final IP/VLAN tables; device inventory with model/serial/MAC/license term.
 - .3 O&M manuals; warranties start dates; spare parts list; vendor contract transfers (support portals).
 - .4 Evidence archive: SAT/Cut-over Reports, photos, captures, logs, Go/No-Go forms, all organized and indexed.
 - .5 Red-line markups of Drawings.
 - .6 All other labour, materials, and equipment required to complete the Work.
- (3) Evidence/Acceptance:
 - .1 Closeout package accepted by Engineer; all deficiencies closed or with mutually agreed plan-to-close.
- (4) Payment: 100% upon acceptance.

1.3.12 Decommissioning / Turnover of Legacy Equipment

- (1) Includes: Payment shall be made at the Lump Sum Price tendered in the schedule.
- (2) The Lump Sum Price shall include all costs for the following:
 - .1 Removal of legacy core/firewall from forwarding path; isolation and safe power-down.
 - .2 Data/credential sanitization; configuration wipes per Owner's policy; asset tags applied "Decommissioned."
 - .3 Turnover or disposal: transfer forms, chain-of-custody; recycling certificates or storage location identified by Owner.
 - .4 All other labour, materials, and equipment required to complete the Work.
- (3) Evidence/Acceptance:
 - .1 Legacy devices confirmed out of service; sanitization records; transfer/disposal documentation completed.
- (4) Payment: 100% upon acceptance.

2.0 PRODUCTS

2.1 NOT USED

2.1.1 Not Used.

3.0 EXECUTION

3.1 NOT USED

3.1.1 Not Used.

END OF SECTION

1.0 GENERAL

1.1 SECTION INCLUDES

- 1.1.1 This section includes the technical requirements for the fibre optic communication system including:
- (1) Supply, installation, and testing of fibre optic cable.
 - (2) Supply and installation of patch panels complete with splice trays.
 - (3) Supply and installation of connectors.
 - (4) Supply and installation of patch cords.
 - (5) Supply and installation of pre-terminated fibre pigtail assembly.
- 1.1.2 This section of the Specifications forms part of the Contract documents and is to be read, interpreted, and coordinated with all other parts.

1.2 RELATED SECTIONS

- 1.2.1 Master Municipal General Conditions
- 1.2.2 DIVISION 01 00 00 General Requirements
- (1) Section 01 77 00S – Closeout Procedures.
 - (2) Section 01 78 00S – Closeout Submittals.
 - (3) Section 01 91 13S – General Commissioning.
- 1.2.3 DIVISION 26 00 00 Electrical
- (1) Section 26 00 00S – Electrical Works and General Requirements
 - (2) Section 26 06 02S – Local Area Network

1.3 REFERENCE STANDARDS

- 1.3.1 Except where specifically modified within this specification, the installation shall, as minimum, comply with the latest issues of the following standards.
- (1) Current Canadian Electrical Code
 - (2) Canadian Standards Association (CSA International).
 - .1 CAN/CSA-C22.2 No.232-09 (R2014), "Optical Fibre Cables".
 - .2 TIA/EIA 568-D
 - .3 TIA/EIA 569-D
 - .4 TIA FOTP 8/59/60/61/78
 - .5 EIA-598-C

2.0 PRODUCTS

2.1 FIBRE CABLE

- 2.1.1 All new multimode optical fibre cables shall be non-armoured, 50 micron multimode (OM4), 24C, FT6-rated, plenum flame rated, no factory splices,

gel-free, loose buffered construction, all dielectric construction, and shall be CSA approved.

- (1) All fibre installed in raceways and conduits shall be non-armoured unless noted otherwise.
- (2) The number of optical fibre strands shall be as noted on Drawings.
- (3) Standard of Acceptance: Corning FREEDM Cable, Riser, 24C, 50 micron multimode (OM4), part number 024TUF-T4190D20, or approved alternate.

2.1.2 All new singlemode optical fibre cables shall be non-armoured, 9 micron singlemode (OS2), 24C, FT6-rated, plenum flame rated, no factory splices, gel-free, loose buffered construction, all dielectric construction, and shall be CSA approved.

- (1) All fibre installed in raceways and conduits shall be non-armoured unless noted otherwise.
- (2) The number of optical fibre strands shall be as noted on Drawings.
- (3) Standard of Acceptance: Corning FREEDM Cable, Riser, 24C, 9 micron singlemode (OS2), part number 024EUF-T4101D20, or approved alternate.

2.1.3 All optical fibre cables installed for the extension or re-routing of existing fibre cables shall match the existing cable specifications.

2.1.4 Colour Coding and Markings

- (1) Optical fibres shall be distinguishable from others in the same cable by means of colour coding as defined in EIA-598-C "Color coding of fibre optic cables".
- (2) The colour formulation shall be compatible with the fibre coating and be heat stable. It shall not fade, smear or be susceptible to migration and it shall not affect the transmission characteristics of the optical fibres and shall not cause fibres to stick together.
- (3) Cable jackets shall be marked with "Manufacturer's Name," sequential meter markings, year of manufacture and a telecommunication handset symbol, as required by CSA. The actual length of the cable shall be within -0/+1% of the length markings. The markings shall be in contrasting colour to the cable jacket. The height of the markings shall be approximately 2.5 mm.

2.2 FIBRE PATCH PANELS

2.2.1 1 RU Rack-Mounted Closet Connector Housing:

- (1) Standard of Acceptance: Corning Closet Connector Housing (CCH), rack units, holds 2 CCH connector panels, Part Number CCH-01U.

2.2.2 Fibre Panel & Pigtail:

- (1) Terminate fibre cables by fusion splicing to a pre-terminated pig-tail panel.

- (2) Standard of Acceptance for Multimode Fibre panels: Corning Closet Connector Housing (CCH) Panel, LC Adapters Duplex, 24C 50 micron multimode (OM3/4), Part Number CCH-CP24-E4.
- (3) Standard of Acceptance for Singlemode Fibre panels: Corning Closet Connector Housing (CCH) Panel, LC Adapters Duplex, 24C, 9 micron singlemode (OS2), Part Number CCH-CP24-A9.

2.2.3 Provide patch panels complete with cable strain-relief brackets.

2.2.4 Provide detailed product information to Engineer for approval prior to order.

2.2.5 Fibre Patch Panel Hardware Lock Kit:

- (1) Standard of Acceptance: Hardware Lock Kit, LANscape Solutions hardware, Part Number HDWR-LOCK-KIT.

2.2.6 CCH Splicing Cassettes:

- (1) Standard of Acceptance: CCH Cassette, Splicing, empty, for 1 CCH panel, Part Number CCH-CS.

2.3 CONNECTORS

2.3.1 LC Duplex or approved alternative.

2.3.2 Provide detailed product information to Engineer for approval prior to order.

2.4 FIBRE OPTIC PATCH CORDS

2.4.1 All new multimode optical fibre patch cords shall be non-armoured, 50 micron multimode (OM4), 2C, FT6-rated, riser flame rated, no factory splices, non-gel filled, tight buffered construction, all dielectric construction, and shall be CSA approved.

- (1) Standard of Acceptance: Corning Professional 2.0 mm Multimode Patch Cord, LSZH™, CPR Dca ClearCurve (OM4), LC UPC Duplex to LC UPC Duplex, 2 m, or approved alternate:

.1 LC-LC: Corning Part Number 050502Q5Z20002M

2.4.2 All new singlemode optical fibre patch cords shall be non-armoured, 9 micron multimode (OS2), 2C, FT6-rated, riser flame rated, no factory splices, non-gel filled, tight buffered construction, all dielectric construction, and shall be CSA approved.

- (1) Standard of Acceptance: Corning Professional 2.0 mm Singlemode Patch Cord, LSZH™, CPR Dca ClearCurve (OS2), LC UPC Duplex to LC UPC Duplex, 2 m, or approved alternate:

.1 LC-LC: Corning Part Number 040402G5Z20002M

3.0 EXECUTION

3.1 QUALIFICATIONS AND INSTALLATION

- 3.1.1 Installation of fiber optic system must be completed by a Corning Cable Systems LANscape NPI Certified Contractor, or a Contractor possessing similar or equivalent certification.
- 3.1.2 Supply and install all fibre optic cable, including the supply and installation of terminations and OTDR testing.
- 3.1.3 All workmanship, material and/or installation practices and activity shall be equal to or better than the most recent version of the applicable standards established by the CSA and the Canadian Electrical Code.
- 3.1.4 The Contractor's technician shall have a minimum of two (2) years of experience installing and testing single and multi-mode cables of all types.
- 3.1.5 Fibre optic cable shall be installed in a continuous run-in conduit and shall be spliced as noted on the Drawings.
- 3.1.6 When installing cable in conduits and junction boxes, the Contractor shall ensure the conduit does not exceed the minimum bend radius. Each cable shall be labelled within 10 centimeters of the terminated ends with a tag and text stating the fibre optic cable identifier and destination name. Cables shall be tagged in every junction box and all other access points with the fibre optic cable identifier and with "CAUTION, FIBRE OPTIC CABLE" tags.
- 3.1.7 Enough cable slack shall be left at termination points to allow the cable to be routed through the termination hardware to a polishing/splicing table, plus a minimum of 3 m additional slack. Cable slack shall be coiled and secured with hook and pile fastener (e.g. Velcro™) ties for breakaway protection. Cable to termination panel shall be secured to the cabinet with wire ties (e.g. Ty-wraps).
- 3.1.8 Excess cable inside junction boxes shall be coiled and mechanically secured in place with hook and pile fastener (e.g. Velcro™) ties such that the minimum bend radius is not exceeded and the cable is suspended above the junction box bottom. The hook and pile fastener straps are to provide "breakaway" protection in the event of an accidental dig up between pull boxes.
- 3.1.9 No splices in the cable are to be made, unless identified in the Drawings.
- 3.1.10 All splice trays, patch cables, and patch panels shall be neatly organized and clearly labeled.

3.2 MANUFACTURER'S INSTRUCTIONS

- 3.2.1 Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and datasheet.

3.3 FIBRE INSTALLATION

- 3.3.1 Install new fibre cabling and terminate as identified in the Drawings.
- 3.3.2 Terminate fibre cables by fusion splicing to a pre-terminated pigtail panel.

3.4 FIBRE TESTING

- 3.4.1 Prior to installation, each new segment of each fibre shall be tested using an Optical Time Domain Reflectometer (OTDR) and power meter equipment. Testing shall be completed in each direction on each fibre and at 850 nm and 1300 nm wavelengths (for multimode fibre) and at 1310 nm and 1550 nm wavelengths (for singlemode fibre). Launch cable shall be used as per the OTDR manufacturer's specifications. The Contractor shall provide a typewritten report and digital test files detailing the results of each test, including OTDR test results in graphical format, cable length, any fibre breaks or anomalies, attenuation of the fibre's connectors, and fibre uniformity, complete with a concise summary of the results. If any segment of cable found to be defective or below specified thresholds notify the Engineer.
- 3.4.2 Before and after installation, each segment of each proposed fibre shall be tested using an Optical Time Domain Reflectometer (OTDR) and power meter equipment. Testing shall be completed in each direction on each fibre and at 850 nm and 1300 nm wavelengths (for multimode fibre) and at 1310 nm and 1550 nm wavelengths (for singlemode fibre). Launch cable shall be used as per the OTDR manufacturer's specifications. The Contractor shall provide a typewritten report and digital test files detailing the results of each test, including OTDR test results in graphical format, cable length, any fibre breaks or anomalies, attenuation of the fibre's connectors, and fibre uniformity, complete with a concise summary of the results.
- 3.4.3 Provide on-reel testing prior to cable installation. In the "Comments" section of the OTDR software the contractor shall include: loss per km, helix factor, and length of cable. These form part of the cable specifications and usually attached to the reel. OTDR pulse width and acquisition time shall be adjusted until a clean trace is obtained. A clean trace is where the end of the fibre is significantly above the noise level. A few hundred meter launch box shall be used at the test point of the fibre. All anomalies shall be noted and included in the report. All test results shall be recorded and submitted via email and PDF to the Engineer for review.
- 3.4.4 Provide splice testing during fibre splicing. Loose tube, maximum loss of splice shall be less than 0.3 dB. OTDR wavelength shall be 850 nm and 1300 nm (for multimode fibre) and 1310 nm and 1550 nm (for singlemode fibre).

Pulse width and acquisition time shall be adjusted so that the splice can be seen even though the splice is within specification. All anomalies shall be noted and reported to Engineer.

- 3.4.5 Provide Final Acceptance Testing. Final Acceptance Testing shall consist of light source/power meter testing, and OTDR bi-directional testing following TIA FOTP8/59/60/61/78 test standard procedure.
- 3.4.6 End to end testing shall consist of testing of the new fibre installed as part of this Contract.
- 3.4.7 Light source/power meter testing shall be provided in either MS Excel or MS Word format and include: dates of tests, contractor, names of technicians, addresses of test locations, cable manufacturer, loose tube or ribbon, number of fibres, test instrument manufacturer and model numbers with last calibration date (equipment shall be calibrated within the last 12 months), length of launch reel (1500 m) or pigtails if used, and wavelengths. Light source/power meter testing shall be completed first to ensure that no fibres have been crossed. Wavelengths shall be 850 nm and 1300 nm (for multimode fibre) and 1310 nm and 1550 nm (for singlemode fibre).
- 3.4.8 OTDR bi-directional testing shall be provided. The fibre shall be tested from each end with the same OTDR parameters. OTDR wavelength shall be 850 nm and 1300 nm. Pulse width and acquisition time shall be adjusted so that the end of the fibre is clearly seen. A few hundred meter fibre launch box shall be used at the test point of the fibre. Any anomalies shall be noted and reported to Engineer. All OTDR test results shall be either in "EXFO" trace format or a format acceptable by Engineer. All test results shall be recorded in PDF and submitted.
- 3.4.9 Document the following in the "Comments" section of the OTDR software: number of fibres in the cable, loose tube or ribbon, length of launch reel if one is being used, test location, (street address), last calibration dates. All attenuation measurements shall be carried out using approved industry standard test equipment and materials. All measuring equipment shall be in good working condition and accompanied by current calibration certificates.
- 3.4.10 Any section of cable found to be defective or below specified thresholds shall be replaced and retested at the Contractor's cost.
- 3.4.11 Prior to acceptance by the Owner, the Contractor shall prepare a summary spreadsheet.
 - (1) Summary sheet shall include rows for each fibre tested, in both directions.
 - (2) Columns shall include the following:
 - .1 Origin
 - .2 Destination
 - .3 Wavelength
 - .4 Total length

- .5 Quantity of splices
- .6 Quantity of connectors
- .7 OTDR results (actual loss)
- (3) Calculation columns shall be prepared as follows:
 - .1 Allowable loss calculated by multiplying the quantity of splices and connectors by the maximum allowable loss for splicing and connections, then adding the total distance multiplied by the allowable loss per kilometer.
 - .2 Headroom calculated by subtracting the actual loss from the allowable loss.
 - .1 A positive result indicates a fibre passing the requirements.
 - .2 A negative number indicates a fibre failing the minimum requirements.

3.5 TERMINATION

- 3.5.1 Splices are permitted only at patch panel locations as shown on the Drawings. Splice locations may not be changed without written approval from the Engineer.
- 3.5.2 All splices shall be neatly dressed and organized in splice cases and patch panels.
- 3.5.3 Terminate all fibres with LC connectors for LAN Equipment. Provide conversion patch cords as required to adapt to existing equipment. The finish for the connectors shall comply with TIA/EIA-568-D. Maximum loss per connector is 0.3 db.

3.6 PATCH CORDS

- 3.6.1 Supply and install appropriately sized patch cords with connectors compatible with equipment as shown in the Drawings.
- 3.6.2 In the absence of adequate rack tie infrastructure, direct inter-rack fibre patching is deemed acceptable, provided that:
 - (1) Its explicitly approved by the Owner or Engineer.
 - (2) Patch cables are appropriately rated and managed to prevent obstruction or mechanical strain.
 - (3) Cable lengths do not exceed manufacturer-recommended optical budgets.
 - (4) Cabling is routed safely, secured using Velcro straps or approved cable ties, and protected from foot traffic or equipment movement.

3.7 LABELLING

- 3.7.1 Label all fibre conductors as shown on the Drawings. Label all fibres inside patch panels, patch cords as shown on the Drawings using Grafoplast or Brady labeling system.
- 3.7.2 Label all fibre cables with the labelling scheme within the Drawings. Label fibre cable using black anodized aluminum engraved nameplate with 25 mm high characters. The engraved characters shall be painted with white enamel paint. Attach the labels to the cable using black UV compatible cable ties.
- 3.7.3 Label all patch cords.

3.8 PHOTO DOCUMENTATION

- 3.8.1 Photographs to clearly demonstrate labeling.
- 3.8.2 Prior to closing patch panels, photographs shall be taken of each splice tray and provided to the Engineer and Owner for review.
- 3.8.3 Photographs of each patch panel shall be provided to the Engineer and Owner for review.
- 3.8.4 Any splice trays or patch panels deemed to be unorganized shall be modified by the Contractor and secondary photographs shall be taken and provided to the Engineer.
- 3.8.5 Photographs of each junction box and vault shall be provided to the Engineer and Owner. Photographs to clearly demonstrate cable labeling within the junction box or vault.
- 3.8.6 Splice trays, patch panels, vaults, and junction boxes deemed to be unorganized shall be modified by the Contractor and secondary photographs shall be taken and provided to the Engineer and Owner for further review.

3.9 MAINTAINING EXISTING EQUIPMENT AND PASHING

- 3.9.1 The Contractor shall ensure that existing electrical equipment is not affected by the project to the satisfaction of Engineer.
- 3.9.2 Of critical importance is to ensure that there is absolutely no impact on the operation of the existing systems in use by the existing fibre optic cable, except for during planned cut-over periods. All planned work on the fibre optic system is to be coordinated with the Owner and Engineer.
- 3.9.3 Refer to Work Restrictions and Part 3 in Section 26 00 00S, for equipment cut-over between existing and new fibre connections. The Contractor shall plan all work such that all service interruptions are performed as outlined in the Cutover Plan.

3.10 WARRANTY

3.10.1 Refer to Section 01 77 00S for warranty information.

END SECTION

1.0 GENERAL

1.1 SECTION INCLUDES

- 1.1.1 This section includes the technical requirements for the Local Area Network (LAN) including:
 - (1) Off-site installation and Day-0 configuration of network switches.
 - (2) Factory Acceptance Testing.
 - (3) Site Acceptance Testing
 - (4) Connection/Cut-over of the Owner's network.
- 1.1.2 This section of the Specifications forms part of the Contract documents and is to be read, interpreted and coordinated with all other parts.

1.2 RELATED SECTIONS

- 1.2.1 DIVISION 01 00 00 General Requirements
 - (1) Section 01 01 00S – Payment
 - (2) Section 01 91 13S – General Commissioning
- 1.2.2 DIVISION 26 00 00 Electrical
 - (1) Section 26 00 00S – Electrical Works and General Requirements
 - (2) Section 26 06 01S – Fibre Communications
 - (3) Section 26 06 03S – Data & Voice Cabling

1.3 SCOPE OF WORK

- 1.3.1 The Scope encompasses the comprehensive upgrade and redesign of the Owner's existing IP network infrastructure. The scope includes replacement of outdated network hardware, installation of new equipment and software, deployment of a centralized Security Information and Event Management (SIEM) system, and integration of a unified Network Management System (NMS) for streamlined monitoring and control. Enhancements identified through the Owner's planning initiatives, such as improved fibre optic cabling, increased physical redundancy, and advanced firewall solutions, are included. The Contractor shall also provide training to the Owner's IT staff to ensure effective operation and maintenance of the upgraded system.
- 1.3.2 The proposed network replacement shall replace the Owner's existing TCP/IP network.
- 1.3.3 Supply, install configure, commission, and test network, including hardware, software, and supporting electrical and communications infrastructure to replace existing network at YYJ.
- 1.3.4 Provide network platform and security fabric operation and administrative training as outlined in Section 01 79 00S.

- 1.3.5 Network Hardware includes, but is not limited to, the following:
- (1) Next Generation Firewall (NGFW) appliances, network switches, power supplies, fibre optic transceivers, fibre optic patch panels, copper patch panels, cable management, power and communications cabling and conduit, device mounting hardware and terminations.
- 1.3.6 Perform Factory Acceptance Test (FAT) for all required network and cybersecurity components as outlined in Part 3, to ensure the proper operation and specifications-compliance of all components prior to installation.
- 1.3.7 Cutover to the new network hardware and software in accordance with the cut-over plan in Part 3.
- 1.3.8 Testing and commissioning of the new network hardware and software at the facility.
- (1) Network Software includes, but is not limited to, the following:
 - .1 Network switch management and administration software
 - .2 SIEM software (Fortinet FortiSIEM)
 - .3 NMS software (Aruba Central)
 - .4 Security fabric software (Fortinet UTM)
 - .5 Licensing shall account for all new and existing switches, and new NGFW appliances at the Owner's facility.
 - .6 Configuration of software required to provide a fully functioning network upgrade, SIEM deployment, and NMS deployment.
 - (2) Testing and commissioning of the new network software at Owner's facility.
- 1.3.9 Decommission the existing network components, including all associated head-end hardware in accordance with a detailed network cut-over plan as outlined in Part 3. Turn over all decommissioned equipment to Owner. If the Owner does not wish to retain equipment, dispose of equipment.
- 1.3.10 Fully document all testing and commissioning tasks. The completed test plans shall be submitted for review and approval prior to proceeding with the Site Acceptance Test (SAT).
- 1.3.11 Perform the SAT over a fourteen (14) calendar day period. The network shall run for the full fourteen (14) day duration of the test without incident before it is considered to be accepted by the Owner as outlined in Section 01 91 13S.
- 1.3.12 Administrator and Operator training shall be conducted as outlined in Section 01 79 00S.

2.0 PRODUCTS

2.1 NEXT GENERATION FIREWALLS

2.1.1 The Contractor shall supply new Next Generation Firewalls (NGFW) hardware appliances.

2.1.2 The firewalls shall provide the following minimum specifications:

- (1) Two (2) GE RJ45 MGMT/HA ports
- (2) Sixteen (16) GE RJ45 port
- (3) Four (4) SFP+ ports
- (4) Four (4) SFP+ Ultra Low Latency ports
- (5) Eight (8) SFP ports
- (6) Up to 12 Gbps Intrusion Protection System (IPS) throughput
- (7) Up to 10 Gbps Next Generation Firewall (NGFW) throughput
- (8) Up to 9 Gbps Threat Protection throughput
- (9) Up to 79.5 Gbps IPv4 Firewall throughput
- (10) Support for Active-Active or Active-Passive HA configurations
- (11) Support for centralized management
- (12) Rack mountable form factor
- (13) Operation in ambient temperatures from 0 to 40°C and relative humidity levels from 5% to 90% non-condensing.
- (14) Possess redundant power supplies.

2.1.3 Standard of Acceptance: Fortigate FG-400F, or approved alternative.

2.2 CORE NETWORK HARDWARE

2.2.1 The Contractor shall supply new high-powered Layer-3 network switches, suitable for Core switching and routing applications.

2.2.2 The Core switch shall provide the following minimum specifications:

- (1) Support for stacking via Virtual Switching Extension (VSX)
- (2) Twenty-Eight (28) SFP/SFP+/SFP28 ports
- (3) Four (4) MAC-sec enabled SFP+/SFP28 ports
- (4) Four (4) QSFP+/QSFP28 ports
- (5) Minimum quoted switching capacity of 4.8 Tbps
- (6) Minimum quoted forwarding capacity of 1145 Mpps
- (7) Possess redundant, hot-swappable power supplies.

2.2.3 Standard of Acceptance: HPE Aruba Networking 8360-32Y4C v2 32p 25G SFP+/28 4 Sec 4p 100G QSFP+/28 FB 3 Fans 2 AC Bundle (JL700C), or approved alternative.

2.3 DISTRIBUTION NETWORK HARDWARE

- 2.3.1 New 48-port distribution switches shall be provided and configured for the ATB communication rooms.
- 2.3.2 Existing switches suitable for distribution applications shall be re-configured to serve as the Distribution layer within the ASC and AOC communications rooms.
- 2.3.3 The Distribution switches shall provide the following minimum specifications:
 - (1) Support for stacking via Virtual Stacking Framework (VSF)
 - (2) Twenty-Four (24) SFP+ ports
 - (3) Four (4) SFP56 or QSFP28 ports
 - (4) Quoted switching capacity of 880 Gbps
 - (5) Quoted forwarding capacity of 654 Mpps
 - (6) Up to 200 Gbps of stacking bandwidth.
 - (7) Possess redundant, hot-swappable power supplies.
- 2.3.4 Standard of Acceptance for Distribution switches: Aruba 6300 (JL658A) or Aruba CX8100 (R9W90A)

2.4 ACCESS NETWORK HARDWARE

- 2.4.1 The Contractor shall supply new 48-port access switches that are suitable for Access layer switching applications.
- 2.4.2 The Contractor shall re-configure existing 24-port access switches that shall serve as the Access layer switches.
- 2.4.3 There shall be three types of network switches, differentiated only by their copper port density:
 - (1) 12-port Access switches shall provide twelve (12) 1GbE RJ45 ports
 - (2) 24-port Access switches shall provide twenty-four (24) 1GbE RJ45 ports
 - (3) 48-port Access switches shall provide forty-eight (48) 1GbE RJ45 ports
- 2.4.4 24- and 48-port Access switches shall provide the following minimum specifications:
 - (1) Support for stacking via Virtual Stacking Framework (VSF)
 - (2) Twenty-four (24) or forty-eight (48) 1GbE RJ45 Ports
 - (3) Four (4) SFP+ ports
 - (4) Up to 740W of Power Over Ethernet (PoE) capacity
 - (5) Quoted switching capacity of 128 Gbps
 - (6) Quoted forwarding capacity of 95.2 Mpps
 - (7) Up to 20 Gbps of stacking bandwidth.
- 2.4.5 12-port Access switches shall provide the following minimum specifications:

- (1) Two (2) SFP+ ports
- (2) Fourteen (14) 1GbE ports
- (3) Up to 139W of Power Over Ethernet (PoE) capacity
- (4) Quoted switching capacity of 68 Gbps
- (5) Quoted forwarding capacity of 45.1 Mpps.

2.4.6 Access switch Standard of Acceptance:

- (1) 48-port switch: Aruba CX6100 (R9Y04A)
- (2) 24-port switch: Aruba CX6100 (JL678A)
- (3) 12-port switch: Aruba CX6100 (JL679A)
- (4) Or an approved alternative.

2.5 DIRECT ATTACH COPPER CABLES

2.5.1 Direct Attached Copper (DAC) cables used for stacking access network hardware shall fulfill the following specifications:

- (1) SFP+ Active DAC Twinax Cable Form Factor
- (2) Up to 10G bandwidth
- (3) 1 meter length

2.5.2 DAC cable Standard of Acceptance: FS SFP+ 1m Direct Attach Copper Cable (SFP-10G-AC01), or approved alternative

2.6 HOT-PLUGGABLE NETWORK INTERFACE MODULES

2.6.1 Transceivers used for fiber optic communication between Next Generation Firewall and core switches, as well as between Next Generation Firewalls themselves, shall fulfill the following specifications:

- (1) Multimode SFP+ Form Factor
- (2) Up to 10G bandwidth
- (3) Maximum 1W power draw
- (4) Support OM3 cables up to 300 meters
- (5) Support OM4 cables up to 550 meters.
- (6) Duplex LC optical connector

2.6.2 Firewall transceiver Standard of Acceptance: Fortinet SFP Transceiver Module 10GbE (FN-TRAN-SFP+SR), or approved alternative

2.6.3 Core to Firewall transceiver Standard of Acceptance: FS SFP-10GSR-85 10GBASE-SR SFP+ transceiver, or approved alternative.

- (1) Transceiver shall be preloaded with Aruba-specific firmware profile (Aruba-coded).

2.6.4 Transceivers used for fibre communications between the Core switches shall fulfill the following specifications:

- (1) Multimode QSFP28 Form Factor
- (2) Up to 100G bandwidth

- (3) Support OM3 cables up to 70 meters
 - (4) Support OM4 cables up to 100 meters
 - (5) Support OM5 cables up to 150 meters
 - (6) Duplex LC optical connector
- 2.6.5 Core to Core transceiver Standard of Acceptance: FS QSFP-SR1.2-100G 100GBASE-SR1.2 QSFP28 BiDi transceiver, or approved alternative.
- (1) Transceiver shall be preloaded with Aruba-specific firmware profile (Aruba-coded).
- 2.6.6 Transceivers used for fibre communications between the Core and Distribution switches may be of three types, and shall fulfill one of the two following sets of specifications:
- (1) Multimode
 - .1 SFP28 Form Factor (for 25G links)
 - .2 QSFP28 Form Factor (for 100G links)
 - .3 Support up to 25G or 100G bandwidth
 - .4 Support OM4 cable up to 100 meters
 - .5 Duplex LC optical connector
 - (2) Singlemode
 - .1 SFP28 Form Factor
 - .2 Support up to 25G bandwidth
 - .3 Support single-mode fibre cables up to 10 kilometers
 - .4 Duplex LC optical connector
- 2.6.7 Core to Distribution transceiver Standard of Acceptance:
- (1) 25Gbps Multimode: FS SFP28-25GSR-85 25GBASE-SR SFP28 transceiver
 - .1 Transceiver shall be preloaded with Aruba-specific firmware profile (Aruba-coded).
 - (2) 100Gbps Multimode: FS QSFP-SR1.2-100G 100GBASE-SR1.2 QSFP28 BiDi transceiver
 - .1 Transceiver shall be preloaded with Aruba-specific firmware profile (Aruba-coded).
 - (3) Singlemode: FS SFP-25GLR-31 25GBASE-LR SFP28 transceiver
 - .1 Transceiver shall be preloaded with Aruba-specific firmware profile (Aruba-coded).
 - (4) Or an approved alternative.
- 2.6.8 Transceivers used for fibre communications between the Distribution and Access switches may be of two types, and shall fulfill one of the two following sets of specifications:
- (1) Multimode
 - .1 SFP+ Form Factor
 - .2 Support up to 10G bandwidth

- .3 Support OM4 cables up to 400 meters
- .4 Duplex LC optical connector
- (2) Singlemode
 - .1 SFP+ Form Factor
 - .2 Support up to 10G bandwidth
 - .3 Support single-mode fibre cables up to 10 kilometers
 - .4 Duplex LC optical connector

2.6.9 Distribution to Access transceiver Standard of Acceptance:

- (1) Multimode: FS SFP-10GSR-85 10GBASE-SR SFP+ transceiver
 - .1 Transceiver shall be preloaded with Aruba-specific firmware profile (Aruba-coded).
- (2) Singlemode: FS.com SFP-10GLR-31 10GBASE-LR SFP+ transceiver
 - .1 Transceiver shall be preloaded with Aruba-specific firmware profile (Aruba-coded).
- (3) Or an approved alternative.

2.7 NETWORK SOFTWARE AND LICENSING

- 2.7.1 The Contractor shall supply Extended Support Plans (ESPs) and Return Merchandize Authorization (RMA) services for all new switches and firewalls network hardware.
- 2.7.2 All recurring software license subscriptions shall commence only upon successful completion of SAT. The Owner shall not incur any operational expense (OPEX) costs associated with recurring software licensing until Declaration of Substantial Completion is granted.
 - (1) Once Declaration of Substantial Completion is granted, recurring software license subscriptions can commence and that date shall be considered the start of the annual license period.
- 2.7.3 Standard of Acceptance for ESP for Aruba JL700C core network switches
 - (1) Aruba 1Y FC NBD Exch HW 8360 32Y4C SVC (part no. H65R4E)
- 2.7.4 Standard of Acceptance for ESP for Aruba JL675A access network switches
 - (1) Aruba 1Y NBD Exch 6100 48G CL4 Switch SVC (part no. HV0L7E)
- 2.7.5 Standard of Acceptance for Cloud-based network management platform for the Core switches:
 - (1) HPE Aruba Central Switch Class-1 Foundation 1-Year Subscription E-STU (part no. Q9Y68AAE)
- 2.7.6 Standard of Acceptance for Cloud-based network management platform for Access Switches:
 - (1) HPE Aruba Central Switch Class-5 Foundation 1-Year Subscription E-STU (part no. R3K03AAE)

- 2.7.7 Standard of Acceptance for security fabric for Fortinet FG-400F network firewalls:
 - (1) FortiGuard Unified Threat Protection (UTP)
- 2.7.8 Standard of Acceptance for Fortinet FortiSIEM virtual machine application:
 - (1) Fortinet FC2-10-FSM98-180-02-DD
- 2.7.9 Standard of Acceptance for RMA services for Fortinet FG-400F network firewalls:
 - (1) FortiCare Technical Support and RMA Services – FortiCare Premium

3.0 EXECUTION

3.1 GENERAL EXECUTION REQUIREMENTS

- 3.1.1 Configuration tasks shall be performed by personnel certified in the Aruba CX platform.
 - (1) Or by personnel in training, under the appropriate supervision of an Aruba-certified mentor.
 - (2) The Contractor shall provide proof of certification to the Engineer prior to commencing configuration of network switches.
- 3.1.2 Refer to the Block Diagrams and Equipment Rack Elevations on the Drawings for details of the proposed network.
- 3.1.3 Remote access to the network is not permitted and shall not be configured by the Contractor. The FAT Network shall not be exposed to the Internet in any way.
- 3.1.4 Software of all types, intended for installation onto VAA devices shall only be sourced from the equipment's manufacturer or authorised vendor.
- 3.1.5 All devices shall undergo Day-Zero initialisation prior to deployment into the Factory Acceptance Testing (FAT) network.
- 3.1.6 Confirm metadata of each device upon unboxing, the following shall be recorded and shared with the Owner or Engineer (accepted as a .xlsx file).
 - (1) Manufacturer
 - (2) Model
 - (3) Serial Number
 - (4) Installed firmware version

3.2 DAY-ZERO INITIALISATION

- 3.2.1 Assemble all hardware components (power supplies, fan trays, modules, SFPs, etc.).
 - (1) All Access Switch to Distribution Switch links shall have a 10Gbps SFP+ module installed.

- (2) All Distribution Switch to Core Switch links shall have a 25Gbps SFP28 module installed, or 100Gbps QSFP28 module installed.
 - (3) All Core Switch to Core Switch links shall have a 100Gbps QSFP28 module installed.
 - (4) All Core Switch to Firewall links shall have a 10Gbps SFP+ module installed.
- 3.2.2 All devices shall have the latest manufacturer-recommended and manufacturer-supplied firmware or operating system version.
- (1) 'Latest' is defined by the most recent version recommended by the manufacturer for a particular device at the time of unboxing.
- 3.2.3 All downloaded software shall be verified using the vendor provided checksum or digital signature.
- (1) Verification shall take place immediately prior to the installation of it onto the device.
 - (2) Verification of the firmware/OS file shall be conducted before each installation.
- 3.2.4 Adherence to Electrostatic Discharge (ESD) handling best practices shall be maintained throughout the process.
- 3.2.5 Access Switches that will be members of a VSF stack, as described in the Design, shall:
- (1) Have stacking cables compliant with Section 2.0 installed.
 - (2) Link Aggregation Control Protocol (LACP) configured to provide redundancy, load-balancing, and fault-tolerance on the dual uplinks.

3.3 DAY-ZERO SWITCH CONFIGURATION

- 3.3.1 All new, reconfigured, or repurposed Aruba CX switches (hereby referred to as Switches) shall be changed to Enhanced Security mode, where it is not already enabled.
- 3.3.2 All Switches shall have the following enabled:
- (1) Local administrator access to Command-Line Interface (CLI), exclusively with the use of credentials specified by the Owner.
 - (2) Remote management via SSH on the management IP address defined in the IP Matrix.
 - (3) Automatic disconnection of remote or local CLI sessions after 5 minutes of inactivity.
 - (4) Password protection on the ServiceOS.
- 3.3.3 All switches shall have a login banner containing the following message:
"ACCESS TO THIS SYSTEM IS RESTRICTED TO AUTHORIZED USERS ONLY. Unauthorized access is strictly prohibited and may result in disciplinary action, up to and including criminal prosecution. Use of this system is monitored, recorded, and all activity is subject to audit. By proceeding, you confirm that

you have been specifically authorised to access this system by the Victoria Airport Authority. If you have not received prior authorisation, disconnect immediately.”

- 3.3.4 Apply initial Access Control Lists (ACLs) to restrict management access to the trusted subnet(s) only.
- 3.3.5 Generate SSH keys (2048-bit or higher).
- 3.3.6 Configure SNMPv3 parameters and syslog destinations.
- 3.3.7 The hostname and domain name of each device shall be set in accordance with the Design.
- 3.3.8 All services that are not explicitly mentioned in the Access, Distribution, or Core Switch specification shall be disabled. Including, but not limited to:
 - (1) HTTP
 - (2) Telnet
 - (3) FTP
 - (4) TFTP
 - (5) SNMPv1 & v2c
 - (6) DHCP
- 3.3.9 Network Time Protocol (NTP) shall be configured with the source detailed in the Design, and the time zone shall be corrected.
- 3.3.10 Once defined, the Contractor shall create a switch group in Aruba Central labelled appropriately for each layer, capturing host names, admin account passwords, NTP, DNS, TACACS, and AAA servers.
 - (1) “Access Layer Group”
 - (2) “Distribution Layer Group”
 - (3) “Core Layer Group”

3.4 ACCESS SWITCH CONFIGURATION

- 3.4.1 After successful Day-Zero Initialization and Configuration, the Contractor shall:
 - (1) Shutdown all unused ports.
 - (2) Apply appropriate descriptions to assigned interfaces in accordance with the Design and Naming Convention.
- 3.4.2 Each Access switch shall have dual redundant uplink ports to diverse distribution switches.
- 3.4.3 MSTP (Multiple Spanning Tree Protocol) shall be enabled globally.
- 3.4.4 Uplinks ports shall be configured with the following in accordance with ArubaOS best practices, including but not limited to:
 - (1) Auto-negotiation disabled,

- (2) 10Gbps speed,
 - (3) Trunk mode, carrying all VLANs relevant to the switch.
 - .1 The management VLAN is required.
 - .2 A native VLAN that is unused by access ports is required.
 - .3 Only VLANs used by end-devices shall be allowed on the trunk.
 - .4 Drop all untagged packets.
 - (4) Broadcast/multicast storm control,
 - (5) Tx/Rx signal strength monitoring,
 - (6) Link Aggregation Groups (LAG),
 - (7) Disable routing,
 - (8) Increased Maximum Transmission Unit (MTU) size on the physical interfaces.
- 3.4.5 The Contractor shall apply port security measures to all access ports in accordance with ArubaOS best practices, including but not limited to:
- (1) BPDU Guard & BPDU Filtering.
 - (2) Manual assignment of edge-port status (admin-edge).
 - (3) MAC address limit to two (2).
 - .1 Unless this is explicitly stated otherwise in the Design.
 - (4) Port-security violation actions:
 - .1 By default, access ports should drop packets.
 - .2 For ports accessing high-security VLANs, the port should be closed.
 - .3 Generate SNMP traps on any violation.
 - (5) Shutdown ports shall only be re-enabled by manual intervention.
- 3.4.6 Dynamic Host Configuration Protocol (DHCP) security measures shall be configured in accordance with ArubaOS best practices, including but not limited to:
- (1) DHCP Snooping shall be enabled globally.
 - (2) Snooping shall be enabled for each end-device VLAN present on the switch.
 - (3) All end-device access ports shall be untrusted.
 - (4) All uplink ports to the distribution layer shall be trusted.
 - (5) Log all DHCP snoop
- 3.4.7 Dynamic Address Resolution Protocol (ARP) Inspection (DAI) security measures shall be configured in accordance with Aruba OS best practices, including but not limited to:
- (1) Enable DAI on all VLANs where DHCP snooping is active.
 - (2) Utilise DHCP Snooping tables to validate ARP requests.
 - (3) DAI violations shall set the port to drop packets and generate SNMP traps.
- 3.4.8 Ensure Link Layer Discovery Protocol (LLDP) is enabled globally.

- (1) Enable LLDP-MED on ports connected to VoIP devices.
 - .1 Configure and apply the necessary policies to advertise CoS and the Voice VLAN on ports connected to VoIP devices.
- 3.4.9 Apply QoS policies for VoIP and video conferencing traffic to achieve a Mean Opinion Score (MOS) of 90% for voice calls hosted within the network.
- 3.4.10 Apply QoS policies that prioritise storage, database, and management traffic.

3.5 DISTRIBUTION SWITCH CONFIGURATION

- 3.5.1 After successful Day-Zero Initialization and Configuration, the Contractor shall:
 - (1) Shutdown all unused ports.
 - (2) Apply appropriate descriptions to assigned interfaces (virtual and physical) in accordance with the Design and Naming Convention.
- 3.5.2 All routing responsibilities, including default gateway assignment and inter-VLAN routing, shall reside at the Core Layer.
- 3.5.3 Spanning Tree Protocol (STP) shall be configured in accordance with Aruba best practices, including but not limited to:
 - (1) MSTP shall be globally enabled.
- 3.5.4 All access VLANs shall be statically created on the distribution switches to support trunking and VLAN propagation.
 - (1) No SVIs or IP addresses shall be assigned to VLANs on the distribution switches.
 - (2) All access VLANs shall be configured with IGMP snooping.
- 3.5.5 Downlink ports (to Access Switches) shall be configured with the following in accordance with ArubaOS best practices:
 - (1) Auto-negotiation disabled,
 - (2) 10Gbps speed,
 - (3) MSTP Root guard enabled,
 - (4) Trunk mode, carrying all VLANs relevant to the connected Access Switch,
 - .1 The management VLAN is required.
 - .2 A native VLAN that is unused by access ports is required.
 - .3 Only VLANs used by end-devices shall be allowed on the trunk.
 - .4 Drop all untagged packets.
 - (5) Broadcast/multicast storm control,
 - (6) Tx/Rx signal strength monitoring.
- 3.5.6 Uplinks ports (to Core Switches) shall be configured to enable the following, in accordance with ArubaOS best practices:
 - (1) Statically assigned 25Gbps or 100Gbps speed,

- (2) MC-LAG and LACP enabled, as per design, to form multi-link trunks.
- (3) Trunk mode, carrying all required VLANs to the Core.
- (4) No SVIs or IP addresses assigned.
- (5) STP priority adjusted if necessary to defer root status to Core switches.
- (6) Link MTU size increased to match Core uplink settings.

3.6 CORE SWITCH CONFIGURATION

- 3.6.1 After successful Day-Zero Initialization and Configuration, the Contractor shall:
 - (1) Apply appropriate descriptions to assigned interfaces (virtual and physical) in accordance with the Design and Naming Convention.
- 3.6.2 The Core switches shall operate in a Virtual Switching Extension (VSX) pair and provide all Layer 3 gateway and routing functions for the network:
 - (1) Inter-VLAN routing.
 - (2) Default gateways for all VLANs.
 - (3) Routing to external networks or cloud via BGP or static routes.
 - (4) Multicast routing (PIM Sparse Mode), with Core serving as Rendezvous Point (RP).
 - (5) Loopback interfaces for routing identity.
- 3.6.3 The Contractor shall configure the following on the Core switches:
 - (1) VIs for all end-user VLANs defined in the Design.
 - (2) These SVIs shall serve as the default gateway addresses for all access-layer and distribution-layer connected devices.
 - (3) Redundant gateway configuration using Active Gateway shall be used for all VLAN interfaces.
 - (4) DHCP helpers and other gateway-related services shall be configured where required.
- 3.6.4 Downlink ports to each Distribution switch shall be configured as Layer 2 trunks:
 - (1) Auto-negotiation disabled,
 - (2) Statically assigned 25Gbps or 100Gbps speed,
 - (3) Trunking all VLANs assigned to Access and Distribution layers,
 - (4) MC-LAG and LACP enabled to support redundancy and link aggregation,
 - (5) VLAN pruning applied as necessary,
 - (6) Drop all untagged packets,
 - (7) Drop all untagged packets.
 - (8) Enable broadcast/multicast storm control.
 - (9) Enable Tx/Rx signal strength monitoring.
 - (10) Ensure MTU matches that of distribution uplinks.

3.6.5 Border Gateway Protocol shall be configured to make provisions for efficient inter-domain routing. For services including:

- (1) Aruba Cloud applications,
- (2) Fortinet Cloud applications,
- (3) Internet Service Providers.

3.7 CONSTRUCTING THE TEST ENVIRONMENT

3.7.1 The Contractor shall ensure that the Factory Acceptance Test (FAT) environment is a purpose-prepared space to ensure equipment performance, protection, and testing accuracy.

3.7.2 The environment shall have operational HVAC systems maintaining ambient temperatures and minimizing humidity.

3.7.3 Electrical power to all equipment shall be supplied through a UPS-backed power distribution system to protect devices from power loss and surges during the test phase.

3.7.4 The test environment shall provide adequate grounding points compliant with manufacturer recommendations.

3.7.5 The test environment shall have access control in place to prevent interference or unauthorised access during the FAT process.

3.7.6 The environment shall include fire suppression systems appropriate for energized electrical equipment, unless otherwise agreed with by the Owner.

3.7.7 The physical installation of all Network Devices shall adhere to the designated Rack Elevations outlined in the design documentation, wherever feasible.

- (1) Where production replication is not possible, temporary racks or staging shelves shall be used to simulate the production layout.
- (2) Factory Acceptance Testing (FAT) on any surfaces other than designated racks or staging platforms is not permitted.

3.7.8 Adequate clearance, airflow, and power shall be validated prior to device energization.

3.8 POST INSTALLATION CHECK-OFF

3.8.1 Before Factory Acceptance Testing (FAT) is permitted to begin, the Contractor shall complete a Post-Installation Check-Off to verify that the physical configuration of the FAT system accurately reflects the approved network design.

3.8.2 The Contractor shall develop a comprehensive checklist for comparing the built system with the finalised design documentation to mark the elements as PASS or FAIL, including but not limited to:

- (1) Rack Elevations,

- (2) Port Schedule,
- (3) Block Diagrams.

3.8.3 The PICO visual inspection shall also include the following:

- (1) Power supplies installed as per manufacturer specifications,
- (2) Redundant power supplies connected (where applicable),
- (3) Equipment grounding in place per Section 3.7 and manufacturer guidance,
- (4) Switches and Firewalls have been labelled correctly.

3.8.4 After visual inspection, equipment is permitted to be energised, and the remaining test elements can be assessed:

- (1) Device powers on correctly and completes Power-On Self-Test (POST) without errors,
- (2) The device shows no active alarms or hardware failures (LED status lights are all healthy).

3.8.5 The Contractor shall document deficiencies or discrepancies which may be found during the PICO.

- (1) Contractor Shall correct the found defects and re-PICO only the effected items.

3.8.6 Once all items on the PICO checklist are PASSED, the Contractor shall submit the checklist to the Owner and Engineer.

3.8.7 The Engineer and Owner shall conduct a review of the PICO documentation to review the discrepancies which were found and corrected.

3.8.8 The Engineer shall issue a written statement to confirm that PICO has been completed and the Factory Acceptance test can commence.

3.9 FACTORY ACCEPTANCE TESTING

3.9.1 The Contractor is responsible for the development and submission of a detailed Test Specification, which defines the procedures used to verify the functionality and performance of the network as implemented within the FAT environment.

- (1) The Test Specification must be written in clear, instructional language suitable for execution by both a tester and an independent witness.
- (2) All test cases shall be designed to simulate real-world use of the system, including the use of traffic generators for stress testing.
- (3) Scenarios testing the fail-over of Distribution and Core infrastructure shall be included.

3.9.2 The Test Specification shall include the following information for each test case:

- (1) Test Case ID: A unique identifier and brief name.
- (2) Objective: A concise description of what is being tested and why.

- (3) Preconditions: Required setup or state of the network prior to executing the test.
- (4) Step-by-Step Procedure: Instructions for conducting the test, written clearly and logically.
- (5) Expected Outcome: A description of the successful result for comparison.
- (6) Quantifiable PASS/FAIL Criteria: Defined thresholds, behaviors, or responses that indicate a pass or failure.
- (7) Data Capture Method: Instructions on how to record evidence (e.g., screenshots, CLI output, log files).
- (8) Accountability: Identification of who performs the test and who witnesses or verifies the outcome.

3.9.3 The Test Specification shall be submitted to the Owner and Engineer no less than ten (10) business days prior to the scheduled FAT for review and comment.

- (1) Review comments shall be addressed and incorporated by the Contractor prior to the commencement of testing.

3.9.4 The Test Specification shall include test cases that prove full functionality of the entire network, including but not limited to:

- (1) All Access Switches have Layer 2 reachability to the Core Switches
 - .1 Confirmed by successful MAC address learning and VLAN continuity across all trunks.
 - .2 Confirm that each Access switch can forward tagged traffic to the Core for all necessary VLANs.
- (2) Uplink redundancy and Link Aggregation (LAG or VSF/VSX) operate as intended
 - .1 Simulate link failure scenarios on redundant uplinks.
 - .2 Verify failover and restoration behavior.
 - .3 Confirm proper LACP negotiation and member state.
- (3) Spanning Tree Protocol is stable and loop-free across the topology
 - .1 Confirm correct root bridge election
 - .2 Validate MSTP instance assignments and port roles.
 - .3 Test Root Guard & BPDU Guard configuration on appropriate ports.
- (4) Voice and video QoS policies are applied and functioning
 - .1 Verify LLDP-MED negotiation for VoIP endpoints.
 - .2 Check DSCP/COS markings are preserved and prioritized across trunk links.
 - .3 Conduct basic MOS scoring or packet inspection as evidence.
- (5) DHCP Snooping and DAI are enforcing Layer 2 security
 - .1 Confirm trusted/untrusted ports are configured per VLAN.
 - .2 Verify DHCP snooping tables are populated.
 - .3 Test that ARP spoofing attempts are blocked and logged.

- (6) All device logging, NTP synchronization, and SNMP telemetry are functional
 - .1 Confirm syslog messages are received by the designated collector (FortiSIEM).
 - .2 NTP synchronization status and time zone configuration validated.
 - .3 All expected SNMP traps, messages, alarms, and warnings are received and reported in Aruba Central.
 - (7) All unused ports are administratively shut down and in a dead VLAN.
 - (8) Management interfaces of all switches are reachable from Aruba Central.
 - .1 Validate access control lists (ACLs) configured in Aruba Central permit traffic only from trusted subnets.
- 3.9.5 The Test Specification shall include test cases that prove proper functionality of the Firewalls, including but not limited to:
- (1) Firewalls are deployed in the correct HA mode as described in the design.
 - (2) Firewall synchronization is complete and real-time.
 - .1 Configuration, session, and routing tables (as applicable) are synchronized between peers.
 - (3) Failover events are gapless and preserve session continuity.
 - .1 Simulate a failure event and verify traffic rerouting.
 - .2 Validate session continuity for key services (e.g., VoIP, HTTPS, VPN).
 - (4) All monitored interfaces are correctly configured for HA monitoring.
 - .1 Loss of critical monitored interfaces trigger a failover.
 - (5) External connectivity tests confirm traffic is properly routed through the firewall(s).
 - .1 End-to-end tests through the firewall to simulate typical user traffic.
 - .2 Verify NAT rules and security policies are applied as intended.
 - .3 Confirm that logs record authorised, blocked, and inspected traffic correctly from both firewalls.
 - (6) System logs and alerts capture HA failover events and forward them to the FortiSIEM.
 - (7) Both firewalls shall be configurable through their management interfaces.
 - (8) Cluster licenses are correctly applied and recognized enabling Threat Prevention and features described in Section 2.1.
- 3.9.6 The Test Specification shall include test cases that prove traffic routing through the Core as designed, including but not limited to:
- (1) VSX is properly configured, with both members synchronised and reporting no mismatches.

- (2) VSX LAGs (vLAGs) to Distribution switches are correctly configured and balanced.
- (3) Routing remains stable and uninterrupted through various simulated failure events, such as:
 - .1 Reboot of the primary VSX node,
 - .2 Failure of the VSX links,
 - .3 Manual shutdown of VSX link interfaces.
- (4) The following shall be demonstrated through failure events.
 - .1 All end-device VLAN gateways remain reachable,
 - .2 The management interface of one or both of the switches remain accessible,
- (5) Specific inter-VLAN traffic is routed through the firewalls for inspection as defined in the design.

3.9.7 Upon Owner's approval of the Test Specification, the Contractor shall commence the Factory Acceptance Testing in the staging environment.

3.9.8 The results from the Factory Acceptance Test shall be documented in a FAT Report that includes:

- (1) A record of the outcome for each test case.
- (2) Evidence of test execution, such as screenshots, terminal logs, or photo documentation.
- (3) Notes on any deviations from the expected result, including remedial actions where they have been permitted by the Engineer or Owner.
- (4) Summary of deficiencies or non-conformances.
- (5) Signatures of the test engineer and the witnessing party for each test section.

3.9.9 The completed FAT Report shall be submitted to the Engineer for review and comment.

3.9.10 Once the required testing has been completed, a demonstration shall be prepared for the Owner's personnel and Engineer to witness the network functioning and see the management interface working.

3.9.11 FAT shall not be considered successful until the FAT Report has been accepted and signed off by the Owner and Engineer.

3.10 NETWORK CUT-OVER

3.10.1 Purpose and Principles

- (1) The objective is to transition the Owner from the existing network to the new LAN with minimal downtime, using staged L2 parallelism and a single, controlled L3 gateway/edge flip at the end.
- (2) The cut-over relies on installing and validating all new Access and Distribution first (L2-only to the existing routed path), then performing

the final routed cutover by enabling SVIs on the new Core in ATB-B109-R10 and switching the egress to the new Fortinet HA firewalls.

3.10.2 Prerequisites

- (1) Day-Zero initialization, baseline configuration and security hardening completed for all switches and firewalls as per Clauses 3.2–3.6.
- (2) PICO complete with deficiencies closed and permission to proceed to FAT issued as per Clauses 3.8–3.9.
- (3) FAT passed with accepted FAT Report as per Clause 3.9; red-lined test cases promoted to cut-over validation steps.
- (4) Approved Outage Request(s), Method of Procedure (MOP), detailed port maps, labelled patching, and a rollback plan for each step (Access, Distribution, Core).
- (5) Engineering windows scheduled with named decision makers (Owner, Engineer, and Contractor) and communications plan.
- (6) All new optics and trunks installed and light-tested end-to-end.

3.10.3 Roles and Communications

- (1) The Contractor shall assign a Cut-over Lead and Rollback Lead.
- (2) The Contractor shall maintain a live bridge during windows; announce each Go/No-Go checkpoint and record timestamps, evidence (screenshots, CLI logs), and decisions.

3.10.4 Sequencing Overview (Downtime-minimizing)

- (1) Phase Summary:
 - .1 Phase A – Access Migration (L2 only, zero/near-zero downtime)
 - Phase B – Distribution Migration (L2 only, zero/near-zero downtime)
 - Phase C – Stage Core & Firewall in ATB-B109-R10
 - Phase D – Routed Cutover (SVIs to Core at B109)
 - Phase E – Edge/Egress Cutover (SonicWall to Fortinet HA)
 - Phase F – Validation & Burn-in (handover to SAT)

3.10.5 PHASE A - Access Layer Migration (L2 only)

- (1) Intent is to move endpoints to new Access switches while keeping the existing routed path unchanged.
 - .1 Install & Label: Mount new Access switches; label per drawings; shut all unused ports; apply port security, DHCP snooping/DAI, LLDP/LLDP-MED, QoS as specified in Clause 3.4.
 - .2 Uplink to Existing Path: Dual-home each Access stack to the new Distribution (where available) or temporarily to the existing aggregation while Distribution is being introduced, using 10 Gbps trunks (tagged VLANs only; drop untagged; no routing).
 - .3 Move Endpoints in Bundles: Re-patch endpoint bundles (by room/patch panel) from legacy access to new Access; verify link, VLAN, PoE, and DHCP on each move.

- .4 Validation (per rack): Trunks up/clean; STP stable; DHCP snooping tables populating; security events visible in NMS/SIEM.
- .5 Rollback, if required (Phase A): Re-patch endpoints back to legacy access; disable new Access uplinks (no L3 changes yet, immediate recovery).

3.10.6 PHASE B - Distribution Layer Migration (L2 only)

- (1) Intent is to put all new Distribution in place and run L2 to the existing routed path until the final switchover.
 - .1 Install & Label new Distribution; create required VLANs (no SVIs); enable MSTP; configure downlinks to Access and uplinks to Core as per Clause 3.5 (allow-lists, MTU, LACP/MC-LAG readiness). Distribution shall not host SVIs.
 - .2 Uplinks to Existing Routed Path: Connect Distribution uplinks toward the current routed/edge path (i.e., existing core/edge/SonicWall path) using 25/100 Gbps trunks so services remain unchanged.
 - .3 Pre-stage Dark Uplinks to B109: Where cabling is ready, land additional Distribution uplinks to the new Core in ATB-B109-R10 but keep them disabled ("dark") until Phase D.
 - .4 Access Swing: For any Access still on legacy aggregation, swing trunks to the new Distribution and validate as in Phase A.
 - .5 Rollback, if required (Phase B): Re-enable legacy Distribution uplinks or swing Access trunks back; still L2 only (fast physical rollback).

3.10.7 PHASE C - Stage Core & Firewall in ATB-B109-R10 (not yet in path)

- (1) Intent is to build the new primary Core (Aruba VSX member) and primary Fortinet firewall in B109-R10 offline/parallel so the final flip is brief.
 - .1 Core Bring-up: Rack/power Core switch, prepare for VSX, configure all SVIs (disabled/shutdown) for end-user VLANs with Active Gateway anycast addresses as per Clause 3.6 (no routing in path yet).
 - .2 Firewall HA Prep: Rack/power the Fortinet primary and secondary, establish HA, sync base config, define monitored interfaces, and connect management/logging (not in the traffic path yet).
 - .3 Light the "Dark" Links (Administratively shut down): Patch the pre-staged Distribution-Core trunks into B109-R10 and keep them administratively shut down until the routed cut.
 - .4 Health Checks: Verify optics, LACP settings, MSTP root preferences, and management reachability; keep all SVIs shut to avoid duplicate gateways.
 - .5 Rollback, if required (Phase C): None required; new core/firewall are not in production.

3.10.8 PHASE D - Routed Cutover (Enable SVIs on Core at B109-R10)

- (1) Intent is to move first-hop gateways and inter-VLAN routing from the current SonicWall-based topology to the Core SVIs (Active Gateway) at B109-R10, one VLAN block at a time.
 - .1 Go/No-Go #1: Confirm all Access and Distribution are on the new hardware, L2-clean, and monitored.
 - .2 Enable Distribution-Core Trunks to B109-R10 and convert to LACP bundles/MC-LAG as designed; confirm STP root at Core.
 - .3 Per-VLAN Gateway Move (repeatable unit)
 - .1 Pre-check: Confirm the Core SVI (VLAN X) is correctly configured but shutdown; confirm the old gateway on SonicWall is active.
 - .2 Change: Shut/disable the old gateway interface on SonicWall (or VRRP/HSRP where applicable), then no-shutdown the Core SVI for VLAN X with the same default-gateway IP (Active Gateway anycast).
 - .3 Convergence: Send gratuitous ARP from the Core SVI; verify reachability (ping/trace), DHCP relay, and east-west traffic.
 - .4 Acceptance for VLAN X: No packet loss beyond transient ARP refresh; endpoints maintain services.
 - .5 Proceed to next VLAN block until all end-user/server VLANs are moved.
 - .4 Default Route (Interim): Keep the Core's default route pointing to the existing egress (SonicWall) until Phase E to decouple edge risk from gateway migration.
 - .5 Rollback, if required (Phase D): For any VLAN, shutdown the Core SVI and re-enable the corresponding SonicWall interface; clear ARP on access/distribution.

3.10.9 PHASE E - Edge/Egress Cutover (SonicWall to Fortinet HA at B109-R10)

- (1) Intent is to move Internet/NAT/VPN egress from the SonicWall to the Fortinet HA pair after all VLANs are homed to the Core.
 - .1 Go/No-Go #2: Core SVIs stable; monitoring/alerts nominal; business owner approval to flip egress.
 - .2 Introduce Fortinet in path:
 - .1 Confirm HA is synchronized, monitored interfaces healthy, policies/NATs loaded, and logs flowing to FortiSIEM.
 - .2 On the Core, change the default route from SonicWall to the Fortinet next-hop. Validate outbound sessions, inbound NATs, remote access VPNs, and site-to-site VPNs (if applicable).

- .3 Remove Old Path (after burn-in): After a defined stability period (60 minutes), disable old default route and retire the SonicWall from the forwarding path.
Rollback, if required (Phase E): Restore Core default route to SonicWall and disable Fortinet external interfaces.
- 3.10.10 PHASE F - Post-Cut-over Validation and Burn-in (prior to SAT)
 - (1) Execute the cut-over validation pack (selected FAT/SAT tests):
 - .1 L3 reachability across representative VLANs
 - .2 VSX health and vLAG status
 - .3 NGFW HA failover (non-intrusive test)
 - .4 Performance spot-checks (east-west and north-south).
 - (2) Begin the SAT process as per Clause 3.11 with a 14-day incident-free burn-in for formal acceptance.
- 3.10.11 Outage Windows and Decision Points
 - (1) Window size: Default 3 hours per change block; reserve final 45–60 minutes for validation and rollback buffer.
 - (2) Coordinate all outages with Owner at least 5 days in advance.
 - (3) Decision points:
 - .1 Go/No-Go #1 before enabling Core SVIs (Phase D).
 - .2 Go/No-Go #2 before changing the Core default route to Fortinet (Phase E).
 - (4) Business-critical moves (PA/FIDS/ACS/CCTV VLANs) scheduled in the lowest-impact windows and migrated first or last per Owner direction.
- 3.10.12 Evidence and Handover
 - (1) Maintain a live Cut-over Log with timestamps, commands, screenshots, interface/route snapshots, and photos of any re-patching.
 - (2) Update the YYJ Network Patching Schedule and as-built port descriptions immediately after each block.
 - (3) Submit the Cut-over Report within five (5) business days: narrative of steps, success criteria, issues and resolutions, and the final running configs promoted to “as-built” baselines.

3.11 SITE ACCEPTANCE TESTING

3.11.1 General

- (1) Perform SAT after successful FAT, approved cutover plan, and approved Outage Request(s). SAT demonstrates the installed network meets the design intent and performance, availability, security, and manageability requirements. Submit test procedures for review/acceptance before SAT starts.
- (2) SAT shall run for a continuous fourteen (14) calendar days without incidents to achieve acceptance, with acceptance granted as per Section 01 91 13S and closeout requirements in Section 01 77 00S.

- (3) The architecture under test includes Access → Distribution (L2 only) → Core (VSX, L3 gateway/routing) with NGFWs in HA; Distribution must not host SVIs; Core provides all L3 gateway functions.

3.11.2 Prerequisites

- (1) Approved Outage Request Form(s), maintenance windows, and coordination notices as required under Work Restrictions.
- (2) FAT complete with accepted FAT Report and red-line test scripts promoted to SAT version.
- (3) Running configurations frozen for SAT start; image/firmware versions recorded (serials, firmware).
- (4) Proven rollback method for each test block (access, distribution, core, firewall). Rollback must restore previous production routing/firewall paths.
- (5) Hardware installed as per Drawings (racks, power/ground, optics, links).
- (6) Labeling and nomenclature applied.
- (7) Photo documentation ready for SAT evidence (copper/fibre terminations, labels, rack elevations).
- (8) Owner administrative access verified to Aruba Central (NMS), Fortinet Security Fabric/UTP, and FortiSIEM log collector.

3.11.3 SAT Scope & Sequencing

- (1) Execute SAT in the following order to minimize outage risk:
 - .1 Access layer tests room-by-room on the new distribution, staying L2-only
 - .2 Distribution layer tests (uplinks to both cores)
 - .3 Core VSX & L3
 - .4 Firewall HA and policy pathing
 - .5 End-to-end services & performance
 - .6 Resiliency/failover
- (2) Network required dual-homed Distribution to both core rooms B112 and B109; Contractor shall verify both paths.
- (3) Contractor shall demonstrate distribution uplinks and traffic forwarding via both cores as indicated in architecture Drawings.

3.11.4 Detailed Test Procedures & Acceptance Criteria

- (1) Physical, Power, and Inventory
 - .1 Verify device models, serials, optics, power supplies, fan trays, and firmware match submittals; record in inventory log.
 - .2 Confirm A/B power feeds and UPS where provided; verify PSUs status and alarms clear.
 - .3 Inspect/rack hardware as per Drawings and photograph all front/rear views and cabling.
- (2) Acceptance: No critical alarms; photos stored; inventory complete.

3.11.5 Labeling & Patching

- (1) Check every device/port/cable label conforms to the convention as per the Drawings.
- (2) Verify patching conforms to the YYJ Network Patching Schedule.
- (3) Acceptance: 100% label compliance; patching matches schedule; deviations logged and corrected.

3.11.6 Layer 2 (Access/Distribution)

- (1) Access uplinks: dual 10 Gbps trunks to diverse distribution; Distribution to Core: 25/100 Gbps trunks with LACP/MC-LAG as designed.
- (2) Trunk VLAN allow-lists enforce only required VLANs; drop untagged; native VLAN unused on access trunks.
- (3) STP: MSTP enabled; root/guard settings align to design (defer root to Core).
- (4) Security on access: BPDU guard/port-security baseline, DHCP Snooping/DAI enabled and effective.
- (5) Verify PoE budget and priority where applicable.
- (6) Acceptance: All trunks up and error-free; correct STP role; DHCP Snooping working; security events logged to FortiSIEM/Aruba Central.

3.11.7 Layer 3 & Core VSX

- (1) Confirm Distribution has no SVIs or IPs; access VLANs are L2-only on Distribution.
- (2) Confirm Core (VSX pair) provides all L3 gateways/SVIs (Active Gateway) for end-user VLANs; DHCP helpers as required.
- (3) Validate inter-VLAN routing, default gateways, and (if used) BGP/static routing to external networks/cloud/ISPs.
- (4) VSX health: peers in-sync; vLAGs to all Distribution nodes up/balanced; no mismatch alarms.
- (5) Acceptance: Ping/trace across VLANs succeeds; gateways reachable; VSX in-sync; routing tables stable.

3.11.8 Firewall HA & Policy Pathing

- (1) Verify HA mode per design; session/config/state tables synchronizing; monitored interfaces configured.
- (2) Simulate failover (power, link, monitored-int loss) and prove gapless failover with session continuity for HTTPS/VoIP/VPN.
- (3) Validate NAT/security policies on both nodes; confirm external connectivity; confirm logs/alerts forwarded to FortiSIEM.
- (4) Acceptance: HA works without material traffic loss; policies/NAT correct; events logged.

3.11.9 Performance

- (1) Throughput: run bidirectional tests between representative access VLANs across Distribution/Core and through NGFWs; confirm no policing drops at designed speeds.

- (2) Latency/Jitter/Loss: under typical load, <0.5% loss, <3 ms added jitter across YYJ Core; document traces.
 - (3) Acceptance: Meets/exceeds thresholds.
- 3.11.10 Manageability, Telemetry & Security Posture
 - (1) Device banners, AAA, SSH keys, SNMPv3, syslog, NTP configured; disable unused services (HTTP/Telnet/FTP/TFTP/SNMPv1/2).
 - (2) Confirm syslog to FortiSIEM and SNMP/traps/alarms visible in Aruba Central; management ACLs restrict to trusted subnets.
 - (3) All unused switchports administratively shut and placed in blackhole VLAN.
 - (4) Acceptance: All items verifiably operational in NMS/SIEM; management access restricted.
- 3.11.11 Resiliency/Failure Scenarios
 - (1) Access uplink failure: each access switch continues service via the other distribution uplink (where dual-homed by design).
 - (2) Distribution-Core path failure: traffic continues via the alternate Core (rooms B112 and B109).
 - (3) Core VSX node reboot/failure: routing and L2 services remain available; vLAGs stay up.
 - (4) Acceptance: No loss of essential services during single-fault events.
- 3.11.12 Documentation & Evidence
 - (1) Produce an SAT Report including: executed procedures, timestamps, command outputs/screenshots, Aruba Central/FortiSIEM extracts, photo evidence, packet captures (where applicable), and a defects log with root-cause and remedial actions.
 - (2) Update as-builts (Drawings, LLD, configs, IP/VLAN matrices, trunk allow-lists, STP/VSX diagrams) and port descriptions per naming standard.
 - (3) Submit red-lined "YYJ Network Patching Schedule" with any field adjustments.
- 3.11.13 Defects, Re-tests, and Acceptance
 - (1) Record any defects by severity and proposed fix; obtain Engineer's approval.
 - (2) Re-test any failed items until pass. If outage or test failure occurs during the 14-day period, restart the clock from the time of remediation.
 - (3) Upon successful completion and accepted SAT Report, proceed to closeout as per Section 01 77 00S and final acceptance as per Section 01 91 13S.

END SECTION

1.0 GENERAL

1.1 SECTION INCLUDES

- 1.1.1 This section includes the requirements for data system including data outlets and wiring for office applications. Data system equipment consists of:
 - (1) UTP cabling.
 - (2) Patch Panels.
 - (3) Patch Cords.
- 1.1.2 Communications Equipment Racks.
- 1.1.3 All conduit and raceways and associated outlet boxes have been specified under other specification sections.
- 1.1.4 All equipment specified under this section shall be supplied and installed under Division 26.
- 1.1.5 This section of the Specifications forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 RELATED SECTIONS

- 1.2.1 Master Municipal General Conditions
- 1.2.2 DIVISION 01 00 00 General Requirements
 - (1) Section 01 77 00S – Closeout Procedures
 - (2) Section 01 78 00S – Closeout Submittals
 - (3) Section 01 91 13S – General Commissioning
- 1.2.3 DIVISION 26 00 00 Electrical
 - (1) Section 26 00 00S – Electrical Work Summary and General Requirements
 - (2) Section 26 06 01S – Fibre Communications
 - (3) Section 26 06 02S – Local Area Network

1.3 REFERENCE STANDARDS

- 1.3.1 Except where specifically modified within this specification, the installation shall, as minimum, comply with the latest issues of the following standards.
 - (1) CAN/CSA-T527, "Commercial Building Grounding and Bonding Requirements for Telecommunications".
 - (2) CAN/CSA-T528-93, "Design Guideline for Administration Telecommunications Infrastructure in Commercial Buildings".
 - (3) CAN/CSA-T529-M95, "Design Guidelines for Telecommunications Wiring Systems in Commercial Buildings".

- (4) CAN/CSA-T530-M90 (ANSI/TIA/EIA-569), "Building Facilities, Design Guidelines for Telecommunications".
- (5) ANSI / EIA/TIA-568B.
- (6) CAN/CSA-C22 No. 214 M90, "Communications Cables".
- (7) NORDX/CDT IBDN Design Guide, Issue 4 (IBDN-DG-9605).
- (8) CAN/CSA C22.2 No. 182.4 M90, Plugs, Receptacles, and Connectors for Communication Systems.
- (9) EIA/TIA Bulletin TSB-36, Technical Systems Bulletin Additional Cable Specifications for Unshielded Twisted Pair Cables, Electronic Industries Association (USA), November 1991.
- (10) The installation shall, as minimum, comply with the latest issues of the following Building Codes: All municipal By-laws, Provincial Codes, The National Building Code, The Canadian Electrical Code, Canadian Labour Code, and the National Fire Code. In the case of conflict or discrepancy the more stringent code shall apply.
- (11) TIA/EIA-606-A.

1.4 PRODUCT DATA

- 1.4.1 Submit product data in accordance with Section 01 33 00S.

1.5 SCOPE OF WORK

- 1.5.1 Supply, install, configure, commission, and test cabling and hardware to support complete operation and functionality of the proposed network replacement and cybersecurity upgrade components, including hardware and software as indicated on the Drawings.
- 1.5.2 Supply and install a sufficient quantity of the following equipment to support the equipment indicated on the Drawings and other specifications.
 - (1) Ethernet Patch Panels
 - (2) CAT6 cabling
- 1.5.3 Supply and install all required communications and power cabling and conduit.
- 1.5.4 Supply and install all required device mounting hardware.
- 1.5.5 Supply and install cable management equipment, including trays, straps, ties, and hooks.
- 1.5.6 Testing and commissioning of the new hardware and cabling at the facility.
- 1.5.7 Adhere to work schedules outlined in the Cutover Plan to minimize downtime and mitigate disruptions to Airport operations.
- 1.5.8 Fully document all testing and commissioning tasks. The completed testing reports shall be submitted for review and approval prior to proceeding with the Final Inspection as outlined in Section 01 91 13S.

1.6 COORDINATION

- 1.6.1 Coordinate work to minimize downtime of any of the Airport's systems. Coordinate all interruptions with the Owner's staff.
- 1.6.2 Refer to Section 26 00 00S for limitations on allowed system downtime and outages.

2.0 PRODUCTS

2.1 UTP WIRING

- 2.1.1 Provide indicating labels on UTP wiring, cabling, patch cords, patch panels and outlet assemblies.
- 2.1.2 Labels to be:
 - (1) Outlet identification labels. Computer printable type: Panduit PDL-401.
 - (2) Labeling on wire or cable from outlet to patch panel: Panduit HSDL9 heat shrink labels sized for data cables.
 - (3) Patch cord labels shall explicitly state the following: The identification number of the device, the switch port number, the patch panel number, and the patch panel port number.
- 2.1.3 Labels shall be updated on all cabling that is re-used for the system.
- 2.1.4 Labeling is to conform to labeling sample in the drawings
- 2.1.5 Ethernet Cabling: 4 pair, 24 gauge, solid conductor, unshielded twisted pairs. Complies with CSA FT4 fire rating. Category 6. Guaranteed for 10,000 Mbps. Blue colour.
- 2.1.6 Cabling shall be FT6 where installed within plenum spaces.
- 2.1.7 Standard of Acceptance: Belden

2.2 CAT6 ETHERNET PATCH PANELS

- 2.2.1 Installed patch panels shall meet the following requirements:
 - (1) 24 ports,
 - (2) 1U rack-mounted,
 - (3) Keystone
 - (4) Suitable for individual port labelling,
 - (5) Support for CAT5 and CAT6 cabling.
- 2.2.2 Standard of Acceptance: Belden AX103253 CAT6 Plus KeyConnect Patch Panel, 24-Port, 1U, Black (part no. 7B-AX103253), or approved alternate.

2.3 POWER WIRING

- 2.3.1 Conductors: stranded for 12 AWG and larger. Minimum size: 12 AWG.
- 2.3.2 Copper conductors: size as indicated, with 600 V insulation of chemically cross-linked thermosetting polyethylene material rated RW90.
- 2.3.3 Where indicated on the Drawings, determine size of existing 120 VAC feed and confirm size of conductors to be used.

3.0 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- 3.1.1 Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and datasheet.

3.2 INSTALLATION – UTP CABLING

- 3.2.1 Install data system wiring and components to strictly adhere to NORDX/CDT IBDN certification guidelines.
- 3.2.2 Terminate UTP cables at outlets.
- 3.2.3 Ensure that manufacturer's bending radius limitations are adhered to.
- 3.2.4 Protect cables from damage during installation.
- 3.2.5 Turn over UTP patch and line cords to owner.
- 3.2.6 All new UTP cabling going to Server Racks shall be bundled.

3.3 TESTING GENERAL

- 3.3.1 Cabling and connectors to be tested by an experienced company employing trained technicians, having certificate from the cable manufacturer, with minimum five (5) years experience in data cabling industry. Provide at the time of tender the name of the company to be performing the connection and testing of cables, a listing of the qualifications of the technicians to be performing the work, copy of the manufacturer's certificate, and a listing major jobs completed by the company.
- 3.3.2 The Owner reserves the right to approve or reject any company or personnel being proposed to perform this work based on that company's or personnel's previous experience or training.
- 3.3.3 Testing to include verification of cable configurations between connected equipment.

3.4 TESTING UTP CABLING

- 3.4.1 System to meet continuity and attenuation tests outlined in IBDN Testing Note: IBDN-TESTS-9104.
- 3.4.2 Category 6 cable to meet ANSI standard 568-D (capable of data transmission up to 10,000 Mbps.) and be plenum and fire rated.
- 3.4.3 After UTP cabling has been installed, perform system and channel tests to ensure that installation meets standard indicated above and values indicated in the IBDN design guide issue 2 (IBDN-DG-9202). Tests to be performed using a Microtest MT-350 scanner. Minimum tests to be performed.
 - (1) Continuity.
 - (2) Attenuation.
 - (3) Near end Crosstalk.
 - (4) Resistance.
 - (5) Pair Assignment Test.
 - (6) Low Band Noise.
 - (7) High Band Noise.
 - (8) Mid Band Noise.
 - (9) Length of Cable.
- 3.4.4 When performing channel tests include all wiring equipment including patch panels and cords, perform tests from data closet outwards.
- 3.4.5 Prior to testing, provide to Engineer written copy of the testing sequence to be performed, testing equipment to be used, and standards to which cable is being tested. After tests have been performed, provide a written report to the Engineer indicating each cable and the results of the testing.
- 3.4.6 Provide a printout from the Microtest scanner for each cable.
- 3.4.7 If any cable or connection should fail tests, replace that cable and/or connection equipment.

3.5 MAINTAINING EXISTING EQUIPMENT AND PHASING

- 3.5.1 The Contractor shall ensure that existing electrical equipment is not affected by the project to the satisfaction of Engineer.
- 3.5.2 Refer to Work Restrictions in Section 26 00 00S, as well as Section 01 91 13S and Section 26 06 02S, for equipment cut-over between existing and new network connections. The Contractor shall plan all work such that all service interruptions are performed as identified in the Cutover Plan.

END SECTION