SECTION 27 41 16
INTEGRATED AUDIO-VIDEO SYSTEMS AND EQUIPMENT FOR CLASSROOMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Stand-alone, networkable, scalable, one-room AV control and presentation system with user control panel. Available models support up to four audio inputs and four video inputs, and include user control panel, choice of amplifier/controller, ceiling or wall mounts, ceiling- or wall-mounted speakers, optional microphones for voice reinforcement, and AV interface cables required to integrate with a compatible video projector with screen. Local classroom software control from the teachers desktop, campus-wide scheduling, browser based remote room view/control interface, and management software are available.

B. Related Information:

1. Division 27 Section "Communications Horizontal Cabling" for communications cabling requirements for modular control system.

1.2 REFERENCES

A. National Fire Protection Association (NFPA):

1. NFPA 70 - National Electrical Code.
2. ANSI/TIA/EIA-588-C.0 – General Cabling Standards
3. ANSI/TIA/EIA-568-C.1 -- Commercial Building Cabling Standard
4. ANSI/TIA/EIA-568-C.2 -- Balanced Twisted Pair Cabling Standard
5. ANSI/BICSI 001-2009, Information Transport Systems Design Standard for K-12 Educational Institutions
6. ANSI S12.60:2002 Acoustic Performance Criteria, Design Requirements, Guidelines for Schools
7. ANSI/NECA/BICSI 568-2006, Standard for Installing Commercial Building Telecommunications Cabling
8. ANSI/TIA/EIA-569-B -- Commercial Building Standard for Telecommunications Pathways and Spaces
9. ISO/IEC 18010:2002 (2002) – Pathways and Spaces for Customer Premises Cabling
10. ANSI/TIA/EIA-606(A) -- The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
11. ISO/IEC 14763-1:1999 (1999) – Implementation and Operation of Customer Premises Cabling, Part 1 – Administration
12. J-STD-607-A -- Commercial Building Grounding and Bonding Requirements for Telecommunications
13. IEEE 1100 – IEEE Emerald Book

14. NFPA 780 Standard for the Installation of Lightning Protection
15. Cal/OSHA-Pocket Guide for the Construction Industry (recent edition)
16. BICSI -- Telecommunications Distribution Methods Manual (TDMM)
17. BICSI -- Information Transport Systems Installation Methods Manual
18. BICSI - AV Design Reference Manual
19. BICSI – Network Design Reference Manual
20. Federal Communications Commission
21. Federal, state, and local codes, rules, regulations, and ordinances governing the work

1.3 REFERENCES

A. ABBREVIATIONS

1. AV: Audio Visual.

1.4 SYSTEM DESCRIPTION

A. For each classroom, the Contractor shall furnish and install a complete, networkable, scalable AV control and presentation System. Each System shall include but not be limited to:

1. One control panel that meets or exceeds the specifications under section 2.B
2. One amplifer/controller core that meets or exceeds the specifications under section 2.C
3. Loudspeakers that meet or exceed the specifications under section 2.D
4. AV connection wall plates that meet or exceed the specifications under section 2.E and 2.F
5. One wireless receiver that meets or exceed the specifications under section 2.G, 2.K, and 2.L
6. One neck-worn teacher transmitter/microphone, including charger cradle, that meets or exceeds the specifications under sections 2.H and 2.J
7. One handheld student transmitter/microphone, including hands-free option and charger cradle, that meets or exceeds the specifications under sections 2.I and 2.J

B. The System is to include all equipment, materials, labor, and training as required to install and test a complete and operating System as described herein.

C. Contractor shall follow installation instructions provided by the manufacturer. Installation drawings shall show the location and general arrangement of equipment, electrical systems and related items. They shall be followed as closely as elements of the construction will permit.

D. Contractor shall examine the installation drawings and verify the conditions governing the work on the job site. Contractor shall arrange accordingly, providing such fittings, horizontal cable raceways, conduits, junction boxes and accessories as may be required to meet such conditions.

E. Deviations from the installation drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the Systems, shall not be made without the written approval of the Engineer.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product required, demonstrating compliance with requirements.

B. Shop Drawings: Indicate the following:

1. Schematic diagram of controlled circuits and motorized equipment actuators.

C. Circuits and emergency circuits with capacity and phase, control zones, load type and voltage per circuit.

1.6 INFORMATIONAL SUBMITTALS

A. Sample of manufacturer's warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operating and maintenance instructions.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualification: Manufacturer of controller with minimum five years record of satisfactory manufacturing and support of components comparable to basis of design system.

B. Source Requirements: Provide control panel, amplifier/switch, loudspeaker, receiver, and microphone hardware and software through a single source from a single manufacturer.

C. All miscellaneous equipment required for a complete, professional installation shall be included in the base bid. No allowances for any additional equipment, hardware, cabling, or miscellaneous will be considered unless specifically excluded from the base bid.

D. All work materials shall be removed at the end of the work day and the work area left in the same condition as found.

E. The work herein specified shall be performed by fully competent workmen, in a thorough manner. All materials furnished by the Contractor shall be new, and all work shall be completed to the satisfaction of the Architect/Engineer.

F. All equipment shall be held firmly in place. This shall include speakers, receiver/amplifiers, cables, etc. Fastenings and supports shall be adequate to support their loads with a safety factor of at least three. All switches, connectors, outlets, etc., shall be clearly, logically, and permanently marked during installation.

G. The Contractor must take such precautions as are necessary to guard against electromagnetic and electrostatic hum and ground loops, to supply adequate ventilation, and to install the equipment so as to provide maximum safety to the person who operates it.

H. Care shall be exercised in wiring so as to avoid damage to the cables (e.g., stapling, pinching, excessive bending) and to the equipment. All joints and connections shall be made with lead-free rosin-core solder or with mechanical connectors approved by the Engineer. All wiring shall be executed in strict adherence to standard broadcast practices.

I. The Contractor shall be an established communications and electronics Contractor that has had and currently maintains a locally run and operated business for at least five years. The Contractor shall utilize a duly authorized reseller of the equipment supplied for this project location with full Manufacturer's warranty privileges.

J. The Contractor shall test the installed System according to the Manufacturer’s instructions and verify that the equipment has been installed properly and is functioning as designed.

K. Manufacturer Qualifications: Approved manufacturer of controller listed in this Section with minimum five years record of satisfactory manufacturing and support of components comparable to basis of design system.

1. Refer to Section 01 16 00 for Substitution Requirements – Any substitution request shall be submitted at least 10 days prior to scheduled bid opening. Any substitution requests submitted after that shall be denied.

2. Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:

a. Product data indicating compliance with requirements of this Section.

b. Samples of each component.

c. Sample submittals from similar project.

d. Project references: Minimum of 5 completed installations, with Owner and Architect contact information.

e. Sample warranty.

3. Substitutions following award of contract are not allowed except as stipulated in Division 01 General Requirements.

4. Approved manufacturers must comply with separate requirements of Submittals Article.

L. Regulatory Requirements: Provide components and systems that comply with requirements of the following:

1. Refer to Section 1.2 A.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of controls system that fail in materials or workmanship within the specified warranty period following substantial completion.

1. Warranty Period: Wireless transmitters, wireless receivers, infrared sensors, loudspeakers speakers, and charging stands: 5 years.

2. Warranty Period: Rechargeable batteries, power cords, power supplies: 1 year.

3. Warranty Period: Other components: 3 years.

B. Manufacturer's Extended Support Service: Extended telephone support: Unlimited period.

C. All warranties shall cover parts and labor.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide products of FrontRow Calypso LLC, Petaluma, CA 94954, Phone +1 707 227 0735, www.gofrontrow.com.

2.2 ROOM AV SYSTEM AND CONTROLLER

A. The System shall include:

1. One control panel that meets or exceeds the specifications under section 2.B
2. One amplifier/controller core that meets or exceeds the specifications under section 2.C
3. Loudspeakers that meet or exceed the specifications under section 2.D
4. AV connection wall plates that meet or exceed the specifications under section 2.E and 2.F
5. One wireless receiver that meets or exceed the specifications under section 2.G, 2.K, and 2.L
6. One neck-worn teacher transmitter/microphone, including charger cradle, that meets or exceeds the specifications under sections 2.H and 2.J
7. One handheld student transmitter/microphone, including hands-free option and charger cradle, that meets or exceeds the specifications under sections 2.I and 2.J

B. Control panel:

1. Basis specification: FrontRow CB-2000
2. Mounting: Single-gang, Leviton Decora® compatible
3. Buttons: 8 back-lit
4. Simultaneous control capacity: Unlimited network (IP addressable) devices, 2 bi-directional serial devices, plus 1 IR device or 1 GPI/relay
5. On-board scheduler: Yes
6. Security pass-code: Yes
7. Battery back-up: Yes
8. File-based cloning: Yes
9. Configuration: Via web-browser
10. I/O:
    i. 1x RJ-45 for IR and serial control, power
    ii. 1x RJ-45 for 10/100Mb network, power
11. Weight: 102g/3.6 oz
12. Power: 9V, 125 mA (via Cat 5)
13. Size: 5 x 4.4 x 12.7 cm/2 x 1.75 x 5 in

Or:

1. Basis specification: FrontRow CB-2050
2. Mounting: Dual-gang, Leviton Decora® compatible
3. Buttons: 8 back-lit
4. Volume: Digital rotary
5. Simultaneous control capacity: Unlimited network (IP addressable) devices, 2 bi-directional serial devices, plus 1 IR device or 1 GPI/relay

6. On-board scheduler: Yes
7. Security pass-code: Yes
8. Battery back-up: Yes
9. File-based cloning: Yes
10. Configuration: Via web-browser
11. I/O:
    i. 1x RJ-45 for IR and serial control, power
    ii. 1x RJ-45 for 10/100Mb network
12. Weight: 102g/3.6 oz
13. Power: 12VDC, 125mA (via Cat 5)
14. Size: 5 x 4.4 x 12.7 cm/2 x 1.75 x 5 in

C. Amplifier/Controller Core:

1. Basis specification: FrontRow Conductor™-ready Plenum Core, Conductor™-ready Wall Core, with FrontRow CM3000 amplifier/switch
2. Audio inputs:
    i. 1x streaming audio (3.5mm TRS) or RJ45 network connection
    ii. 4x analog stereo (3.5mm TRS, 1 RJ45)
    iii. Intercom (RJ45)
3. Audio outputs:
    i. 2x audio line out (3.5mm TS)
    ii. 1x streaming audio out (3.5mm TRS)
    iii. Intercom (RJ45)
4. Network support: 4 port 10/100Mb
    i. 2x +12VDC powered ports for network plus power
5. Digital Page-override: Yes (via Conductor)
6. Analog Page-override: Yes (via TB13)
7. Audio over IP: Yes
8. Speaker Load Impedance: 4 ohms min - 16 ohm max
9. Additional inputs: IR, GPI
10. Additional outputs: IR, COM (RS232 serial)
11. Amplifier Type: 92% efficient class D
12. Continuous Power @ 1% THD:
    i. 16 watts (rms) per channel @ 4 ohms

ii. 8 watts (rms) per channel @ 8 ohms

13. Power input requirements: 12VDC, 3.5A
14. Mounting: Plenum-rated enclosure

D. Loudspeakers (Wall Mounted):

1. Basis specification: FrontRow 202-05-000-00 IR Speaker Kit
2. Form: A single speaker enclosure containing two offset woofers and a centrally mounted tweeter, plus a centrally mounted, integrated IR receiving module
3. Mounting type: wall mount
4. Speaker power rating: 20 Watts RMS/30 Watts Max.
5. Speaker impedance: 4 Ohms nominal
6. Speaker frequency response: 150Hz -20kHz
7. Inputs:
   i. 2 quick connect/disconnect speaker cable terminals
   ii. 1 RCA sensor cable connector
8. Indicator: LED power
9. Mounting brackets: two 16 gauge steel mounting brackets with set screws
10. Sensor module receiving frequencies: 2.3MHz & 2.8Mhz
11. Sensor power: powered by receiver
12. Maximum sensor operating range: 18.5m/60 ft.line-of-sight
13. Maximum sensor reception area: 232m2/2500 ft2
14. Cable form: Single cable combining sensor and speaker cables
15. Maximum cable length: 15.25m/50ft
16. Cable type:
   i. Main jacket: UL listed, Plenum rated jacket
   ii. Sensor cable: RG58/u coaxial cable CL3P shielded, UL listed, Plenum rated jacket
   iii. Speaker cable: 18 AWG 2 conductor UL listed CL2P Plenum-rated
17. RoHS compliance: Combination sensor-speaker assembly, including cable, shall be manufactured using a lead-free process and be free of known hazardous metals and materials

E. Loudspeakers (Ceiling Mounted):

1. Basis specification: FrontRow 470-2856-125 Ceiling Speaker Kit and FrontRow 300-2176-120 Speaker Cable Kit
2. Mounting type: Ceiling mount
3. Speaker power rating: 30 Watts RMS/45 Watts Max.

4. Speaker impedance: 8 Ohms
5. Speaker frequency response: 60Hz-20kHz
6. Inputs: Quick connect/disconnect speaker terminals
7. Mounting mechanism: UL Listed Plenum Rated tile bridges and UL Listed Plenum Rated speaker enclosures
8. Cable type: 18 AWG 2 conductor UL listed CL2P or better plenum-rated
9. RoHS compliance: UL Listed Plenum Rated tile bridges and UL Listed Plenum Rated speaker enclosures shall be manufactured using a lead-free process and be free of known hazardous metals and materials

F. Analog Wall Plates:

1. Basis specification: FrontRow WP-PCAV
    a. Inputs: DB15 VGA, 3.5mm mini-TRS audio, RCA composite video, stereo RCA audio
    b. Profile: single-gang Decora® style wall plate with attached flying lead with locking 13-pin DIN connector
    c. Video resolution: UXGA (1600x1200)
    d. Cabling: Plenum-rated 50’ AV cable
        i. RoHS compliance: UL listed - shall be manufactured using a lead-free process and be free of known hazardous metals and materials
        ii. Input: 13-pin DIN locking connector
        iii. Output: DB15 VGA, 3.5mm mini-TRS audio, RCA composite video, stereo RCA audio
        iv. Width: Fits through ¾” conduit

G. Digital Wall Plates – HDMI:

1. HDMI extender
    a. Profile: single-gang Decora™ style wall plate transmitter with HDMI type A female input connector, LED power indicator
    b. I/O:
        i. 2x RJ45 connectors on transmitter
        ii. 2x RJ45 connectors on receiver
    c. Input HDMI cable distance: ≤10FT
    d. Output HDMI cable distance: ≤10FT
    e. Total HDMI signal length 75’ (HDMI cables + CAT5/6)
    f. Power: +5VDC 300mA available line power (powered at receiver end)
    g. PC resolution: up to UXGA (1600 x 1200)
    h. Digital video resolution: 480i, 480p, 576i, 576p, 720p, 1080i, 1080p

i. Compliance: HDMI 1.3b, HDCP

2. HDMI audio de-embedder
   a. Formats: Digital 2.0CH/5.1CH LPCM, Dolby Digital, or DTS audio
   b. Input: HDMI type A female
   c. Output: Stereo 3.5mm analog, HDMI type A female
   d. Power: +5VDC, 200mA
   e. Regulatory: FCC, CE, UL
   f. Power consumption (max): 1W
3. Cable type: 2x 50’ plenum-rated Cat5e/6 UTP
   a. RoHS: UL listed - shall be manufactured using a lead-free process and be free of known hazardous metals and materials

H. Wireless Receiver:
   1. Basis specification: FrontRow 5201R Symbio
   2. Receiver frequency: 2.3MHz & 2.8MHz (2 simultaneous channels)
   3. Operating range: 18.5m/60ft line-of-sight (typical)
   4. Frequency Response: 50Hz to 10kHz
   5. THD: < 1% @ 1kHz
   6. Signal to Noise: > 65dB (system)
   7. Power Supply: +12VDC, 300mA
   8. Mic level out: 0V to 100mVrms at maximum volume & maximum deviation, typical
   9. Line level out: 0V to 1Vrms at maximum volume & maximum deviation, typical
   10. Size (wxhxd): 14 x 3.8 x 18 cm/5.5 x 1.5 x 7 in
   11. Weight: 766g/1.7lbs.
   12. Controls:
      i. Power
      ii. Two microphone volume controls (channel A and channel B)
   13. Signal-to-noise from microphone to speaker output (including audio circuitry): >65dB
   14. Reception area: 163m²/1225ft²
   15. Reception angle: 130° x 60°
   16. External sensor ports: 3, RCA
   17. The Wireless Microphone System shall be manufactured using a lead-free process and be free of hazardous metals and materials (RoHS compliant)
   18. The Wireless Microphone System receiver shall be UL listed

I. Teacher Transmitter/Microphone:

1. Basis specification: FrontRow 940TM Pendant Microphone
2. Transmission type: infrared
3. Number of switchable channels: 2
4. Transmitting frequencies: 2.3MHz & 2.8MHz
5. Number of built-in microphones: 2
6. Microphone type: uni-directional cardioid
7. Number of batteries required for operation: 1
8. Minimum battery life: 8 hours
9. Battery type: AA 2300mAh rechargeable NiMH or alkaline (1.5V)
10. Minimum operating range: 18.5m/60ft line of sight
11. Wearing style: Around the neck (pendant)
12. Maximum dimensions: 11 x 6 x 2.5 cm/4.5 x 2.5 x 0.9 in
13. Maximum weight: 85g/3oz (with battery)
14. Charge protection (prevents damage from accidentally recharging alkaline batteries): Yes
15. Drop-in charger available: Yes
16. User controls:
    i. Mute switch: Large, positioned on front
    ii. On/off
    iii. Channel selector
17. Inputs/outputs:
    i. 2.5mm optional external mic input
    ii. 3.5mm stereo summing auxiliary input
    iii. 1.3mm DC charge jack
18. Indicator: LED for power on, low battery, charge, and mute
19. RoHS compliance: The transmitter shall be manufactured using a lead-free process and be free of hazardous metals and materials
20. UL listing: The transmitter/microphone shall be UL listed

J. Student Transmitter/Microphone:

1. Basis specification: FrontRow 950H Pass-Around Microphone
2. Transmission type: infrared
3. Number of swtichable channels: 2

4. Transmitting frequencies: 2.3MHz & 2.8MHz
5. Number of batteries required for operation: 1
6. Minimum battery life: 5 hours
7. Battery type: AA 2300mAh rechargeable NiMH or alkaline (1.5V)
8. Minimum operating range: 12.2m/40ft line of sight
9. Wearing style: Handheld or around the neck (must include hands-free option)
10. Maximum weight: 73.7g/2.6oz (with battery)
11. Maximum dimensions: 14.6 x 2.8 x 3.5 cm/5.7 x 1.1 x 1.4 in
12. Charge protection (prevents damage from accidentally recharging alkaline batteries): Yes
13. Drop-in charger included: Yes
14. User controls:
    i. On/off
    ii. Channel selector (inside battery compartment)
    iii. 3-position mic gain (inside battery compartment)
15. Inputs/outputs
    i. 3.5mm stereo summing auxiliary input
    ii. 1.3mm DC charge jack
16. Indicator: LED for power on, low battery, charge
17. RoHS compliance: The transmitter shall be manufactured using a lead-free process and be free of hazardous metals and materials
18. UL listing: The transmitter/microphone shall be UL listed

K. Charging Cradle

1. Basis specification: FrontRow 950C Charger
2. Number of charging pockets: 2 (one for teacher transmitter/microphone and one for student transmitter/microphone)
3. Energy Star qualified: The charging cradle shall be Energy Star qualified and meet ENERGY STAR® Eligibility Criteria for Products with Battery Charging Systems (BCSs)
4. Indicators: One LED for each pocket indicating charging, battery fault, and charge complete
5. RoHS compliance: The charging cradle shall be manufactured using a lead-free process and be free of hazardous metals and materials
6. UL listing: The charging cradle shall be UL listed

L. External Ceiling Sensor

1. Basis specification: FrontRow 204-01-006-00 Ceiling Sensor Kit

2. Indicator: LED power
3. Mounting type: Drop ceiling acoustic tile or sheetrock ceiling
4. Sensor module receiving frequencies: 2.3MHz & 2.8Mhz
5. Sensor power: powered by receiver
6. Minimum sensor operating range: 18.5m/60 ft.line-of-sight
7. Minimum sensor reception area: 232m2/2500 ft2
8. Minimum cable length: 15.25m/50ft
9. Cable type: RG58/u coaxial cable CL3P shielded, UL listed, Plenum rated jacket
10. RoHS compliance: Must be manufactured using a lead-free process and be free of known hazardous metals and materials
11. UL listing: The ceiling sensor shall be UL listed

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to installation, examine work area to verify measurements, and that commencing installation complies with manufacturer's requirements.

3.2 INSTALLATION

A. Comply with requirements of Division 27 Sections "Common Work Results for Communications."

B. Do not install AV or control devices until space is enclosed, HVAC systems are running, and overhead and wet work in work space are complete.

C. Install control devices in accordance with manufacturer's instructions.

D. Install speakers in accordance with manufacturer's instructions.

E. Install projector and mount in accordance with manufacturer's instructions.

F. Grounding: Provide electrical grounding in accordance with NFPA 70.

G. Perform setup for each audio-visual equipment component.

3.3 SYSTEM STARTUP

A. Provide system startup and adjustment to occupied conditions in accordance with manufacturer's recommendations.

B. Perform operational testing to verify compliance with Specifications. Adjust as required.

3.4 CLOSEOUT ACTIVITIES

A. Demonstration: The Contractor shall demonstrate the System to operate in accordance with the requirements of these specifications as well as the Manufacturer’s performance specifications. The test shall be performed in the presence of an authorized representative of the Owner.

B. Should such a demonstration of performance show that the Contractor has not properly installed the System, the Contractor shall make all commercially reasonable changes or adjustments at no additional cost to the Owner.

C. Training: Train Owner's personnel to operate, maintain, and program AV controls. Contractor shall provide manufacturer's representative and contractor representative for training. Contractor and Manufacture representatives shall provide training for a minimum of one day to Owner selected personnel.

END OF SECTION