
SECTION 16760 - CLASSROOM SOUND FIELD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. DRAWINGS AND GENERAL PROVISIONS of the contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to the work of this section.
- B. All work performed under this Section of the work is subject to all requirements contained under Section 16100, "Electrical General Requirements".
- C. Refer to AHERA Management Plan and Lead Based Paint Management Plan which are available from the Owner.

1.2 STANDARDS, CODES, REFERENCES, AND REGULATORY REQUIREMENTS

- A. Federal Communications Commission
- B. Food & Drug Administration
- C. National Fire Protection Association standards
- D. National Electric Code/Life Safety Code
- E. ANSI S12.60:2002 Acoustic Performance Criteria, Design Requirements, Guidelines for Schools
- F. State Administrative Code
- G. State & Local Building Codes

1.3 SUMMARY

- A. Classroom Sound Field Systems:
 - 1. Provide a Sound Field System to serve each classroom as indicated on plan. A wireless teacher microphone shall provide amplification of the teacher's voice. A wireless hand-held, student pass-around microphone shall provide amplification of the students' voices.
 - 2. The Sound Field System shall include all components and accessories needed to provide amplification of the teacher's voice in all classrooms for:
 - a. Improved academic achievement
 - b. Decreased distractibility and increased on-task behavior
 - c. Increased attention to verbal instruction and activities and improved understanding
 - d. Decreased number of requests for repetition
 - e. Decreased test taking time
 - f. Improved spelling ability under degraded listening conditions
 - g. Increased word recognition ability
 - h. Improved test scores
 - i. Increased language growth, especially for non-English speaking students
 - j. Improved student voicing when speaking
 - k. Increased student length of utterance
 - l. Increased student confidence when speaking
 - m. Improved ease of teaching
 - n. Reduced vocal strain and fatigue for teachers

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3. The Sound Field System shall have been cleared by the US Food and Drug Administration (FDA) as suitable for use by children with normal hearing and hearing impairment
 4. Application:
 - a. A Sound Field System shall be installed in all classrooms as indicated on plan.
 - b. A typical classroom shall contain four ceiling-mounted speakers located by dividing the ceiling into quadrants and placing a speaker in the center of each quadrant. Provide additional speakers where appropriate (see below) and where indicated on plan. These speaker locations shall provide uniform sound distribution regardless of the arrangement of teacher and students.
 1. For classrooms up to 1200ft², provide four speakers
 2. For classrooms 1200ft² to 1600ft², provide six speakers
 3. For classrooms larger than 1600ft², provide six speakers
 - c. The System receiver/amplifier shall be located as indicated on plan.
 4. Description:
 - a. For each location indicated, the Contractor shall furnish and install a complete wireless Sound Field System. The System shall include but not be limited to (per System):
 1. Teacher transmitter/microphone
 2. 2-channel receiver/amplifier
 3. 2-channel handheld transmitter/microphone
 4. 2 external sensors, cable, & bracket
 5. 4 ceiling-mounted speakers or more as indicated on plan
 6. Receiver mounting bracket for locations indicated
 7. Auxiliary input box with four inputs for interface with TV, VCR, etc.
 - 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.
 - B. The drawings 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.
 - C. Examine the drawings and verify the conditions governing the work on the job site. Arrange accordingly, providing such fittings, wireways, conduits, junction boxes and accessories as may be required to meet such conditions.
 - D. Deviations from the drawings, with the exception of minor changes in routing and other such incidental charges that do not affect the functioning or serviceability of the Systems, shall not be made without the written approval of the Engineer.

1.4 GENERAL REQUIREMENTS

- A. All bids shall be based on the equipment as specified herein or listed equal.
- B. The catalog numbers and model designations for the classroom Sound Field Systems are that of Phonic Ear, 3880 Cypress Drive, Petaluma, CA 94954, Telephone 800-227-0735, Fax 707-769-

9624.

- 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, except portable equipment, shall be held firmly in place. This shall include speakers, receiver/amplifiers, cables, etc. (An exception to this rigid mounting clause will be allowed when resilient shock mounting is required to decouple the array from the structure it is being mounted in.) 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, 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 and to the equipment. All joints and connections shall be made with rosin-core solder or with mechanical connectors approved by the Engineer. All wiring shall be executed in strict adherence to standard broadcast practices.

1.5 SUBMITTALS

- A. Submit the following in accordance with Conditions of Contract:
 - 1. Provide a tabulation of the specification clearly comparing the submitted item with the specified item, being able to refer to all written expressed functions and capabilities. Specification Sheets shall be submitted on all items.

1.6 QUALITY ASSURANCE

- A. All items of equipment including wire and cable shall be designed by the Manufacturer to function as a complete system.
- B. 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 distributor of the equipment supplied for this project location with full Manufacturer's warranty privileges.
- C. Electrical Component Standard: Provide work complying with applicable requirements of NFPA 70 "National Electrical Code" including, but not limited to:
 - 1. Article 250, Grounding.
 - 2. Article 300, Part A. Wiring Method.

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3. Article 310, Conductors for General Wiring.
 4. Article 725, Remote Control, Signaling Circuits.
 5. Article 800, Communication Systems.
- D. EIA Compliance: Comply with the following Electronics Industries Association Standards:
1. Sound Systems, EIA-160.
 2. Loudspeakers, Dynamic Magnetic Structures, and Impedance, EIA-299-A.
 3. Racks, Panels, and Associated Equipment, EIA-310-A.
 4. Amplifiers for Sound Equipment, SE-101-A.
 5. Speakers for Sound Equipment, SE-103.
- E. The Manufacturer shall offer a service contract for System maintenance on completion of the guarantee period.
- F. The Manufacturer shall be responsible for providing all specified equipment and mentioned services for all equipment as specified herein.
- G. The Contractor shall, at the Owner's request, make available a service contract offering continuing factory-authorized service of the System after the initial warranty period.

1.7 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of each item of fixed equipment and show interconnecting wiring. A copy of the as-built drawings will be submitted within thirty days of completion of the job. Drawings will indicate location of equipment and tagged circuits. A function block drawing will be required.
- B. Include operator instructions for each required mode of operation, routine troubleshooting procedures, Manufacturer's operation and maintenance manual for each item of equipment and accessory, and routine cleaning methods and materials.

1.8 IN-SERVICE TRAINING

- A. Upon completion of installation, the Manufacturer shall provide initial in-service training with this System. These sessions shall be broken into segments that will facilitate the training of individual users in the operation of this System as directed by the Owner.
- B. Operators Manuals and Users Guides shall be provided at the time of the first training.

1.9 WARRANTY

- A. The Contractor shall warrant the equipment to be new and free from defects in material and workmanship, and will, within three years from date of acceptance by Owner, repair or replace any equipment found to defective.

PART 2- PRODUCTS

2.1 CLASSROOM SPEECH REINFORCEMENT SYSTEM

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- A. The system shall include wireless infrared transmitter, one infrared receiver/amplifier with remote sensors, one collar microphone, one infrared emitter for the transmitter, one hand held, infrared student microphone, four acoustical ceiling speakers, four cables to connect speakers to receiver/amplifier, 8 nickel metal hydride batteries, one battery charger to charge AA nickel metal hydride batteries, and a power supply for the receiver/amplifier.
- B. Receiver/Amplifier:
1. Audio Power: 4 x 7W / 4Ω (combined power of 28W)
 2. Base-Station Frequency Response: 50Hz to 16kHz
 3. Power Requirements: 15VAC at 2A
 4. Auxiliary Input: 2 RCA true stereo pairs
 5. Auxiliary Input Expansion: Allow expansion of four or more additional inputs, switchable or mixed
 6. Auxiliary Output: 3.5mm, with level control independent from speaker output level
 7. Speaker connection: 4 standard crimp quick-connect
 8. Speech reinforcement: OptiVoice
 9. Controls:
 - i. Power
 - ii. 2 primary volume controls (channel A and channel B)
 - iii. 1 auxiliary volume control
 - iv. OptiVoice selector
 - v. System should not have speaker balance controls
 - vi. System should not have a master volume control
 10. Sub-carrier frequencies: 2.3MHz & 2.8MHz (independent channels)
 11. Type: super heterodyne – crystal controlled
 12. Signal-to-noise from microphone to speaker output (including audio circuitry): >65dB
 13. Image rejection: >40dB
 14. Reception sensitivity: >25dBμV
 15. Reception selectivity: ±40kHz
 16. Transmitter charging: Built-in, using 2-unit charging cord
 17. Dimensions: 8.5 x 1.75 x 8.3 in
 18. Weight: 3lbs
 19. Reception area: 163m²/1225ft²
 20. Reception angle: 140° x 170°
 21. Built-in sensor: Yes
 22. Active summing network: Yes
 23. External sensor ports: 3, RCA
- C. 2-Channel Lavalier Transmitter/Microphone:
1. Sub-carrier frequencies: 2.3MHz & 2.8MHz switchable
 2. Audio distortion: <1.0% THD @1kHz, nominal deviation
 3. Audio frequency response: 50Hz to 16kHz
 4. Maximum deviation: 25kHz (+90dB SPL at mic input)
 5. Signal-to-noise: >65dB at maximum deviation
 6. Microphones: 2
 7. Optional external microphone input jack: 2.5mm
 8. Microphone input impedance: 2.2kOhms
 9. Auxiliary input: 3.5mm
 10. Power: 1 AA rechargeable NiMH or alkaline (1.5V)
 11. Fail-safe charge (prevents damage from recharging alkaline batteries): Yes

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12. Charge jack: 1.3mm
 13. Operating time: 12 hours (alkaline); 7 hours (1600mAH NiMH)
 14. Mute switch: Front
 15. Indicator: LED for power on, low battery, charge, and mute
 16. Operating range: 12m/40ft line of sight minimum
 17. Diodes: 5 high-efficiency
 18. Weight: 65.3g/2.3oz (with battery)

D. 2-Channel Hand-held Transmitter/Microphone:

1. Sub-carrier frequencies: 2.3MHz & 2.8MHz switchable
2. Audio distortion: <1.0% (± 15 kHz deviation @1kHz)
3. Microphone element type: uni-directional, dynamic
4. Power: 2 AA rechargeable NiMH or alkaline (1.5V)
5. Charging system: Cradle, charges batteries without removing from unit

E. External Sensor:

1. Power: Powered by receiver
2. Cable: Minimum 32.8' (10m)
3. Mounting: Metal bracket
4. Diode count: 9

F. Ceiling Speakers

1. Type: Ceiling mount
2. Power rating: 35 Watts RMS/70 Watts Max.
3. 8 Ohms
4. Frequency Response: 65-20,000 Hz
5. Quick connect/disconnect speaker terminals
6. Mounting: Metal ceiling tile bridge
7. Sound containment: Back-can

G. System Wiring:

1. Safety: Loudspeaker wiring shall be Class 2 or better, plenum-rated

H. Sensor Wiring:

1. Type: Coaxial
2. Type: Plenum-rated

2.2 WIRING INSTALLATION

A. System wiring shall be subject to the following:

1. Wiring shall be continuous from each speaker to receiver/amplifier. Splices are not permitted.
2. All wire shall be tagged at each end.

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3. All wire shall be color coded.
 4. Wiring may be installed without conduit above suspended acoustical ceilings, using bridle rings as required for cable support. Bridle rings shall be located as high as possible in the ceiling or truss space and shall be attached to the building structure and not the work of other trades such as ductwork or the ceiling support system. Bridle rings shall be installed at no greater than four-foot intervals to support the cable. In no case shall cables lay on ceiling tiles. Wiring not installed in conduit shall not be installed within 18 inches of light fixture ballasts or within 36 inches of motors or transformers. All wiring not installed in conduit shall be Teflon-insulated plenum cable and shall be so identified with a continuous marking.
 5. Unless above a suspended acoustical ceiling, wiring shall be installed in conduit, wireway or raceway as indicated on plan.
 6. Wiring shall be installed perpendicular or parallel to lines of building construction (walls, structural steel, etc).
 7. Wiring shall be installed in accordance with the maximum bending radius requirements as recommended by the Manufacturer.
 8. All wiring shall be installed in accordance with the Manufacturer's requirements, as well as these specifications.
 9. Wiring color coding shall remain the same throughout the System. Colors used for coding shall be as directed by the System Manufacturer.
 10. All wire shall be copper.

2.4 RECEIVER/AMPLIFIER MOUNTING

- A. Receiver/amplifier shall be mounted in one of two ways: either using a shelf provided by the receiver/amplifier Manufacturer or using a shelf added to the existing TV/VCR mounting assembly.

2.3 WORKMANSHIP

- A. Hardware: All ceiling loudspeaker baffles shall be installed with hardware matching the color of the baffle. Baffle color to match ceiling color.
- B. Mounting: All ceiling loudspeaker baffles shall be flush against the ceiling and enclosures shall be supported to the structure above. All recessed speakers shall include a speaker backbox.
- C. Mounting: All remote infrared receivers shall be mounted at ceiling height.
- D. Mounting: Audio receiver/amplifier brackets shall be mounted, square and plumb. Wall mounted receiver/amplifiers shall be located at the height recommended by the Manufacturer.

2.4 CLEAN-UP

- A. Remove unused materials and debris from the work and storage areas. Leave areas in an undamaged and acceptable condition.

2.5 TESTING

- A. 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 balanced the System, the Contractor shall make all necessary changes or adjustments and conduct a second performance demonstration.
- C. Should a second performance demonstration fail, the Contractor agrees to correct the System deficiencies at no additional cost to the Owner.

END OF SECTION 16760