

Bid Specifications for Classroom Amplification Systems

PART 1 - GENERAL

1.1 STANDARDS, CODES, REFERENCES, AND REGULATORY REQUIREMENTS

- A. Federal Communications Commission
- B. US Federal and State Hazardous Metal and Material Environmental Laws
- 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. Federal, State and Local Administrative Codes
- G. Federal, State & Local Building Codes

1.2 SUMMARY

- A. Classroom Sound Reinforcement Systems:
 - 1. Provide a Sound Reinforcement System to serve each classroom. A wireless teacher microphone shall provide amplification of the teacher's voice.
 - 2. The Sound Reinforcement 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 ease of teaching
 - k. Reduced vocal strain and fatigue for teachers
 - 3. The Sound Reinforcement System shall be UL Listed under the basic standard used to investigate products in this category, UL 6500, "Audio/Video and Musical Instrument Apparatus for Household, Commercial and Similar General Use," ANSI/UL 60065 and CAN/CSA-C22-2 60065-03, "Audio, Video and Similar Electronic Apparatus - Safety Requirements."
 - 4. The Sound Reinforcement System shall have been underwritten by Educational Underwriters (EdU) as a research-based technology which supports the intent of school administrators' efforts in meeting the No Child Left Behind Act of 2002.
 - 5. The Sound Reinforcement System shall be manufactured using a lead-free process and be substantially free of six hazardous substances, i.e., four heavy metals: lead (Pb), mercury, cadmium, hexavalent chromium, and two brominated flame retardants: polybrominated biphenyls (PBB), and polybrominated diphenyl ethers (PBDE).
 - 6. The Sound Reinforcement System shall support the efforts of the U.S. Green Building Council to advance buildings that are environmentally responsible and supports the LEED Certification Program for Schools.

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1.3 REFERENCES

- A. Language, Speech & Hearing Services in Schools – July 1997
“Hearing and listening in a typical classroom”
Catherine V. Palmer, PhD, University of Pittsburg
SUMMARY: The use of a wireless microphone by the teacher and loudspeakers placed appropriately in the room may result in reduced student fatigue, increased on-task student behavior, improved classroom management, and decreased teacher vocal fatigue.
- B. American Journal of Audiology – Volume 12 – December 2003 - ASHA
Speech Perception Benefits from Sound Reinforcement FM Amplification
Lisa Lucks Mendel, Richard A. Roberts & Julie H Walton
SUMMARY: A 2 year study on the positive effects of Phonic Ear EasyListener Sound Field FM amplification on speech perception performance in classrooms.
- C. American Journal of Audiology – Volume 11 – December 2002 - ASHA
Background Noise Levels and Reverberation Times in Unoccupied Classrooms: Predictions and Measurements
Heather A. Knecht, Peggy B. Nelson & Lawrence L. Feth
SUMMARY: The purpose of this study was to evaluate the extent of the problem of noise and reverberation in schools.
- D. Journal of Speech, Language, and Hearing Research – Volume 45 – October 2002 - ASHA
Intelligibility of Modified Speech for Young Listeners with Normal and Impaired Hearing
Rosalie M. Uchanski, Ann E. Geers & Anthanassios Protopapas
SUMMARY: Examination of whether the benefits of modified speech could be extended to provide intelligibility improvements for all children.
- E. The MARRS Project: Mainstream Amplification Resource Room Study – 1978-1981
Sarff, Ray, & Bagwell, 1981; Ray, Sarff, & Glassford, 1984
SUMMARY: National Diffusion Network (NDN) project that uses a wireless FM microphone system for Sound Field amplification of the teacher’s voice to enhance oral instruction, lessen teacher voice fatigue, and improve student academic achievement. This has been validated by the U.S. Department of Education.
- F. Testing a Possible Cause of Reduced Ability of Children to Process Speech in Noise - 2003
Clinical Trial studied the relationship of the efferent auditory neural system to the ability to process speech in noise. National Institute on Deafness and Other Communication Disorders - 11/03/2003

1.4 APPLICATION:

- A. A Sound Reinforcement System shall be installed in all classrooms.
- B. Each classroom shall be equipped with appropriate speaker and sensor types, quantities, and locations to provide uniform sound distribution in the listening area and uniform infrared pickup in the teaching area.
- C. Description:
 - 1. For each classroom, the Contractor shall furnish and install a complete wireless Sound Reinforcement System. Each System shall include but not be limited to:
 - a. One receiver/amplifier that meets or exceeds the specifications under section 2.1.B
 - b. One neck-worn teacher transmitter/microphone, including charger cradle, that meets or exceeds the specifications under sections 2.1.C and 2.1.E

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- c. One handheld student transmitter/microphone, including hands-free option and charger cradle, that meets or exceeds the specifications under sections 2.1.D and 2.1.E
 - d. Either:
 - i. Two combination sensor-speaker assemblies that meet or exceed the specifications under section 2.1.F, or
 - ii. Four ceiling speaker assemblies and external wall or ceiling sensor assemblies that meet or exceed the specifications under sections 2.1.G, 2.1.I, and 2.1.J
2. 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. 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.
- C. 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.
- D. 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 GENERAL REQUIREMENTS

- A. All bids shall be based on the equipment as specified herein (in particular, Section 2.1) or listed equal.
- B. The catalog numbers and model designations for the classroom Sound Reinforcement Systems are those of FrontRow (a division of Phonic Ear), 2080 Lakeville Highway, 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 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

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rosin-core solder or with mechanical connectors approved by the Engineer. All wiring shall be executed in strict adherence to standard broadcast practices.

1.6 QUALITY ASSURANCE

- A. The equipment, including cabling and speakers, shall be designed and supplied by the Manufacturer to function as a complete system. All system components must be installed and used according to the Manufacturer's design.
- 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.
 - 3. Article 310, Conductors for General Wiring.
 - 4. Article 725, Remote Control, Signaling Circuits.
 - 5. Article 800, Communication Circuits.
- 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 or Contractor shall offer post-installation service for the System.
- F. 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.

1.7 PROJECT RECORD DOCUMENTS

- A. The Contractor shall 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. The Contractor shall record the following information for each classroom installation: who installed the system, date of installation, equipment serial numbers, and verification that section 1.5.G of this bid specification was executed properly.

1.8 IN-SERVICE TRAINING

- A. Upon completion of installation, the Contractor 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. Operator Manuals and/or User Guides shall be provided at the time of the first training.

1.9 WARRANTY

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- A. The Manufacturer shall provide a 5-year limited warranty that the equipment is free from defects in material and workmanship, and that it will, within the specified terms of the limited warranty, repair or replace any equipment found to defective.

PART 2- PRODUCTS

2.1 SOUND REINFORCEMENT SYSTEM

- A. The System shall include:

1. One receiver/amplifier that meets or exceeds the specifications under section 2.1.B
2. One teacher transmitter/microphone that meets or exceeds the specifications under section 2.1.C
3. One student transmitter/microphone that meets or exceeds the specifications under section 2.1.D
4. One charger cradle for teacher and student transmitter/microphones that meets or exceeds the specifications under section 2.1.E
5. Two or more combination infrared sensor- speaker assemblies that meet or exceed the specifications under section 2.1.F
 - a. If required to accommodate room characteristics, the Contractor may substitute the following for combination infrared sensor- speaker assemblies:
 - i. Four ceiling-mounted speaker assemblies that meet or exceed the specifications under section 2.1.G, and
 - ii. Either at least one external ceiling sensor assembly that meets or exceeds the specifications under sections 2.1.I or at least two external wall sensor assemblies that meet or exceed the specifications under section 2.1.J

- B. Receiver/Amplifier:

1. Basis specification: FrontRow Pro Digital 940R Receiver/Amplifier
2. Transmission type: infrared
3. Number of simultaneous reception channels: 2
4. Receiving frequencies: 2.3MHz and 2.8MHz
5. Frequency response: 50Hz to 10kHz (Mic), 20Hz to 20kHz (Auxiliary Audio)
6. Signal-to-noise from microphone to speaker output (including audio circuitry): >65dB
7. TDH: <1% @ 1kHz into 8Ω
8. Image rejection: >40dB
9. Audio power: 2 x 10W @ 8Ω, 2 x 20W @ 4Ω
10. Power supply: 19VAC at 3.16A
11. Maximum dimensions: 21.5 x 23.5 x 2.25cm/8.5 x 8.3 x 1.75in
12. Maximum weight: .94kg/2.11lbs
13. Internal infrared sensor: Yes
14. Internal sensor minimum operating range: 18.5m/60ft line-of-sight
15. Internal sensor minimum reception area: 163m²/1225ft²
16. Active summing network: Yes
17. Stereo audio output: Yes
18. User controls:
 - a. The system must include:
 - i. Power
 - ii. Two microphone volume controls (channel A and channel B)
 - iii. Two auxiliary audio input volume controls
 - iv. One 3-position selector that progressively emphasizes higher-frequency speech sounds for improved speech clarity (e.g., OptiVoice)
 - b. The system must NOT include:
 - i. Speaker balance controls
 - ii. Individual speaker volume controls
 - iii. A master volume control

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- iv. An equalizer
 - 19. Inputs/outputs:
 - a. Input power jack
 - b. 1.3mm mic charge jack (with ability to charge two transmitter/microphones at once)
 - c. 3 RCA jacks for external sensor connection
 - d. 4 quick-connect speaker terminals
 - e. one mono RCA audio output, with level control independent from speaker output level
 - f. 2 RCA stereo audio input jacks (with stereo sound output)
 - 20. Digital audio processing: Microphone A and B audio signals shall use digital signal processing
 - 21. Digital feedback suppression: Receiver shall include dynamic, automatic digital feedback suppression
 - 22. RoHS compliance: The Sound Reinforcement System shall be manufactured using a lead-free process and be free of hazardous metals and materials
 - 23. Standby mode: The receiver shall automatically enter standby mode when not receiving a microphone or line audio input, and shall emerge from standby mode <10 seconds when a microphone or line audio signal resumes
 - 24. UL listing: The receiver shall be UL listed
 - 25. Power consumption: The fully installed receiver shall draw less than 7 Watts when on and receiving a signal, less than 1 Watt when in standby mode, and less than 0.8 Watts when off as measured by a Hameg HM8115-2 Programmable Power Meter
- C. Teacher Transmitter/Microphone:
- 1. Basis specification: FrontRow 940TM Pendant Microphone
 - 2. Transmission type: infrared
 - 3. Number of swtichable 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:
 - a. Mute switch: Large, positioned on front
 - b. On/off
 - c. Channel selector
 - 17. Inputs/outputs:
 - a. 2.5mm optional external mic input
 - b. 3.5mm stereo summing auxiliary input
 - c. 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
- D. 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

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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:
 - a. On/off
 - b. Channel selector (inside battery compartment)
 - c. 3-position mic gain (inside battery compartment)
 15. Inputs/outputs
 - a. 3.5mm stereo summing auxiliary input
 - b. 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
- E. 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
- F. Combination Sensor-Speaker Assembly
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:
 - a. 2 quick connect/disconnect speaker cable terminals
 - b. 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. Minimum sensor operating range: 18.5m/60 ft.line-of-sight
 13. Minimum sensor reception area: 232m²/2500 ft²
 14. Cable form: Single cable combining sensor and speaker cables
 15. Minimum cable length: 15.25m/50ft
 16. Cable type:
 - a. Main jacket: UL listed, Plenum rated jacket
 - b. Sensor cable: RG58/u coaxial cable CL3P shielded, UL listed, Plenum rated jacket
 - c. Speaker cable: 18 AWG 2 conductor UL listed CL2P Plenum-rated

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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

G. Ceiling Mount Speakers

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

H. 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

I. External Wall Sensor

1. Basis specification: FrontRow 204-01-007-00 Wall Sensor Kit
2. Indicator: LED power
3. Mounting type: Wall mount bracket
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 cable length: 15.25m/50ft
8. Cable type: RG58/u coaxial cable CL3P shielded, UL listed, Plenum rated jacket
9. RoHS compliance: Must be manufactured using a lead-free process and be free of known hazardous metals and materials

2.2 RECEIVER/AMPLIFIER MOUNTING

- A. Receiver/amplifier shall be mounted in one of three ways: either using a shelf provided by the receiver/amplifier Manufacturer, using a shelf added to the existing TV/VCR mounting assembly, or placed on an existing shelf or platform in the classroom

2.3 TESTING

- A. The Contractor shall demonstrate the System to operate in accordance with the requirements of

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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.