SECTION 27 21 00 – LOCAL AREA NETWORK

PART 1 - GENERAL

1.01 SUMMARY

A. General: Los Angeles World Airports (LAWA) has deployed a large scale campus-wide Cisco Multi-Protocol Label Switching (MPLS) layer three network with Cisco 6500E/6800 series core switches at two physically separate locations on the Airport. Individual Terminals and various other locations around the airport have Cisco 6500E/6800 series switches that serve as distribution layer switches as well as the campus MPLS provider edge switches. Telecommunication Rooms deploy Cisco 6500E/6800 distribution/provider edge switches. These switches contain 10GBASE-LR blades and modules that accept uplinks from Cisco 3850/4500E series access switches. All assignments of distribution / PE switch ports are coordinated with LAWA.

B. Furnish and install new Access Layer PoE stackable switches with redundant power supplies and voice gateways as shown on the contract drawings. Include all cabling between redundant power supplies and stackable switches. Include all stack-wise cabling for both switch-to-switch connections and for a wrap-around StackWise link from top to bottom switch in stack. Furnish and install X2 10GB adapters as shown on the contract drawings, both at the switch stack and at the blades at the distribution switches.

C. Furnish and install new industrial switches, expansion modules and power supplies as shown on the contract drawings. Include DIN rail mounting for each switch, expansion module and power supply. Provide UL listed 120VAC US power cord for power supplies. Furnish and install two SFP 1000-base-LX adaptors in each switch with corresponding SFP modules at distribution switches.

D. Coordinate with the Systems Manager and LAWA IT to develop a standard template configuration for all Access Layer PoE stackable switches and industrial switches. Template shall include switch names, temporary password, spanning tree configuration, trunk configuration, storm control, multi-tiered Quality of Service, multicast and disabling of unnecessary services. Once approved by LAWA IT and the Systems Manager, apply templates to all switches.

E. Contractor shall work with LAWA to provide basic configuration for the switch stacks including uplink trunks, HSRP configuration, spanning tree configuration, quality of service, switch naming, passwords and disabling of unnecessary services for each concourse 3750 switch stack to ensure uniformity with similar LAWA switch stacks, configuration of access ports for end devices, as well as complete configuration of IE-3000 industrial switches.

F. Related documents included in the specification requirements:

Section 01 11 00 – Summary of Work

Section 01 25 00 – Substitution Procedure

Section 01 31 00 – Administrative Requirements

Section 01 33 00 – Submittal
Section 01 40 00 – Quality Requirements
Section 01 43 00 – Quality Assurance
Section 01 64 00 – Owner Furnished Products
Section 01 77 13 – Preliminary Closeout Reviews
Section 01 77 16 – Final Closeout Review
Section 01 78 00 – Close Out Submittals
Section 27 05 00 – Basic Telecommunication Requirements
Section 27 13 33 – Communications Systems Interfaces (Legacy Systems)

G. Systems to be supported on the Local Area Network shall include but are not be limited to the following:
   1. Electronic Visual Information Display System
   2. Terminal Area Support Systems (TASS)
   3. VoIP and analog telephone
   4. Closed circuit television
   5. Access control and video surveillance systems
   6. Public address
   7. LAWA administrative network
   8. Tenant local area networks
   9. Tenant high speed internet access & VPN transport
   10. Building automation
   11. Other networks

   NOTE: VoIP supports the Common Use Systems (CUTE) used at airline ticket counters and gates. Coordinate with LAWA to ensure correct CISCO design configuration to support CUTE functionality and CUTE interface with the Avaya VoIP Telephone System.

H. Provide all necessary fiber patch cords for connection of network equipment uplinks and downlinks. Provide all copper patch cords to interconnect switches to horizontal cabling at access layer switch locations. Provide patch cords from wall jack faceplates to VoIP telephones. Tenant and subsystem users will provide their own patch cords from wall jack faceplates to their respective equipment.

I. If applicable, furnish, install, and configure new Wireless LAN access points at locations shown on the contract drawings as specified in Section 27 21 33 - Wireless Communication System. Configure access points to provide public internet access as well as private wireless services.

J. If applicable, furnish and install new analog courtesy telephones, utility room telephones, loading bridge telephones and elevator telephones as shown on the contract drawings. Connect telephones to voice gateway using single pair circuits in the Premise Wiring and

Distribution System. Configure telephones with telephone numbers, auto ring-down or other features as instructed by LAWA IT.

K. If applicable, furnish, install and configure desk style 6-button VoIP telephones at gate podiums and other locations shown on the contract drawings. Connect telephones to PoE switch ports at IDF using circuits assigned by the Premise Wiring and Distribution System. Configure each telephone and associated switch port with line appearances and feature sets as directed by LAWA IT.

L. The System Manager will compile a list of LAN connections, VoIP telephones and analog gateway circuits required by each tenant and subsystem. Provide all necessary configurations for trunks, switch ports and gateway connections to support these connections. Fully test all connections prior to releasing them to the Systems Manager for use by tenants and subsystems.

M. Perform a complete bandwidth analysis for each access layer switch uplink. Initial analysis shall be based on expected trunk traffic profiles for each access layer port. Once trunks are activated measure peak bandwidth use on each uplink port on a weekly basis as devices are added to the system. Provide a weekly report to LAWA IT and the System Manager reflecting the switch name, uplink name, link bandwidth, peak bandwidth utilization and percentage of bandwidth the peak represents

1.02 REFERENCES

A. Definitions:
1. AAA: Authentication, Authorization, and Accounting
2. CCIE: Cisco Certified Internetwork Expert
3. GBIC: Gigabit Interface Converter
4. LAN: Local Area Network
5. MPLS: Multi-Protocol Label Switching
6. NTP: Network Time Protocol
7. PoE: Power over Ethernet
8. QoS: Quality of Service
9. SNMP: Simple Network Management Protocol
10. TCP/IP: Transmission Control Protocol / Internet Protocol
11. VLAN: Virtual Local Area Network
12. VoIP: Voice over Internet Protocol

B. All work and materials shall conform to and be installed, inspected and tested in accordance with the governing rules and regulations of the telecommunications industry, as well as federal, state and local governmental agencies, including, but not limited to the Codes, Standards and References as specified in Section 27 05 00 – Basic Telecommunications Requirements Cisco Recommended Practices.

C. References to codes and standards called for in the Specifications refer to the latest edition, amendments, and revisions to the codes and standards in effect on the date of these Specifications.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate all aspects of this specification section with the requirements and responsibilities of the Systems Manager and LAWA IT.

B. Coordinate the Local Area Network transport requirements with the Systems Manager as specified in 27 13 33 Communications Systems Interfaces (Legacy Systems) and other systems vendors to ensure that LAN resources to support the network carriage requirements of other systems (dependent systems) is provisioned and configured and prioritized to support the phased installation and commissioning of the dependent systems and the operational requirements of those systems including their commissioning and testing. Systems that are dependent on the Local Area Network include (but not limited to):

1. Legacy Systems as described in Communications Systems Interfaces (Legacy Systems)
2. Wireless Communications Systems (WiFi)
3. Electronic Visual Information Display Systems (EVIDS)
4. Common User Terminal Equipment (CUTE)
5. Paging Systems (PA)
6. Access Control and Alarm Monitoring Systems (ACAMS)
7. Video Surveillance Systems (VSS)
8. Voice Communications systems including the connectivity requirements of
    - VoIP Telephones
    - Defibrillator Alarms thru the Analog interface
    - Other Analog Circuits thru the Analog interface
    - Building Management Systems as specified in Division 23
    - Network Lighting Control Systems as specified in Division 26
    - Power Monitoring Systems as specified in Division 26
    - Fueling Systems
    - Others not identified at this point in time

C. The Contractor shall be required to coordinate the work in this contract with related works contracts and contractors where infrastructure resources being provided and installed in this project are extended into related works projects.

D. Coordinate IP addressing schema for switches, voice gateways, and end devices with LAWA IT.

E. Coordinate configuration of call managers, voice mail system and network management with LAWA IT.

F. Coordinate requirements for uplink circuits and circuit assignment to end devices with the Premise Wiring and Distribution System contractor.

G. Coordinate activation and commissioning schedule for network services with LAWA IT. Schedule network activation to support test and commissioning activities for all supported subsystems.

H. Coordinate requirements for network end device connections, IP address assignments with each subsystem contractor, LAWA IT and Airline Users.

1.04 SUBMITTALS

A. General – Comply with all LAWA submittal procedures given in other Sections. The following is in addition to or complementary to any requirements given elsewhere.

1. Contractor shall provide submittals as specified in Section 01 33 00 – Submittal Procedures and Section 27 05 00 – Basic Telecommunication Requirements.
2. Product Data
    a. Distribution Switch Blades
    b. Access Layer Switches and redundant power supplies
    c. Voice Gateways
    d. SFP and GBIC Modules
    e. VoIP and analog Telephones
3. Composite Network Diagram – Provide a complete diagram indicating all access layer switch stacks, voice gateways and uplinks. Indicate specific interfaces used for uplinks and downlinks and management IP addresses for all devices.
4. Test Plans and Procedures
    a. Sample of data forms to be used during performance testing.
    b. Certification that Contractor has successfully completed operational and field testing of the systems and it is ready for demonstration of compliance with Contract requirements.

B. As-Built Documentation

1. Provide a comprehensive network diagram reflecting all switches, voice gateways, device names, IP address assignments and uplink / downlink interfaces.
2. Provide a spreadsheet indicating IP addresses and switch ports, and VLAN assignments used to support all connected LAN devices.
3. Provide documentation of all switch configurations in hard and soft copy format proposes to use in this project.

1.05 QUALITY ASSURANCE

A. Contractor shall develop a complete test plan to ensure that all network devices are functioning and configured in a consistent manner in accordance with requirements of this specification and LAWA requirements. Include failover testing for all redundant paths and links recording recovery times after a forced failover. The Test Plan developed by the contractor shall be coordinated with the Systems Manager (refer to Specification Section 27 13 33 – Communications Systems Interfaces (Legacy Systems) for specific Systems Manager responsibilities and duties related to this specification).

1.06 EQUIPMENT CERTIFICATION

A. Provide materials that meet the following minimum requirements:

1. Electrical equipment and systems shall meet UL Standards (or equivalent) and requirements of the NEC. This listing requirement applies to the entire assembly. Any modifications to equipment to suit the intent of the specifications shall be performed in accordance with these requirements.
2. Equipment shall meet all applicable FCC Regulations.
3. All materials, unless otherwise specified, shall be new and be the standard products of the manufacturer. Used equipment, refurbished or damaged material is not acceptable and will be rejected.
4. The listing of a manufacturer as “acceptable” does not indicate acceptance of a standard or catalogued item of equipment. All equipment and systems must conform to the Specifications.
5. Where applicable, all materials and equipment shall bear the label and listing of Underwriters Laboratory or Factory Mutual. Application and installation of all equipment and materials shall be in accordance with such labeling and listing.

B. Components of equipment shall bear the manufacturer's name or trademark, model number and serial number on a nameplate securely affixed in a conspicuous place, or cast integral with, stamped or otherwise permanently marked upon the components of the equipment.

C. Major items of equipment that serve the same function must be the same make and model / version/service pack.

D. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that a complete and fully operational system will result.

1.07 FIELD/SITE CONDITIONS

A. The Contractor shall be responsible for the proper placement of all cabling, racks, cabinets, patch panels, cover plates, outlet boxes, and related hardware, as well as all distribution, and termination equipment.

B. The Contractor shall obtain the approval of Engineer or Design Consultant for the final layout of any equipment to be installed in new or existing telecommunications rooms and tenant

wiring closets prior to the installation of any materials or equipment. Shop drawings showing proposed installation details shall be submitted for approval before beginning installation.

C. The Contractor shall furnish an adequate supply of technicians and materials at all times, and shall perform the work in the most appropriate, expeditious, and economical manner consistent with the interests of the LAWA.

D. The Contractor shall be responsible to LAWA for the acts and omissions of its employees, subcontractors and their agents and employees, and other persons performing any of the work under a contract with the Contractor.

E. The Contractor shall not unreasonably encumber the site with any material or equipment. Operations shall be confined to areas permitted by law, permits, and contract documents.

F. The Contractor shall have an experienced Project Manager on site at all times when work is in progress on any project. The individual who represents the Contractor shall be the single point of contact between the Contractor and LAWA, and shall be responsible for the entire project. This representative shall be able to communicate with LAWA or designated representative whenever requested throughout the life of the project.

G. While working in the facility, the Contractor shall not block any entrances, egresses, or other passageways that are necessary for normal, safe operation. It should be noted that the Contractor is responsible to provide any lifts, hand trucks, etc. that it will need to transport its materials and equipment throughout the site.

H. The Contractor shall protect all buildings, walls, floors, and property from damage resulting from the installation. Any and all damage to property shall be repaired by the Contractor at its expense. If the Contractor enters an area that has damage (not caused by the Contractor), the Contractor shall immediately bring this to the attention of the Engineer so the area can be appropriately noted.

I. Following each day's work, the Contractor shall clean up the areas in which it has been working and dump all trash in the appropriate designated areas.

1.08 WARRANTY

A. Contractor shall provide a warranty for products and work provided under this Section as specified in Section 27 05 00 – Basic Telecommunications Requirements.

B. Provide one year Cisco SMARTnet coverage on all new items of Cisco equipment excluding SFP and GBIC modules. SMARTnet coverage shall be 8 x 5 x Next Business Day.

C. Submit a copy of all manufacturer warranty information.

PART 2 - PRODUCTS

Contractor Please Note: All references to model numbers or manufacturers and other pertinent information herein are intended to establish standards of performance, quality and construction. These model numbers are based on equipment currently installed at LAWA. Equivalent products may be considered if adequate information is submitted to the specifying engineer for approval beforehand.

2.01 ACCESS LAYER SWITCHES

A. Access Layer PoE switches shall be Cisco WS-C3850-24P-S or WS-C3850-48F-S or non-stack WS-C4510RE-S7+96V+/WS-C4507RE-S7+96V+/units with dual Supervisors. Switches shall provide full 802.3AT Power over Ethernet + support on all ports. In stacks that exceed two switches include a wraparound one meter StackWise cable to interconnect top and bottom switch in stack. Switch quantities are shown on the contract drawings. Each switch stack shall be provided with one X2-10GB-LR module located in the top switch in the stack with a second X2-10GB-LR uplink module in the bottom switch in the stack. X2-10GB-LR modules shall also be provided at ports on distribution switches to support uplinks.

B. Access Layer switches located at gate cabinets shall be Cisco IE-3000-8TC-E industrial switches. Each switch shall be provided with one Cisco IEM-3000-8TM 10/100-BASE-T expansion module and PWR-IE3000-AC power supply module and two GLC-LH-SM SFP Modules. Provide DIN rail mount for switch, expansion module and power supply. Provide UL listed grounding power cord for power supply. Include two GLC-LH-SM SFP modules for ports on distribution switch to receive uplinks. Equip each IE-3000 at gate cabinets with one Panduit model DPOEKIT 8-port midspan power inserter kit with DPOEWM8B wall mount bracket to supply power to 6-button VoIP Telephones at gates.

2.02 REDUNDANT POWER SUPPLIES

A. Redundant power supplies shall be Cisco model PWR-RPS2300 units with two C3K-PWR-1150WAC power supply modules and CAB-RPS2300 power cables. One RPS chassis shall be provided for each stack of up to six switches or fraction thereof. Power supply DC power cable shall be provided for each supported switch.

2.03 VOICE GATEWAYS

A. Voice Gateways shall be Cisco model VG-224 units in quantities shown on the contract drawings. Each voice gateway shall be provided with one 25-pair Amphenol connectorized cable terminated on the 110-block equipment termination field at each room. Provide machine imprinted labels on the 110-block equipment field indicating the voice gateway name and circuits one through xx.

2.04 DISTRIBUTION SWITCH MODULES

A. Distribution / PE switch modules and new Cisco 6509E switches shall be provided and configured.

2.05 VOICE OVER IP TELEPHONES

A. Voice over IP telephones shall be Cisco model 7960G six-button units.

2.06 ANALOG WALL TELEPHONES

A. Analog wall mount telephones shall be Allen Tel trimline units with DTMF dial pad, hookswitch and cradle, armored handset cord and hearing aid compatible receiver. Units shall be Allen Tel model GB2554V44AC or approved equal. Color shall be ash.

2.07 PATCH CORDS

A. Copper patch cords shall be factory manufactured units certified to Category 6 specifications. Coordinate patch cord colors for voice and data services with the LAWA IT department. Cables shall be provided in various lengths to allow for neat, organized installation with a minimum of excess cable. All RJ-45 connectors shall be provided with no-snag boots. Coordinate color code for patch cords with LAWA IT.

B. Fiber patch cords shall be provided in a duplex configuration with connector types as appropriate for the connected equipment. Patch cords shall be provided with factory installed SC/APC connections.

2.08 LABELS

A. Shall meet the legibility, defacement, exposure and adhesion requirements of UL 969.

B. Shall be pre-printed or laser printed type.

C. Where used for cable marking, a label with a vinyl substrate and white printing area and a clear “tail” that self laminates the printed area when wrapped around the cable shall be provided. The label color shall be different than that of the cable to which it is attached.

D. Where insert type labels are used, provide clear plastic cover over label.

E. Acceptable Manufacturers:

1. **W.H. Brady**
2. **Ideal**
3. **Panduit**
4. **Other equal**

PART 3 - EXECUTION

3.01 GENERAL

A. System installation and construction methods shall conform to LAWA requirements, requirements of the State of California and all applicable building codes.

B. Contractor shall install equipment to meet Seismic Zone 4 requirements of the State of California and as stated herein.

1. Where undefined by codes and standards, Contractor shall apply a safety factor of at least 2 times the rated load to all fastenings and supports of system components.

C. Cable Dressing: Where fiber or copper cables enter telecommunications room it shall be neatly bundled and fastened and a suitable transition device installed to minimize tension and bend radius on cables. All cable runs shall be horizontal or vertical, and bends shall comply with minimum specified cable bending radii.

3.02 PHASES OF IMPLEMENTATION

A. Provide a consolidated and integrated schedule.

3.03 EXAMINATION

A. The Contractor shall perform a detailed inspection of the site prior to submitting any technical data for approval.

B. The Contractor shall verify that the proposed equipment and methods of installation are compatible with the existing conditions and prepare a corresponding written report of their findings.

C. LAWA shall be notified in writing if modifications of the existing building are required in order to accommodate the new equipment. These modifications shall be made only upon receiving written approval from LAWA.

D. Submit installation drawings for LAWA review and approval.

3.04 GENERAL SWITCH CONFIGURATION

A. The 3750 switch stack shall be configured in a manner that is consistent with similar existing switch stacks in the LAWA network. This configuration will include configuration of uplinks, trunks, spanning tree, HSRP, switch names, passwords and other general configuration required to activate the switches.

B. Provide complete configuration for all IE3000 switches and configuration for all 3750 access ports to support end devices.

3.05 DEPLOYMENT OF VoIP TELEPHONES

A. Furnish and install Category 6A patch cords and VoIP telephones at locations shown on the contract drawings. Test each telephone for correct operation.

B. Furnish and install all analog telephones and provide patch cables to interconnect phones to assigned ports on voice gateways. Test all analog telephones for correct operation.

C. Provide all necessary patching from assigned ports on voice gateways to third party telephones in locations such as elevator cabs. Test each telephone after connections are made.

3.06 INSTALLATION

A. All installation shall follow applicable manufacturer manuals and/or industry best practices.

3.07 FIELD SITE QUALITY CONTROL

A. Test Plan/Procedure: The Contractor shall develop and submit a comprehensive Network Test Plan that has been coordinated with LAWA IT for testing of the network to the LAWA Systems Manager for review and approval 60 days prior to the beginning of any testing activities. The test plan shall detail the objectives of all tests. The tests shall clearly demonstrate that the system and its components fully comply with the requirements specified herein.

B. Contractor shall provide full staff and equipment support to LAWA IT staff during testing of the network. This support shall include failover testing for all uplinks, pre-emptive fail back and testing of uplink bandwidth utilization. Support shall include provision of two (2) network technicians with CCIE certifications for a period of at least two weeks.

1. Test Reports: The Contractor shall submit for each test, a test report document that shall certify successful completion of that test. Submit for review and acceptance within seven (7) days following each test. The test report shall contain, at a minimum:

   a. Commentary on test results.

   b. A listing and discussion of all discrepancies between expected and actual results and of all failures encountered during the test and their resolution.

   c. Complete copy of test procedures and test data sheets with annotations showing dates, times, initials, and any other annotations entered during execution of the test.

   d. Signatures of persons who performed and witnessed the test.

   e. Test Resolution: Any discrepancies or problems discovered during these tests shall be corrected by the Contractor at no cost to the Owner. The problems identified in each phase shall be corrected and the percentage of the entire system re-tested determined by the Design Consultant, before any subsequent testing phase is performed.

2. Termination
    a. Performance verification test shall be terminated when:
        1) Individual components, subsystems, or the integrated system fail to perform as specified.
        2) It is determined that system is missing components or installation is not complete.
    b. Upon termination, corrective work shall be performed and performance verification test rescheduled with LAWA IT.
    c. Retesting shall be performed by Contractor at no additional expense.
    d. Contractor shall continue to perform corrective actions and retest until system passes all tests to satisfaction of LAWA IT.

C. Final Inspection and Acceptance
1. After testing is complete, review tabulated records with LAWA IT.
2. The Contractor will not be responsible for failures caused by:
    a. Outage of main power in excess of backup power capability provided that automatic initiation of all backup sources was accomplished and automatic shutdowns and restarts of systems performed as specified.
    b. Failure of any LAWA furnished power, communications, and control circuits provided failure was not due to Contractor furnished equipment, installation, or software.
    c. Failure of existing LAWA equipment provided failure was not due to Contractor furnished equipment, installation, or software.

3.08 STARTUP

A. The Contractor shall not apply power to the system until after:
1. System and components have been installed and inspected in accordance with the manufacturer's installation instructions.
2. A visual inspection of the system components has been conducted to ensure that defective equipment items have not been installed and that there are no loose connections.
3. System wiring has been tested and verified as correctly connected as indicated.
4. All system grounding and transient protection systems have been verified as properly installed and connected, as indicated.
5. Power supplies to be connected to the system and equipment have been verified as the correct voltage, phasing, and frequency as indicated.

B. Satisfaction of the above requirements shall not relieve the Contractor of responsibility for incorrect installations, defective equipment items, or collateral damage as a result of Contractor work/equipment.

3.09 IDENTIFICATION AND LABELING

A. All cables and patch cables shall have a permanent label attached at both ends.

B. The Contractor shall confirm specific labeling requirements with the Design Consultant prior to cable installation or termination.

C. All indoor cable and patch cable labels shall be pre-printed using BRADY TLS 2200 printer or equivalent and shall be placed loose on the patch cable near the connector end without heat shrinking labels. Labels shall use a three line format with the origination patch panel and port on the first line, the destination patch panel and port on the second line and the system or other descriptive information on the third line.

3.10 COMPUTERIZED MAINTENANCE MANAGEMENT SYSTEM

A. LAWA CMMS: Information regarding all equipment including model, nomenclature, serial number, function, location, recommended preventative maintenance schedule, Quality Assurance Inspections and other pertinent data will be stored in the CMMS database. Contractor shall include in their Bid the cost for collecting and inputting this data for all systems and equipment provided by this Contract into this database.

3.11 CLOSEOUT ACTIVITIES – ACCEPTANCE, MAINTENANCE, TRAINING

A. Acceptance - Completion of the installation, in-progress and final inspections, receipt of the test and as-built documentation including data input of all installed cables in the LAWA management system and successful performance of the system for a 60-day period will constitute acceptance of the system. Upon successful completion of the installation and subsequent inspection, LAWA shall be provided with a numbered certificate from the Manufacturer registering the installation.

END OF SECTION 27 21 00