GUIDE SPECIFICATION
Los Angeles World Airports

SECTION 27 51 13 – PAGING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the minimum requirements for public address announcement and paging systems to be installed and interfaced to existing systems as part of Terminal renovations. Contractor shall interface with the existing public address system which is manufactured by Innovative Electronic Designs, Inc. (IED) and shall provide all equipment and cabling necessary for a complete and upgraded system. Contractor shall upgrade existing IED system as required to meet the requirements given in this Specification Section.

B. Contractor shall include in the Bid all labor, materials, tools, plant, transportation, storage costs, training, equipment, insurance, temporary protection, permits, inspections, taxes and all necessary and related items required to provide complete and operational system shown and described in the Specifications.

C. The Contractor is responsible for providing and coordinating final equipment arrangements, locations, phased activities and construction methods that minimize disruption to Terminal operations and provide complete and operational systems.

D. The Contractor shall coordinate with electrical contractor for provision of horizontal conduit and field boxes required to accommodate cabling of all loudspeakers, microphones and other system equipment.

E. Work Included:
1. All wiring and cabling as shown on the drawings.
2. All paging system receptacles as shown on the drawings.
3. All equipment and materials as shown on the drawings.
4. Cover-plates for outlet and junction boxes.
5. Extension rings where required to provide a flush surface for cover plate mounting on finished walls.
6. Engraved nameplates on all boxes.
7. Coordination of the paging system Ethernet VLANs with the MPLS provider.
8. Integration of the new announcement control system (vACS) with the existing “Globalcom” announcement control system. The Contractor shall hire the Installer responsible for maintenance of the existing Paging System to configure and program the linking of the new Announcement Control System (vACS) and the existing “ACS”.
9. The coordination of all millwork mounting of devices with the millwork providers.

10. The Paging System acoustical design shall meet or exceed the minimum acoustic performance specifications for each zone. Demonstrate by specified tests that all components and the completed systems meet the specifications including acoustical performance requirements.
11. The Contractor shall ensure new equipment shall be capable of tying into existing system. Contractor shall hire the LAWA contractor responsible for maintaining the existing paging system for this work to program and configure the paging head-end equipment.
12. Additional conduit and cabling as required by LAWA per Division 27. Except for network cabling from microphone paging stations, all paging cabling shall be run in 100% conduit runs separate from other systems. Additionally, high level, low level and control circuit wiring shall be routed in separate conduit from each other between the end devices and the associated Telecommunications Equipment Cabinet.
13. Set-up and adjustment of digital line-array loudspeakers in the field with the manufacturer's and LAWA's representative.
14. All conduits, device junction boxes and pull-wires per Division 27.
15. Safety wires for all fixed system equipment.
16. The isolated grounding electrode conductor and other equipment and materials for the isolated ground system.
17. Loudspeaker back-cans for ceiling loudspeakers are furnished under this section .
18. The Paging system shall interface with the Common Use system. The system shall be configured so that the Common Use system can trigger pre-recorded boarding announcements from the paging control computer. Reference section 27 42 20.
19. The Paging system shall interface with the Fire Alarm system. The Fire Alarm system shall provide contact closure or serial digital interface to the paging system as well as one audio input to the paging system.

F. The Contractor shall coordinate specialty electronic, Information Technology (IT) data networks and any other IT infrastructure systems necessary for transport of paging systems audio or data information.

G. Refer to Construction Drawings for device locations and details.

H. Related documents included in the specification requirements:
   1. Section 01 11 00 – Summary of Work
   2. Section 01 25 00 – Substitution Procedure
   3. Section 01 31 00 – Administrative Requirements
   4. Section 01 33 00 – Submittal
   5. Section 01 40 00 – Quality Requirements
   6. Section 01 43 00 – Quality Assurance

7. Section 01 64 00 – Owner Furnished Products
8. Section 01 77 13 – Preliminary Closeout Reviews
9. Section 01 77 16 – Final Closeout Review
10. Section 01 78 00 – Close Out Submittals
11. Section 27 05 00 - Basic Telecommunications Requirements
12. Section 27 05 05 – Selective Demolition Telecommunication Systems

I. Products furnished (but not installed) under this section.

J. Products installed (but not furnished) under this section.

1.2 PRICE AND PAYMENT PROCEDURES (NOT USED)

1.3 REFERENCES

A. Abbreviations and Acronyms

AAS	Ambient Analysis System
ACS/vACS	Announcement Control System/Globalcom Announcement System
ANSI	American National Standards Institute
ASTM	American Society for Testing Materials
BFU	Board of Fire Underwriters
BICSI	Building Industry Consulting Services International
CSA	Canadian Standards Association
DEC	Department of Environmental Conservation
DRP	Digital Record/Playback
EIA	Electronics Industry Association
ER	Equipment Room
FCC	Federal Communications Commission

FM	Factory Mutual
IED	Innovative Electronic Designs, Inc.
IEEE	Institute of Electrical and Electronics Engineers
ISO	International Standards Organization
NEC	National Electrical Code
NEMA	National Electrical Manufacturers' Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Administration
PDRP	Permanent Digital Record/Playback
TIA	Telecommunications Industry Association
TR	Telecommunications Room
TWC	Tenant Wiring Closet
UFBC	Uniform Fire Prevention and Building Code
UL	Underwriter's Laboratories, Inc.
vACS	Globalcom Announcement Control System

B. References

1. 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 following:
   a. CFR 47 Part 15 Radio Frequency Devices
   b. EIA-160 Sound Systems

c. EIA-219 Audio Facilities for Radio Broadcasting Systems
d. ANSI/TIA/EIA-568-C.1 Commercial Building Telecommunications Cabling Standard Part 1: General Requirements, 02/02/09
e. ANSI/TIA/EIA –569-B Commercial Building Standard for Telecommunications Pathways and Spaces, May 2009
f. ANSI/TIA/EIA -606-A Administration Standard for Commercial Telecommunications Infrastructure, 11/24/08
g. ANSI/TIA/EIA -607 Commercial Building Grounding and Bonding Requirements for Telecommunications, August 1994
h. ANSI/TIA/EIA – 862 Building Automation Systems Cabling Standard for Commercial Buildings, 2002
i. FCC 47 Part 68 Code of Federal Regulations, Title 47, Telecommunications
j. IEC 60849 Sound Systems for Emergency Purposes
k. IEEE National Electrical Safety Code (NESC); 2007
l. ISO/IEC 11801 Information Technology - Generic Cabling For Customer Premises
m. LADBS Los Angeles Department of Building and Safety - City of Los Angeles Electrical Code
n. NEMA 250 Enclosures for Electrical Equipment (1000 V Maximum)
o. NFPA-70 National Electric Code; 2008
p. NFPA 72 National Fire Alarm And Signaling Code
q. UL 1863 Underwriters Laboratories Standard for Safety – Communications Circuit Accessories

2. 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.
3. System installation and construction practices shall conform to standard industry practices as defined by the National Association of Broadcasters Engineering Handbook (latest edition), and Sound System Engineering (Don and Carolyn Davis, Howard W. Sams, publisher).

1.4 ADMINISTRATIVE REQUIREMENTS (NOT USED)

1.5 SUBMITTALS

A. Action Submittals:
1. Comply with all LAWA submittal procedures per Division 1 and requirements given in other individual Division 27 Sections. The following is in addition to or complementary to any requirements given elsewhere.
2. Submit a detailed bill-of-materials listing all manufacturers, part numbers, and quantities that the Bidder proposes to use in this project.

3. Submit all proposed labeling materials and nomenclature for approval.
4. Coordination Drawings:
   a. Indicate locations where space is limited for installation and access.
   b. Submit floor plans, elevations, and details indicating major equipment and end device locations. Indicate all floor, wall and ceiling penetrations.
5. Submit all testing plans (acceptance, and endurance) for review and approval prior to the performance of any testing.
6. Paging Zone Code Documents:
   a. Submit floor plans which use color coding and shading to indicate all of the individual loudspeaker zones and the codes that access each loudspeaker zone individually and each zone group. Laminated color copies and PDF format software copies shall be provided.
   b. Submit a list of all paging stations, their locations, and which buttons or codes access which zone groups. If the paging stations are of the 12-button type and require a user-access code, the document is to contain a list of the user types, a description of their level of access, and what the access code is. The user types (for instance: emergency, administrator, airline employee, etc.) and levels of access shall be determined by the Owner and submitted to the Contractor in a timely manner.
   c. The documents above are to be submitted to LAWA and the Design Engineer for approval prior to the System Acceptance testing. The final version of this document shall be created after one month of regular system use and written approval from the Owner that paging station zone group assignment are satisfactory.

B. Project / Closeout Documents required include:
1. Marked-up copies of Contract Drawings
2. Marked-up copies of Shop Drawings
3. Newly prepared Drawings
4. Marked-up copies of Specifications, Addenda and Change Orders
5. Marked-up Project Data submittals
6. Record Samples
   a. Labels for wire and cable identification.
   b. Labels for equipment racks and equipment.
   c. Example of engraved cover plates.
   d. Labeling convention shall be in accordance with LAWA IT Labeling Convention/Standard.
7. Field records for variable and concealed conditions
8. Record information on Work that is recorded only schematically
9. As-built drawings
10. Record drawings:
    a. Post changes and modifications to the Documents as they occur. Drawings will be updated electronically and submitted to LAWA in accordance with the schedule pro-

vided for this by LAWA. Do not wait until the end of the Project. LAWA and the Design Engineer will periodically review Project Record Documents to assure compliance with this requirement.

b. At every quarter, submit Project Record Documents to LAWA and the Design Engineer for LAWA's records.
c. Upon completion of the as built drawings, LAWA and the Design Engineer will review the as built work with the Contractor.
d. If the as built work is not complete, the Contractor will be so advised and shall complete the work as required.
e. Project Record Drawings shall also be submitted in electronic format. Electronic drawing format shall be AutoCAD® Release 2014 or later. LAWA shall have the right and capability to manipulate all electronic file drawings and documentation.

C. Maintenance Material Submittals

D. Shop drawings shall be submitted for review on all items that require assembly by the Contractor including, but not limited to all:
1. Floor plans incorporating the Architect's latest backgrounds indicating equipment, boxes, conduit and cabling. The Contractor’s standard nomenclature shall be employed. It shall not be deemed acceptable for the Contractor to use the Consultants electronic drawing files as their shop drawings.
2. Riser diagrams shall be submitted if applicable and if conduit and cabling information is more readily conveyed this way than in plan format as in #1 above.
3. Detailed system diagrams with separate drawings for Audio, Video and Control subsystems if appropriate given the complexity of the systems. Diagrams shall include Contractor's labeling, symbols and nomenclature. It shall not be deemed acceptable for the Contractor to use the Consultant's electronic drawing files as their shop drawings.
4. Equipment room layouts showing equipment locations and dimensions with equipment cabinets and clearances.
5. Loudspeaker enclosures, aiming and mounting.
6. Supporting brackets for the suspension and support of fixed systems components. Shop drawings shall be stamped and signed by a structural engineer registered in the State of California.
7. Supporting brackets for the suspension and support of portable systems components.
8. Receptacle cover plates indicating connectors, jacks, controls and labeling to scale.
9. Any equipment custom manufactured by the Contractor.
10. Acoustic performance mapping of each loudspeaker in situ (EASE analysis) for each zone.

E. Test results shall be submitted for review for the following as specified herein:
   1. Performance tests on completed component sub-assemblies including all racks, consoles and enclosures.
   2. Performance tests on the complete system.
   3. The test procedures for the test described in Part 3 below shall be submitted for review 30 days prior to the performance of the tests.

F. Product Data Submittal: The Contractor shall submit for review a complete and final list of all components that are to be furnished. This list shall be in the same order and format as the Specifications and shall include confirming manufacturers' independent test data for each specified item. A brochure and photograph (unless included in the brochure) of each item shall also be furnished.

1.6 QUALITY ASSURANCE

A. The Contractor's Quality Assurance Inspector shall conduct a visual inspection of all installations to verify that the installations are in accordance with LAWA's and manufacturer's specifications. Records of the inspections signed and dated by the Quality Assurance Inspector shall be provided to LAWA and the Design Engineer. LAWA and the Design Engineer shall be notified by the Contractor of any inspection(s) and LAWA and the Design Engineer may elect to participate in any inspection(s). All QC information shall be provided to LAWA for input into the CMMS (refer to paragraph 3.10).

B. Unless otherwise stated, all electrical, electronic and optical equipment shall be products of firms regularly engaged in the manufacture of electrical, electronic or optical equipment. The equipment shall be the latest model or type offered which meets the applicable specifications at the time of the submittal. Discontinued items replaced by newer models or versions are prohibited and should not be submitted for review.

C. All materials and products shall be new and of professional quality. No used materials shall be installed. No existing equipment shall be re-used except as noted on the drawings.

1.7 SUBSTITUTION OF EQUIPMENT

A. Approval of alternate or substitute equipment or material in no way voids Specification requirements.

B. Under no circumstances shall LAWA be required to prove that an item proposed for substitution is not equal to the specified item. It shall be mandatory that the Contractor submits to Engineer all evidence to support the contention that the item proposed for substitution is

equal to the specified item. The Owner's decision as to the equality of substitution shall be final and without further recourse.

C. In the event that LAWA or the Design Engineer is required to provide additional engineering services as a result of substitution of equivalent materials or equipment by the Contractor, or changes by the Contractor in dimension, weight, power requirements, etc., of the equipment and accessories furnished, or if the Design Engineer is required to examine and evaluate any changes proposed by the Contractor for the convenience of the Contractor, then the Design Engineer's expenses in connection with such additional services shall be paid by the Contractor and may be deducted from any moneys owed to the Contractor.

1.8 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 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. Manufacturers of equipment assemblies that include components made by others shall assume complete responsibility for the final assembled unit.
   1. All components of an assembled unit need not be products of the same manufacturer.
   2. Constituent parts, which are alike, shall be from a single manufacturer.
   3. Components shall be compatible with each other and with the total assembly for intended service.
   4. The Contractor shall guarantee for a minimum of two (2) years, the performance of assemblies of components, and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly.

C. 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.

D. Major items of equipment that serve the same function must be the same make and model.

E. 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.

F. Maximum standardization of components shall be provided to reduce spare part requirements.

1.9 DELIVERY, STORAGE AND HANDLING (NOT USED)

1.10 FIELD/SITE CONDITIONS AND ON-SITE PERSONNEL REQUIREMENTS

A. Contractor shall be (or shall subcontract with an installer who is) certified by the paging system manufacturer (IED) to install their equipment. Contractor shall secure the services of the LAWA designated maintenance contractor for any work involving configuration or programming changes made to the active LAWA paging system at no additional cost to LAWA.

B. 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.

C. The Contractor shall obtain the approval of LAWA or Design Engineer 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.

D. 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 LAWA.

E. 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.

F. 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.

G. 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.

H. 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.

I. 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.

J. 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.

1.11 WARRANTY

A. Materials and workmanship shall meet or exceed industry standards and be fully guaranteed for a minimum of two (2) years from Final Acceptance. The Contractor shall provide the highest available level of IED maintenance service during the warranty period.
   1. The Contractor shall use current LAWA maintenance provider to conduct all maintenance work. Service personnel must be local to the project jurisdiction to allow required response times to be met.
   2. The Contractor shall be responsible for and make good, without expense to LAWA, any and all defects arising during this warranty period that are due to imperfect materials, appliances, improper installation or poor workmanship.
   3. The Contractor shall submit, in writing, provision during the warranty period of two years for on-site availability of service personnel within twenty-four hours of call seven days a week and for exchange of faulty components within 1 additional day. This service requires assurance of commitment by the subcontractors and suppliers of all components.

B. Submit a copy of all manufacturer warranty information.

C. The Contractor shall, within the warranty period, schedule two visits to inspect and perform preventive maintenance on the system. The first visit shall be six months after the commencement of the warranty period. The last visit shall be just prior to the end of the warranty period. All work done must be submitted to LAWA in a written report describing the work, the amount of time taken, and all the individual's names who performed the work.

D. The Contractor shall return 90 to 120 days after the system has been turned over to the Owner for additional programming, maintenance and system fine-tuning. Conduct interviews with the user group via telephone to acquire information needed to complete this task. Allow for one full day of programming in your initial bid to complete. Provide a per hour programming fee that will be charged if additional programming is needed.

E. The following items shall be furnished to the Owner by the Contractor for future maintenance and repair:
   1. Provide (6) spare 12 button paging stations (horizontal orientation) which include hand-held microphone with magnet on the back.
   2. Provide (3) spare 200 watt amplifier cards.
   3. Provide (2) spare 400 watt amplifier card.
   4. Provide (1) spare 500R card.
   5. Provide (2) spare ambient noise sensors.
   6. Provide ceiling/wall loudspeaker spares in quantities of 10 per type installed.
   7. Provide (1) spare line-array loudspeaker.

PART 2 - PRODUCTS

2.1 PAGING SYSTEM GENERAL DESCRIPTION

A. System shall be a professional quality, multi-function system to be used primarily for transmission and broadcast of emergency and audible paging messages and background music sources. New equipment shall consist of:
   1. New loudspeakers, connectors, transformers, crossovers, signal delays, cabling, conduit, boxes, wiring, and appurtenances for a fully functional and operational systems as described herein and shown on the contract drawings. Installation shall include all branch conduits, required for a complete installation including all fittings, pull strings, seismic supports/bracing, etc.
   2. Amplifiers, mixers, signal conditioning equipment, digital message repeaters and storage, compressor/limiters, switchers/routers, equalizers, operating software, test equipment, and head end equipment as described herein and shown on the contract drawings.
   3. All system operations and controls shall be controlled by a microprocessor and appropriate digital processing. The microprocessor shall manage and control all system func-

tions and hardware such as microphone stations and associated queuing, telephone interfaces, distribution of emergency announcements, local announcements, terminal announcements, background music, recorded announcements, and pre-recorded messages.

4. The equipment listed herein, consists of major equipment for the project. The contractor shall integrate into the system design and provide any additional components, wiring, programming, etc., to complete a functional system operating as described within the specifications and shown on the drawings.
5. In the event that a specified piece of equipment or product has been superseded, discontinued or is no longer available from the manufacturer, the Contractor shall submit a request for substitution of the originally specified product. The substitute product shall be the manufacturer's most current model of the specified product, or if the specific product line has been discontinued, a product by the same manufacturer with specifications meeting or exceeding, and as close as possible to those of the originally specified product.

B. Public address system shall consist of the following:
1. Announcement control system (ACS/vACS)
2. Globalcom Announcement Control System (vACS)
3. System control computer
4. Ambient analysis system (AAS- Ambient sensors & Ambient Sensor Collectors)
5. Monitor/test system
6. Gate, podium, and supervisory microphone stations
7. Equalizers
8. Amplifiers/Titan Frames
9. Loudspeakers
10. Logic Voltage I/O
11. Audio I/P Module

C. Globalcom Announcement control system (ACS/vACS) shall consist of:
1. The vACS/ACS microprocessor controlled multiple microphone station/Titan Frame/Client Server inputs and multiple output zones.
2. All microphone input stations shall be assignable to any combination of the output zones.
3. Assignments must be readily changeable by qualified authorized personnel through the use of the system control computer.
4. Message types shall have the following priority:

Description:	**Priority:**
a. Fire Marshalls Microphone Dispatch Center Emergency All Call (Airport-wide)	1
b. Emergency Pre-Recorded Message -Fire	2

	Emergency Pre-Recorded Message Evacuation (Bomb Threat/Earthquake)	
c.	Gate – Direct Podium/Supervisor – Direct Local Multi-Zoned Group (Flight Calls) Local Multi-Zoned Pre-Recorded (Area Specific Advisories) Local Multi-Zoned Group Pre-Recorded (Tenant/Airport Specific Advisories)	3
d.	Remote Zoned (Communications Center Operators) Terminal Zone Group - Prerecorded	4

D. Use of the Fire Marshall's microphone or Dispatch Center Emergency 'All Call' (Airport-wide) shall override all other messaging, including supervisory microphones.
   1. Only one emergency announcement may be made at a time, regardless of zone assignments, and an emergency announcement or message shall interrupt and prevent any other use of the system.

E. A multi-local or local announcement shall not prevent a terminal announcement from playing, but it shall interrupt and override the terminal announcement in the zones that have been assigned to multi-local or local zone's use.

F. System shall be capable of making at least 8 local announcements simultaneously, as long as there is no zone overlap.

G. ACS/vACS shall be capable of recording at least 8 terminal announcements simultaneously, but shall only play 1 terminal announcement in each zone at a time.

H. All audio switching circuits shall be designed and constructed so that no switching transients, clicks, pops or microphone keying tones will be audible.

I. All external connections to the ACS/vACS shall be made with compression type screw terminal strips.

J. Redundant power supplies shall be furnished so that the system can continue to operate if a power supply fails.

K. Control system components shall be mounted on printed circuit cards installed in plug-in card files.

L. All control system equipment shall be rack mounted in 42" deep LAWA standard 19-inch equipment cabinets per Section 27 11 00 located within LAWA Telecom rooms.

M. ACS/vACS shall incorporate audio and control inputs from the following:
1. Main Terminal Dispatch Center: up to 6 inputs
2. Podium microphones
3. Gate microphones
4. Fire Marshall's microphone
5. Supervisory microphones located throughout the Terminal
6. Emergency relay contact from the facility life safety system
7. FIDS/BIDS/GIDS server
8. Emergency Visual Messaging System
9. Terminal Courtesy Announcement System (T-ACS)
10. Other ACS and vACS

N. Public address system control computer system:
1. Contractor shall furnish a permanent PC-compatible computer for configuration and control of the ACS/vACS, control and operation of the AAS specified functions, manipulation and operation of the DRP and PDRP, and operation of the PA system's monitor/test system.
2. Minimum hardware/software requirements: control system computer configuration shall be sufficient to ensure proper operation of the public address system and shall incorporate, at a minimum:
   a. Processor based PC-compatible computer with fastest available processor speed at time of product submittal. ACS/vACS host computer shall come equipped with multiple serial and parallel data ports.
   b. 19-inch or larger color flat panel monitor.

O. Program storage:
1. Permanent program storage shall be accomplished in non-volatile memory and EPROMS.
2. Following interruption of service, power restoration shall be automatically sequenced in a minimum of two stages - processing equipment followed by amplification equipment.
3. There shall be no loss of operating configuration information and operator intervention shall not be required in order to restore system operation.

P. Digital record/playback system (DRP):
   1. The DRP shall be designed so it can be installed in the ACS/vACS as an integral part of the whole system.
   2. The DRP shall have at least 8 separate channels and each channel shall be able to record at least 600 seconds of audio. When a microphone station zone group selection button is momentarily pressed the following functions shall be performed:
      a. The microprocessor shall detect the action.
      b. The system shall find an open DRP channel.
      c. The 'READY' LED indicator shall illuminate on the microphone station.
      d. The DRP channel shall be assigned, and the announcement from the microphone station shall be stored. The announcement time duration shall be preset to 50 seconds.
      e. The green LED associated with that button shall start to flash 8 seconds before the preset announcement limit.
      f. The announcement shall be retained for playback when the microphone or announce button is released. The microphone or announce button must be released prior to the preset announcement limit or prior to any 5 second silent period.
   3. The announcement will play back automatically, to the selected zones, in its assigned queue position.
   4. An announcement shall be canceled when a microphone or announce button is pressed and held for a 5 second silent period. Cancellation shall be indicated by the green light going off.
   5. The red 'BUSY' LED's beside the zone group select buttons on the microphone station shall light when all DRPS channels are busy.
   6. The microphone station shall be able to select a desired zone group when all DRPS channels are busy. The 'BUSY' LED will flash acknowledging acceptance of the stationinto the queue (first-in, first-out). When the station reaches the top of the queue, the station beeper will sound and the green 'READY' LED will turn on and the microphone station can proceed with its announcement recording.

Q. Permanent digital record/ playback system (PDRP):
   1. The PDRP system shall be designed as an integral part of the announcement control system.
   2. The PDRP system shall have a non-volatile Memory capable of storing not less than 800 seconds of audio messages.
   3. Playback of the PDRP system messages shall be assignable to any zone or zones by the microcomputer.
   4. Scheduling of PDRP system messages shall be set by the microcomputer.
      a. The PDRP system shall have the ability to record and play back a limited or unlimited repeat sequence, or to play any message at a specified interval on a real time clock schedule.

b. Initiation or interruption of a playback sequence, on site recording, or monitoring of all PDRP messages shall be possible from any assigned microphone station.
c. It shall be possible to play a message to the zone map for multi-local group 1 of that microphone station, or to a terminal zone group instead of to the zone map assigned to the message.

5. The PDRP system shall hold in permanent storage recorded messages such as:
   a. Emergency evacuation instructions.
   b. Fire warning/life safety instructions
   c. Public service messages (clean air act announcements, white zone, vehicle parking messages, and freedom of speech area identification.)
   d. Airline regulatory announcements such as the number of bags allowed on a flight, or non-smoking flights.
   e. Institutional messages such as baggage matching/unattended baggage announcements.

R. Ambient analysis system (AAS):
1. The AAS shall control specified audio levels in response to ambient or background noise levels.
2. All parameters governing the manner in which the system responds to noise and adjusts the program signal shall be set individually for each channel.
3. Manufacturer's software package shall be provided to set up the system, observe and tailor its operation, permanently save the setup parameters, and produce a printed record of them.
4. The AAS shall have the capability to differentiate between ambient noise and the actual program material.
5. The system shall be a microprocessor based system with software which removes the contribution of the program signal from the sensed signal to determine the true level of the ambient noise.
6. The microprocessor shall direct the associated digital attenuator(s) corresponding to the appropriate program channel(s) to increase or decrease level accordingly.
7. The period of time over which levels can be adjusted shall be established in the software in the range of 1 second to 5.25 hours.
8. Each AAS shall be configured in the field from the portable control computer system. The public address system control computer shall be the permanent host for the setup software package following initial set-up.
9. A 'CALIBRATE CHANNEL' screen shall display real-time levels of 4 key parameters, allowing the Owner to accurately fine-tune the system and verify its proper operation.
10. A computer shall only be required for setup and monitoring. Once the initial set-up procedure is completed, setup parameters shall be saved in non-volatile memory in the AAS. Following set-up, the AAS shall then operate without the use of a computer.

11. The AAS shall have the ability to control one channel or a group of channels in real-time response to the ambient noise.
12. The AAS microprocessor shall be capable of controlling at least 44 channels simultaneously.
13. The system shall provide precise control of the program level in response to inputs from remote sensors.
14. AAS ambient noise sensor units shall have mounting options for deep double gang electrical boxes, or 4-inch speaker back boxes and grills.
15. One sensor shall be capable of controlling from one to forty-four attenuators simultaneously. A group of sensors shall be capable of being averaged to control one attenuator.
16. Each AAS microphone shall consist of an omnidirectional condenser microphone, a preamplifier, and an analog signal converter.
17. Each AAS microphone shall be capable of being located up to 5,000 feet from the mainframe.
18. Connections between the sensors and the mainframe shall be made using standard audio shielded twisted pair cable of 18 AWG or larger.

S. Monitor/test system:
   1. The monitor/test system shall have the capability to audibly monitor the signal at any point in the system. As a part of the monitor system, manual or programmed audible frequency self-testing shall be available, as well as an inaudible (20 kHz) test designed to exceed the requirements of NFPA 72F. The monitor test system shall be a full function monitoring system with self-diagnostics systems testing capability.
   2. The monitor/test system shall be designed to allow the user to check status and condition of the audio and non-audio signals both audibly and visually.
      a. Via the System control computer, the monitor/test system shall be capable of selecting and feeding any one of remotely located monitor/test points to an audio interface module which measures and attenuates the signal for use by the computer and monitor amplifier which shall be connected to a dedicated monitor/amplifier.
      b. This feature shall allow the operator of the computer to select any remote signal, measure its level and listen to this level at some fixed predetermined level independent of the original, so that a quality and magnitude comparison can be made both electronically and audibly.
      c. At the same time, the output level shall be displayed numerically on the screen. System shall also be capable of monitoring power supply voltages throughout the system. The monitor test system shall also be capable of monitoring low impedance power amplifiers (8 ohms or less), line level audio, DC voltages, and AC voltages.
      d. System shall have a useful input signal range of minus 55dB to plus 40dB.
      e. System shall consist of high quality line level amplifiers that can be switched to a single line level output.

3. The monitor/test system shall consist of two main parts: the first part shall be a rack mount unit, and the second shall be the monitor interface module. These two products shall be designed to be used together or to be used independently.
   a. The monitor/test system shall consist of the monitor test card, physical housing, power supply and motherboard. The monitor test card shall contain 64 balanced, differential, high impedance, gain adjustable, high quality audio amplifiers. These amplifiers shall normally be set to accept a standard 70 Volt line input at clipping level but shall also be capable of accepting input level from DC to 1000 Volts AC. The outputs of these 64 amplifiers shall be computer switched to an active output module. The monitor test card shall also contain necessary card edge connections and circuitry to interface a standard EIA-422 digital link to the 64 switches that select one of the inputs.
   b. A support panel that serves as a card guide and mount for the plus 15 V and plus 5 V power supply shall be physically mounted to the monitor test card.
   c. The monitor test system board shall be the motherboard that is the rear panel of the housing, shall provide a mounting for all internal and external connectors and shall provide the interconnecting wiring. The external connectors shall be:
      1) Wire-in compression screw terminal that provides access to all 64 audio inputs with 192 individual screw terminals and three additional terminals for access to the audio line output.
      2) The AC line connector which shall be a standard 3 pin male European style socket;
      3) Two each 37 pin sub D connectors that shall provide access to the controlling computer and to other components in the EIA- 422 circuit.
         a) Up to 255 monitor/test systems shall be able to be linked together per inter-communications port on the monitor-test system.

T. Microphone Stations:
   1. Each microphone station shall originate announcements into zone groups as detailed in the floor plans and public address system drawings.
   2. Any microphone station shall be capable of being programmed into any zone group.
   3. Microphone stations shall be capable, if so programmed, of making emergency zone group announcements, terminal zone group announcements, local zone group announcements, and multi-local group announcements.
   4. If programmed, microphone stations shall also be capable of performing any or all of the control functions of prerecorded messages. These control functions shall include initiating a playback sequence, interrupting a playback sequence, recording a message, monitoring a message, or playing back a message to its own multi local zone group, or to a terminal zone group instead of to the zone map assigned to that message.
   5. Microphone stations shall include a hand-held, push-to-talk microphone. Gooseneck paging microphones are not allowed. Each microphone station shall have buttons for zone group selection to activate that microphone station for announcements into pre-

programmed zones. Each station shall contain its own microphone preamplifier, limiter/compressor, and line amplifier with balanced output. Each microphone station will be provided complete with cut-outs and mounting hardware for microphone stations mounted in furniture, fixtures, equipment, or structure. Provide horizontal orientation microphone stations. If vertical orientation microphone stations are requested due to physical mounting constraints, Contractor must obtain prior approval from LAWA IT. Microphone stations shall be either flush wall mounted or millwork mounted. Table top mounted microphone stations are not permitted without approval from LAWA IT.

a. A green 'READY' LED shall illuminate when the desired portion of the system is ready for the announcement.
b. After the green LED is illuminated, any 5 second pause in the announcement whether before, during or at the end of the announcement, will terminate the announcement.
c. A red 'BUSY' LED on the microphone station shall indicate when the portion of the system requested is busy.
d. If the portion is busy, selecting the desired zone group will automatically enter that microphone station into the queue (first-in/first-out).
e. The red 'BUSY' LED shall begin to flash, acknowledging acceptance of the microphone station into the queue.
f. When the microphone station gets to the top of the queue, the beeper shall beep and the green LED shall illuminate, indicating that the microphone station is available for the announcement.
g. The normal procedure for making an announcement on the microphone station type being used shall be resumed before the cessation of the beeps.

U. Podium and supervisory microphone stations:
1. Supervisory microphone stations shall have a twelve (12) button keypad for data entry plus an LCD digital display. Microphone stations shall be either flush wall mounted or millwork mounted. Table top mounted microphone stations are not permitted without approval from LAWA IT.
   a. Keypad entry shall enable them to select any zone group or prerecorded message function in the system to which it has been given access by programming from the computer keyboard.
   b. Supervisory microphone stations shall have three non-announcement functions available from the keypad by entry of a number sequence:
2. Keypad disable/enable.
3. Self-test.
4. Internal oscillator 'ON/OFF' for system test purposes.

V. Gate microphone stations:

1. Gate microphone stations shall consist of a push-to-talk microphone, microphone clip and connector. Microphone stations shall be either flush wall mounted or millwork mounted. Table top mounted microphone stations are not permitted without approval from LAWA IT.
2. When a gate microphone is activated, it will activate the zone to which the associated podium microphone is normally programmed to activate.
3. Connection to the public address system shall be via a connection to the podium station with which the gate microphone is associated.
4. No access to preprogrammed announcements shall be available from the gate microphone stations.

W. Telephone interface:

1. Telephone interface stations, when addressed from a tone type telephone, shall have capabilities similar to those of the supervisory microphone stations.
2. Provide three dual input telephone interface stations.

X. Loudspeakers shall be the type and number depicted in the contract drawings and as required by the Contract Documents.

Y. Amplification shall:

1. Be provided as shown in the Contract Drawings.
2. Provide full bandwidth signals to those loudspeakers that have a single, full range audio input.
3. Provide crossovers and a high and low frequency signal to those loudspeakers which are bi-amplified.
4. Be capable of supplying 4 Ohm, 8 Ohm, 16 Ohm and 70 Volt output without the use of a transformer.
5. Be provided with adequate cooling for the amplifiers, as recommended by the amplifier's manufacturer.

Z. Connection to the emergency announcement system:

1. Emergency messaging shall be automatically initiated whenever the system is notified of a general alarm condition in the new Terminal.
   a. Whenever a local alarm condition is detected by the fire alarm system, the fire alarm system will initiate immediate notification of the alarm condition to the Dispatch Center.
   b. If a General Alarm Condition is annunciated the fire alarm system will immediately provide contact closure to the system.

c. The system shall automatically broadcast emergency instructions whenever a General Alarm notification is transmitted. The System emergency message shall repeat for a minimum of 20 minutes or until the fire alarm system is manually reset.

2. The system shall be provided with a sensing input which will accept a relay or contact closure from the fire alarm system which will completely and fully mute the system.
3. When the relay or contact closure is removed, the system shall return to normal operational status with the settings that were active and in place just prior to the system's receipt of the contact closure.

2.2 GENERAL PERFORMANCE REQUIREMENTS

A. System Performance:
1. Electrical Performance; Source Input to Power Amplifier Output:
a. Frequency Response (Equalizer flat): +/- 0.2 dB 20 Hz to 20 kHz.
b. Total Harmonic Distortion (THD): Less than 0.05%, 20 Hz to 20 kHz, 4 ohms.
c. Noise: At least -105 dB, 20 Hz to 20 kHz, referenced to input of +4 dBm.
d. Crosstalk: At least 60 dB, 20 Hz to 20 kHz.
e. Damping Factor: Greater than 20 (below 1 kHz).
2. Nominal gain from microphone station output to input of Ambient Noise Analysis system shall be 0dB.
3. Nominal voltage at input of Ambient Noise Analysis Systems shall be 1.00 volt RMS.
4. Electro/Acoustic Performance; Distributed Systems: 90 dB maximum RMS single word level, 80 dB average RMS measure at ear level in each zone with test speech source having equivalent RMS voltage equal to that measured at the microphone station output with 65dBA speech at normal microphone distance from the mouth.
5. Intelligibility Performance; objective measurements of intelligibility, as referenced in IEC standard 60268-16, shall be performed in all representative acoustical environments. Representative acoustical environments are defined as major functional areas such as Baggage Claim areas, Departures Ticketing Lobby, Departures Hold Rooms, etc. Measurements are to meet or exceed standards established by IEC 60849 which calls for a 'Common Intelligibility Scale' greater than or equal to 0.7 (STI equivalent of 0.5). Measurements shall be carried out according to all provisions and limitations as provided by IEC 60849.
6. Loudspeakers located near microphone stations in low ceiling areas may need to be tapped down to avoid possible feedback.

B. Ambient Noise Analysis System:
1. Shall be adjusted in each zone to provide variable attenuation in the range of 0 to -10dB. To be calibrated to correspond with minimum and maximum expected ambient noise levels, but not to exceed 10dB, + or – 3dB, above maximum ambient noise level, as meas-

ured when area is full of people. Ambient Noise Analysis System must be calibrated by a manufacturer-approved consultant, and calibration process must include at least 2 follow-up visits which measure all representative acoustical environments. Observations and measurements must be submitted in written form.

2. Contractor shall confirm that ambient microphone positions are not located in close proximity to noise emitting equipment which turns on and off intermittently, providing false ambient noise information to the system.

C. Monitor/Test System: Shall perform routine, automatic diagnostic tests utilizing a self- generated test tone. Refer to manufacturer's instructions and recommendations for settings.

D. Each output zone shall be adjusted at the corresponding power amplifier and using the system software so that volume levels (using an appropriate pink noise source) from zone to adjacent zone are within 3dB of each other, before any Ambient Noise System auto-attenuation takes place.

E. General Network Requirements:
   1. A 100Mbps switched Ethernet network is required for general audio, switched at a layer 2 (MAC) protocol level throughout.
   2. Microphone Station to ACS/vACS - One dedicated VLAN at 100Mbps.
   3. Digital Amplifier to ACS/vACS - One dedicated VLAN at 100Mbps.
   4. ACS/vACS to ACS/vACS - One dedicated VLAN at 100Mbps.
   5. Quality of Service - QoS shall be used to give the time sensitive CobraNet data precedence over less sensitive computer traffic, insuring that other transactions occurring over the network do not affect audio delivery.

2.3 MAJOR EQUIPMENT

A. Schedule of Major Equipment (or equivalent):

Description	**Mfr.**	**Model**
Speakers:		
Ceiling Loudspeaker – 6.5”	Atlas	FAP 62T with and without custom hanger
Ceiling Loudspeaker – 8”	Atlas	FAP 82T w. hanger
Ceiling Loudspeaker – 8” for flush mounting on metal pan ceilings	JBL	8138
Outdoor-rated ceiling speaker – 8”	Misco	JC80WP-10T70-A
Outdoor-rated ceiling speaker – 5”	Misco	JC5WP-4T70
Ceiling-mount speaker system	EAW	CP621
Ceiling Loudspeaker – Low Profile for ceiling clearance problem areas	Sound Tube	CM42-EZII
Wall speaker	Atlas Sound	SM42T-W
Wall speaker –Surface mount	TOA	H3
Line-Array Loudspeaker – for high volume areas or high ceiling areas	Renkus-Heinz	IC16
Amplifier and DSP Section:		
Titan Mainframe System 120VAC	IED	TITANSYS-L
Titan DSP Software	IED	T-DSP
Titan Monitor/Test Software	IED	T-MON
Titan Backup power amp switching software	IED	T-BACK
Power Amp Card Dual 70-Volt 200W 120VAC	IED	IED6272L
Power Amp Card 70-Volt 400W 120VAC	IED	IED6472L
Ambient Analysis Sensor Collector	IED	IED6540TSYS-L

Ambient Sensor Collector Software	IED	T-AMB
Ambient Sensor - 2 Gang Plate	IED	IED0540S
Ambient Sensor	IED	IED9032NS
Headend Section:		
ACS/vACS "Announcement Control System"	IED	IED1200ACS/vACS
Backup CPU/Hard Drive Card	IED	510CPU
Digital Frame link Card-Multimode with Back ST	IED	510N and NT
Microphone station input card and STRIP	IED	500C and FT
Globalcom 2 Logic in/2 relay out module	IED	IED1522LK
Atlas computer keyboard/drawer assembly	IED	IED 0590KDS
2 Channel analog to Cobranet input module	IED	IED 1502Ai
ACS microphone station 528 rackmount	IED	IED 528SRME-H
Globalcom Lifeline failover software	IED	IED 1000LL
Dell Power Edge Server	IED	1151
8 input keyboard/video/mouse switcher	IED	900 SWS
Titan Amplifier Frame	IED	T-9160L
Duel Channel 200W 70,7 V amplifier card	IED	T-6472L
Logic I/O relay	IED	T-9302L1R

ACS/Vacs Configuration Computer	IED	591R-S5
UPS for ACS/vACS with network interface card	APC	SU3000RMXL3U with one SUA48R3XLBP
Relay input card (for Fire Alarm Interface)	IED	508BI0
Telephone Interface	IED	508T
1000ACS/vACS software with a 32-zone license	IED	IED1000
FAS Software	IED	Model 632
Custom software for Duran Audio network "fault" feed	IED	IED0760
Audio Ducker	Rolls	DU-30
Rackmount LED Display/Keyboard	MA	RM-KB-LCD17
Telephone Auto Dialer	Antx	DS8-N
Microphone Stations:		
Paging mic station -12 button horizontal, IP digital unit (flush or surface mounted depending on the backbox)	IED	528HFM-H
Hand-held microphone	IED	501HH
Paging mic Station – Side Kick microphone station (flush or surface mounted	IED	528SK-H
Paging Microphone expansion board to accommodate Side Kick microphone side kick unit	IED	528E
Rackmount paging station w. spkr, IP digital	IED	508SRM
MIC station horizontal desktop with expansion board	IED	A528HDTE-H
MIC station horizontal desktop without expansion board	IED	A528HDT-H

2.4 VISUAL PAGING

A. Visual Paging: The visual paging system shall be integrated into the SITA Shared Use Station (SUS) and shall meet the requirements of that system and the existing system functionality. The Contractor shall be responsible for providing the information necessary for and coordinating the programming of visual paging system so that visual and audio zones are synchronized. The Contractor shall also be responsible for any programming changes required in the visual paging system to accept from SITA flight information associated with new gates.

B. Emergency Visual Paging: The emergency visual paging system shall be integrated to the existing Emergency Visual Paging which monitors are in the SSCP's in all nine (9) Terminals. Contractor shall integrate the new system to the existing Globalcom ACS/vACS-based head-end equipment and associated computer(s) located in the Telecom Building.

C. General Audio/Visual Paging System: If LAWA determines that a new Globalcom is necessary for the new system, the Contractor shall integrate the new system to the existing Globalcom and shall designate the new Globalcom system as "ACS/vACS #X" where "X" shall be provided by LAWA. Contractor shall also work with the LAWA Network Group to establish a "shared VLAN" or shall provide and install two (2) IED model11 OODAB digital audio bridges in case of two systems on "separate VLAN's". Contractor shall also upgrade the firmware within the main and lifeline Globalcom CPU assemblies to the latest version. Upon completion of the integration, ARCC staff using the two ARCC microphone stations #9 and #67 shall be able to make audio/visual pages to the Terminals in the CTA area.

2.5 CUSTOM FABRICATION

A. Equipment cabinets: Telecommunications Rooms and equipment cabinets are supplied by Section 27 05 00. Contractor may arrange with cabinet supply contractor to ship cabinets to their factory for pre-rack and wiring of paging equipment. Paging system contractor is responsible for providing all cooling equipment, shelves, drawers, special power wiring, ground connections, cables, connectors, appurtenances, and adapters of any kind necessary to accommodate the PA system installation, operation, testing, or maintenance.
   1. Contractor shall provide the appropriate factory or custom rack mount adapters for all equipment installed in the equipment rack, whether specifically itemized or not.
   2. Contractor shall provide security covers for all equalizers, crossovers, signal delays, and other adjustable signal processors.
   3. Unused slots shall be covered using blank panels provided by the system manufacturer.
   4. Contractor shall provide at least one security screw for each piece of equipment and four security screw tools for the system.

B. Interface tie points: Contractor shall furnish custom-fabricated interface tie points to accommodate distribution of system program material, and to transition wiring types between the paging system equipment racks and loudspeaker zones. Contractor shall furnish operable methods for labeling, dressing, and distributing wires, shields, and grounding conductors so as not to adversely impact the quality of system voice and data transmission. Contractor shall provide test points at each audio and data circuit appearance for that tie point for maintenance and testing purposes. All circuits and cables shall be clearly labeled. All interface tie-points will be mounted within NEMA 12 enclosures, to be sized by Contractor in accordance with the requirements of the NFPA 70. Enclosures are to include integral door locks. All interface tie points are to be keyed alike. Keys shall be turned over to the Owner at Final Acceptance.

C. Transformers: Where required by the function of the system, provide appropriate impedance ratio and power handling capacity for audio transformers required in the system.

D. Loudspeaker hardware: Contractor is solely responsible for ensuring that all grilles, transformers, enclosures, baffles, and ancillary hardware to be supplied are compatible with the loudspeakers specified.

E. Pads: Contractor shall provide balanced pads, comprised of 0.5 watt, 5 percent composition resistors soldered to fixed connection points at each end, as required to achieve proper impedance matching and levels.

F. Remote control panels and receptacle plates: Contractor shall fabricate with 1/8-inch thick 6061-T6 aluminum with a brushed, anodized finish (color to match surrounding surfaces).

G. System functional diagrams: Contractor shall provide 1/2-size as-built functional diagram, framed with acrylic cover and mounted adjacent to equipment rack, for each control or audio system (including patch field designations). Mounting inside interface tie point enclosures will be acceptable.

2.6 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. Brother
   3. Panduit
   4. Other equal

F. Contractor shall provide permanently mounted 1/32-inch thick by 1/4-inch high black lamicoid or anodized, brushed aluminum labels with 1/8-inch engraved lettering for each piece of equipment and every user-adjustable control and input on the audiovisual equipment.

2.7 FIRESTOPPING MATERIALS

A. Fire stopping for openings through fire-rated and smoke-rated walls and floor assemblies shall be listed or classified by an approved independent testing laboratory for "Through- Penetration Fire Stop Systems." The system shall meet the requirements of "Fire Tests of Through-Penetration Fire Stops" designated ASTM E814.

B. Inside of all conduits, the fire stop system shall consist of dielectric, water resistant, non-hardening, permanently pliable/re-enterable putty along with the appropriate damming or backer materials (where required). The sealant must be capable of being removed and reinstalled and must adhere to all penetrants and common construction materials and shall be capable of allowing normal wire/cable movement without being displaced.

PART 3 - EXECUTION

3.1 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. All equipment locations shall be coordinated with other trades and existing conditions. Coordinate work with other trades and existing conditions to verify exact routing of all cable conduit, etc. before installation. Coordinate with all the Telecommunications, Mechanical, Baggage Handling and Electrical Drawings. Verify with Design Engineer the exact location and mounting height of all equipment in finished areas.

D. All work shall be concealed above ceilings and in walls, below slabs, and elsewhere throughout building. If concealment is impossible or impractical, LAWA and the Design Engineer shall be notified before starting that part of the work. In areas with no ceilings, install only after LAWA and the Design Engineer reviews and comments on arrangement and appearance.

E. The Contractor shall patch all openings remaining around and inside all conduit, sleeves and cable penetrations to maintain the integrity of any fire rated wall, ceiling, floor, etc. The fire stop system shall consist of a dielectric, water resistant, non-hardening, permanently pliable/re-enterable putty along with the appropriate damming materials (where required). The sealant must be capable of being removed and reinstalled and must adhere to all penetrants and common construction materials and shall be capable of allowing normal wire/cable movement without being displaced.

F. Provide required supports, beams, angles, hangers, rods, bases, braces, straps, struts, and other items to properly support work. Supports shall meet the approval of LAWA and the Design Engineer.

G. 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.

1. Cables shall be combed and each strand shall run parallel with the other trands.
2. After combing and straightening strands, Contractor shall separate strands into bundles according to routing requirements and termination points.
3. Bundles shall be secured with hook-and-loop cable strap material.
   a. Cable ties manufactured from a hard polymer material, such as plastic or nylon, shall not be used.
   b. Hook-and-loop material shall be low life cycle, back-to-back type, black in color, and ½ inches wide.
4. Contractor shall begin to bundle and strap cables within 6 inches of exit from conduit, and bundles shall have cable straps applied at intervals not greater than 10 feet for entire length of vertical and horizontal run. Power distribution cabling shall be on the opposite side from signal wiring in equipment enclosures and shall be uniformly located throughout an installation.
5. No splicing (including with terminal blocks) is allowed for cabling homeruns.

3.2 EXAMINATION

A. Before construction work commences, the Contractor shall visit the site and identify the exact routing for all horizontal and backbone pathways. Before construction work commences, the Contractor shall visit the site and identify the exact routing for all horizontal and backbone pathways.

3.3 PREPARATION

A. Ensure that all equipment/materials to be installed are UL (or equivalent) listed as required by LADBS.

B. Prior to installation of equipment, Contractor shall conduct a field walk with LAWA IT to ensure that construction has advanced to a point where equipment is ready to be installed. Telecom equipment rooms in which equipment is to be installed shall have no work pending where construction dust or debris can impact the equipment upon installation.

C. The Contractor shall conduct workshops with LAWA IT to acquire the necessary information needed to allow the proper programming of this system as he is directed. The contractor, after interviewing the client, shall then submit a written report stating his interpretation of the client's requirements for approval. Only after the LAWA has approved the programming report may the contractor proceed with the programming of this system.

3.4 INSTALLATION - PHASES OF IMPLEMENTATION

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.

E. Provide a consolidated and integrated schedule.

F. Functionality of the existing paging system shall be maintained at all times. The work shall be done in such a fashion that no existing paging zone is out of service during the hours of 5:00 am to Midnight, and no zone is out of service at all for more than 1 hour in areas which are still in use. Temporary paging must be provided as required at no additional cost to the LAWA.

3.5 QUALITY CONTROL – SITE TEST AND INSPECTION

A. Phases of Testing
   1. On-Site Performance Verification Testing
   2. On-Site Endurance Testing

B. Test Plan/Procedure: The Contractor shall submit a Test Plan for each testing phase for the review and approval of LAWA and the Design Engineer. The test plan for each phase 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. The test plan shall be provided at least forty-five (45) days prior to the scheduled start of each test. Test plans shall contain at a minimum:
   1. Functional procedures including use of any test equipment.
   2. Test equipment is to be identified by manufacturer and model.
   3. Interconnection of test equipment and steps of operation shall be defined.

4. Expected results required to comply with specifications.
5. Record of test results with witness initials or signature and date performed.
6. Pass or fail evaluation with comments.
7. The test procedures shall provide conformity to all specification requirements. Satisfactory completion of the test procedure is necessary as a condition of system acceptance.
8. Documentation verification, both interconnects and functionality shall be part of the test. Where documentation is not in accordance with the installed system interconnect and operating procedures, the system shall not be considered accepted until the system and documentation correlate.
9. The Contractor shall cooperate with and provide LAWA representative(s) the opportunity(s) to participate in any or all of the tests.
10. 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 LAWA and the Design Engineer before any subsequent testing phase is performed.

C. Performance Verification Testing:
    1. Complete operational testing of all components and systems shall be witnessed by designated LAWA Representatives.
    2. Schedule test with LAWA and the Design Engineer. Do not begin testing until:
        a. All systems have been installed and individually and jointly tested to ensure they are operating properly.
        b. Written permission from LAWA and the Design Engineer has been received.
    3. Testing: As part of performance verification, test all components of system. The tests shall demonstrate system features.
    4. Verification: Verify correct operation of the required system functionality as defined in these specifications.
    5. Adjustment, Correction, and Completion:

a. Correct deficiencies and retest affected components.
b. Make necessary adjustments and modification to system after obtaining approval of LAWA and the Design Engineer.
c. Completion: Performance verification test shall be complete when testing or retesting of each component has produced a positive result and has been approved in writing by LAWA and the Design Engineer.

6. Recording:
   a. Describe actual operational tests performed and equipment used and list personnel performing tests.
   b. Record in tabular form all test results, deficiencies, and corrective measures.
7. Termination:
   a. Performance verification test shall be terminated by LAWA and the Design Engineer 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 and the Design Engineer.
   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 and the Design Engineer.

D. Endurance Testing:
1. Provide personnel to monitor the systems 24 hours per day, including weekends and holidays during endurance testing.
2. Start test after:
   a. Successful completion of performance verification testing.
   b. Training as specified has been completed.
   c. Correction of deficiencies has been completed.
   d. Receipt of written start notification from LAWA and the Design Engineer.
3. Monitor all systems during endurance testing. Coordinate monitoring with the Design Engineer.
4. Recording: Record data on approved forms so as to provide a continuous log of systems performance. Include:
   a. Date and time for all entries.
   b. Name of individual making entry.
   c. Environmental conditions.
   d. Authority activities in process.
   e. Description of all alarm annunciations, responses, corrective actions, and causes of alarms. Classify as to type of alarm.

f. Description of all equipment failures, including software errors.
g. Description of all maintenance and adjustment operations performed on system.
h. Daily and weekly tabulations.
i. Daily entries of performance data shall be reviewed by the Design Engineer's representative designated to observe monitoring of system.

5. LAWA and the Design Engineer may terminate testing at any time when the system fails to perform as specified. Upon termination of testing the Contractor shall commence an assessment period as described in Phase II.
6. Testing
   a. Phase I - Initial Testing:
      1) Time: 24 hours per day for 15 consecutive calendar days.
      2) Make no repairs during this phase unless authorized in writing by LAWA and the Design Engineer.
      3) If system experiences no failures, proceed to Phase III - Final Testing.
   b. Phase II - Initial Assessment:
      1) After conclusion of Phase I or terminating of testing, identify all failures, determine causes, and repair. Submit report explaining: Nature of each failure, corrective action taken, results of tests performed to verify corrective action as being successful, and recommended point for resumption of testing.
      2) After submission of report, schedule review meeting at job site. Schedule date and time with LAWA and the Design Engineer.
      3) At review meeting, demonstrate that all failures have been corrected by performing verification tests.
      4) Based on report and review meeting, LAWA and the Design Engineer will direct Contractor to repeat Phase I, restart Phase I, or proceed to Phase III - Final Testing.
   c. Phase III - Final Testing:
      1) Time: 24 hours per day for 15 consecutive calendar days.
      2) Make no repairs during this phase unless authorized in writing by Engineer.
7. Phase IV - Final Assessment:
      1) After conclusion of Phase III or termination of testing, identify all failures, determine causes, and repair. Submit explaining the nature of each failure, corrective action taken, results of tests performed, and recommended point for resumption of testing.
      2) After submission of report schedule review meeting at job site. Schedule date and time with the Design Engineer.
      3) At review meeting, demonstrate that all failures have been corrected by performing verification tests.

4) Based on report and review meeting, LAWA and the Design Engineer will approve endurance test or direct Contractor to repeat all or part of Phases III and IV.

8. Adjustment, Correction, and Maintenance:
   a. During endurance testing make adjustments and corrections to system only after obtaining written approval of LAWA and the Design Engineer.
   b. During endurance testing, perform required maintenance on systems including provision of replacement parts.

E. Commissioning Testing
   1. The Contractor shall develop a commissioning test plan that includes the following components, as a minimum:
      a. LAWA readiness
      b. Operational procedures verification
      c. Disaster recovery procedures
      d. Computerized Maintenance Management System data verification
      e. Change management procedures
   2. The commissioning test plan/procedures shall be submitted to the Engineer for review and approval.

F. Final Inspection and Acceptance:
   1. After endurance testing is complete, review tabulated records with LAWA and the Design Engineer.
   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. When performance of integrated system does not fall within the above rates, determine cause of deficiencies, correct, and retest.
   4. When requested by LAWA and the Design Engineer, extend monitoring period for a time as designated by LAWA and the Design Engineer.
   5. Period shall not exceed 60 days exclusive of retesting periods caused by termination of Phases I or III and assessment period of Phases II and IV.
   6. Submit final report of endurance testing containing all recorded data.

3.6 SYSTEM STARTUP

A. Upon completion of the installation of all equipment in an area, perform the following tests and record results. Verify safe and proper operation of all components, devices, or equipment, establish nominal signal levels within the systems and verify the absence of extraneous or degrading signals. Make all preliminary adjustments and document the setting of all controls, parameters of all corrective networks, voltages at key system interconnection points, gains and losses, as applicable. Submit test report. Correct all non-conforming conditions prior to requesting Acceptance Testing. Perform at least the following procedures:

B. Mechanical. Verify:
   1. Integrity of all support provisions.
   2. Absence of debris of any kind, tools, etc.

C. Power and Isolated Ground. Verify:
   1. Isolation of Isolated Ground system from raceway and related ground.
   2. Grounding of devices and equipment. Integrity of signal and technical power system ground connections.
      a. System shall be hum free, stable and free of oscillation with earth ground temporarily disconnected.
      b. The earth ground shall be made at only one point in the system and shall be in accordance with NFPA 70-1990, paragraphs 250-74 Exception No. 4, 250-75 Exception 384-2 Exception or the equivalent from the latest version of NEC.
      c. The equipment racks shall be isolated from, and not electrically connected to, the building grounding system. This means that the conduit system shall not be electrically connected to the equipment racks and that the equipment racks shall be installed so that they are electrically isolated from the building structural steel. The racks shall be electrically connected at only one point to the isolated grounding system.
   3. Proper provision of power to devices and equipment.
   4. Circuits feeding paging system equipment shall be 120 VAC, 20A isolated ground type with separate green ground wire. Receptacles serving paging system equipment shall be orange isolated ground type. Paging system power circuits shall be from a dedicated isolated ground panel supplied from the isolation transformer.
   5. Paging system power grounds shall ultimately terminate only at the isolation transformer ground and shall not be connected to or be in electrical contact with building steel, or the conduit system.
   6. The isolation transformer ground shall be bonded to the building grounding electrode or similar reliable earth ground point.

7. Rotating machinery or other noise inducing equipment must not be powered by the paging power system or share a ground bus with the paging power system.
8. Paging system equipment racks shall be direct wired to the paging power system. The appropriate number of 20A circuits shall be dedicated to the paging equipment racks to power current equipment and to provide an additional 30% for future expansion. The paging equipment racks shall not make electrical contact with the conduit system.

D. Signal Wiring. Verify:
1. Integrity of all insulation, shield terminations and connections.
2. Integrity of soldered connections. Absence of solder splatter, solder bridges.
3. Routing and dressing of wire and cable.
4. Continuity, including conformance with wire designations on running sheets, field and shop drawings.
5. Absence of ground faults.
6. Polarity.

E. Use the proper sequence of energizing systems to minimize the risk of damage.

F. Sound Systems:
1. Electronic Tests; confirm:
   a. Gain at 1 kHz.
   b. Maximum output.
   c. Input clipping level.
   d. Frequency response.
   e. Total harmonic distortion.
   f. Signal-to-Noise ratio.
   g. Signal-to-Crosstalk ratio.
2. Gain control settings: Establish tentative normal settings for all gain controls. Set all equalizers flat. Set all automatic gain control devices to bypass. Terminate power amplifier outputs with power load resistors with resistance value within 10% the nominal output impedance of the respective amplifier. Adjust all gain controls on equipment for optimum signal to noise ratio and signal balance and, unless they are sub panel mounted, cap them to prevent tampering. Unless specified or directed otherwise, adjust gains such that in a given system the "front end" operates at unity gain and maintains 10 dB of clip margin referenced to the first onset of clipping of the associated power amplifier(s). Measure and document system gains at 1 kHz. Settings may require further adjustment by the Contractor, a result of testing by the representative of the Owner.
3. Freedom from parasitic oscillation and radio frequency pickup: Maintain previous setup. Set up for each mode of operation specified in the functional requirements;

verify that all systems are free from spurious oscillation and radio frequency pickup using broadband oscilloscope. Correct any such defects.

4. Hum and noise level/signal to noise level/signal to crosstalk level: Maintain previous setup. Terminate microphone and line level inputs with shielded resistors of 150 and 600 ohms, respectively. Set available variable gain controls such that full power amplifier output would be achieved with 40 dBm input level at a microphone input and +12 dBm at a line level input. Measure and document the specified parameters of the system overall for each microphone input channel and line level input channel. Compare with nominal signal level.
5. Total Harmonic Distortion: Maintain previous setup. Measure at reference operating level at 63 Hz, 125 Hz, 1 kHz, 10 kHz.

G. Electro/Acoustic Tests:
   1. Uniformity of coverage.
   2. Electronic and acoustic frequency response/one third octave equalization. Measure at ear level. Comply with applicable portions of ANSI (SMPTE) PH22.202M-1984, "B chain electro-acoustic response - control rooms and indoor theaters." Adjust to "curve X of B chain characteristic". Representative of the Owner will direct final adjustment.
   3. Maximum continuous sound pressure level (in the reverberant field). Drive systems with broadband pink noise. Sustain for at least five minutes with no system damage. Measure for "A" and "C" weightings at ear level on loudspeaker axis. Turn off noise.
   4. Acoustic signal to noise ratio referenced to the specified maximum continuous sound pressure level in the reverberant field. Measure for "A" and "C" weightings at ear level on loudspeaker axis with mechanical systems operating. Present comparison with previous measurement.
   5. Acoustic gain before feedback. Locate acoustic source (4 inch loudspeaker/pink noise generator) two feet from system microphone. Measure at system microphone position and at most distant listener position at ear level. Present comparison.

H. System Overall:
   1. Verify levels.
   2. Provide permanent "wedge" type labels on all controls, as applies, to indicate correct settings after systems performance testing and adjustment procedures have been successfully completed.

I. At least 10% of the total number of zones must be tested at two different times and at two different locations within the zone during peak hours and during quiet hours. These tests must indicate that pages are at least 6dB, but no greater than 10dB

above, ambient noise levels. Measured ambient noise levels must be time averaged over a period of at least one minute and are not to include announcements from the paging system.

J. Upon completion of the installation of all loudspeakers in an area, perform the following tests and record results. Correct non-conforming conditions, unless the cause is clearly outside the Work of this Section, in which case submit the apparent cause to the Owner.
   1. Loudspeaker Line Impedance: At terminal cabinets at equipment rooms, measure the impedance of each loudspeaker line. Sweep from at least 20 Hz to at least 16 kHz.
   2. Loudspeaker Polarity: Test the acoustic polarity of all loudspeakers using an Acoustic Polarity Tester.
   3. Freedom From Buzzes, Rattles and Objectionable Distortion: Individually apply to each loudspeaker line a slow sine wave sweep from 50 Hz to 5 kHz at a level of 6 dB below rated power amplifier output voltage. Listen carefully for buzzes, rattles and objectionable distortion.
   4. Uniformity of Coverage: Apply broadband Pink Noise. Adjust level to approximately 70-80 dBA at measurement locations. Measure in 4 kHz octave band at ear level. Adjust loudspeaker aiming and 70 Volt loudspeaker taps for uniformity of coverage.

K. 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.

3.7 CLEANING (NOT USED)

3.8 IDENTIFICATION AND LABELING

A. See IT Infrastructure Standards of Practice Volume 3, Chapter 1.

B. The Contractor shall confirm specific labeling requirements with LAWA and the Design Engineer 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 origi-

nation 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.

3.9 TRAINING

A. General
   1. By means of training classes augmented by individual instruction as necessary, the Contractor shall fully instruct LAWA's designated staff and Airline personnel in the operation, adjustment and maintenance of all products, equipment and systems.
   2. The Contractor shall be required to provide all training aids, e.g., notebooks, manu als.
   3. The Contractor shall provide an appropriate training area equipped with all required equipment. The location of the training area shall be coordinated with LAWA and the Design Engineer.
   4. All training shall be completed a minimum of two weeks prior to system cut over. Training schedule shall be subject to LAWA and the Design Engineer's approval.
   5. Training shall be conducted by experienced personnel and supported by training aids. An adequate number and amount of training material shall be provided by the Contractor. The following is considered a minimum:
      a. Functional flow-charts, overall block diagrams, and descriptive material for all software;
      b. Schematic drawings for each of the hardware components;
      c. All procedure manuals, specification manuals, and operating manuals;
      d. As-built drawings.
   6. Participants shall receive individual copies of technical manuals and pertinent documentation at the time the course is conducted. The courses shall be scheduled such that LAWA personnel can participate in all courses (no overlap).

B. Types of Training:
   1. User Training: System users shall be instructed in all aspects of operations of the system. Four (4) hours of basic user training shall be provided in two sessions. Additionally, four (4) hours of advanced user training shall be provided in two s sessions.
   2. Technician Training: Eight (8) hours of maintenance training shall be provided in two sessions. Training for maintenance technicians shall be provided on site, and shall include, but not be limited to, installation, operation, renovation, alteration, inspection, maintenance and service on each system and subsystem provided, so as to enable troubleshooting and repair to the component level.

The training shall include on-the-job training that allows LAWA field techs train on the equipment installed in the field.

3. System Administrator Training: System Administrator Training shall be provided. System Administrator Training shall include both classroom work and on the job training and shall be provided on-site at LAX or at a location within 50 miles of LAX.
4. Classroom Training: Eight (8) hours of software training shall be provided for each system in two sessions. The Contractor shall structure the course to describe all systems, software and applications and support programs. This course shall include a functional overview of the complete software system. The course material must be presented in depth with the instructor covering detailed design, structure, and algorithms.
5. The person or persons providing the training shall have detailed knowledge of the system design, installation, performance and operations and shall have recent IED training. Instructions shall include step-by-step procedures that provide instruction on how to perform daily health checks, system startup and shutdown, system failover and failback, database and system backup (for the visual and audio components of the application).

C. Prior to the training sessions, the Contractor shall provide:
   1. As-built drawings and record drawings in accordance with the Section 27 05 00.
   2. Manuals of operating and maintenance literature, pursuant to the requirements of the Section 27 05 00.
   3. System geographical layout and block diagrams under a plastic cover on the wall of the equipment rooms.
   4. The Contractor shall submit the training plan to LAWA for approval three weeks prior to propose training date. The Contractor training shall include description of the system physical topology, how to adjust the ACS/vACS, and the review of configuration details.

3.10 COMPUTERIZED MAINTENANCE MANAGEMENT SYSTEM

A. 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.

B. Asset tags shall be installed and recorded for all paging head end equipment (including ACS/vACS, Noise Sensor Collector, amplifier frames, UPS, etc…), line-array speakers, microphone paging stations, and workstations installed.

3.11 CLOSEOUT ACTIVITIES, FINAL INSPECTION AND ACCEPTANCE

A. 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 LAWA management system and successful performance of the Paging System and its' components for thirty (30) day period will constitute acceptance of the system.

END OF SECTION 27 51 13