SECTION 275117 – GYMNASIUM SOUND SYSTEM

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

A. Provide a complete operable gymnasium sound system using materials and equipment of types, sizes, ratings, and performances as indicated in both drawings and specifications. Equipment to include control equipment, amplifier, rack, microphones, microphone outlets, wireless hand held set microphones, tape player, CD player, speakers, back boxes, conduit, wire, and other miscellaneous components required for a complete installation.

1.2 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of public address systems, of types, sizes, and electrical characteristics required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer: Qualified with at least 5 years of successful installation experience on projects with public address systems installation work similar to that provided for project, and factory authorized to provide service for that system.

C. NEC Compliance: Comply with NEC as applicable to installation and construction of public address system components and accessories.

D. UL Compliance and Labeling: Provide public address system components which are UL-listed and labeled.

E. EIA Compliance: Provide public address system which complies with the Electronics Industries Association Standards.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's data on public address systems including, but not limited to, roughing-in diagrams and instructions for installation, operations and maintenance, suitable for inclusion in maintenance manuals. Also include project specific riser and wiring diagrams, differentiating clearly between manufacturer-installed wiring and field-installed wiring.

B. Include data in operation and maintenance manuals.

PART 2 - PRODUCTS

2.01 GYMNASIUM SYSTEM

A. General: The gymnasium system shall be a complete system for amplifying sound signals from microphones and distributing them to several speakers, hung from roof structure in gymnasium.

B. Functional Performance: Components and system features and functions shall include, but are not limited to, the following:

1. Multiple Sources: Switch selectability of sources for sound amplification between various microphones and inputs designated and arranged for AM/FM tuner, combination cassette/digital compact disk player, and auxiliary equipment.
2. High-Quality Sound Reproduction: Freedom from noises such as pops, clicks, hiss and hum at the loudspeaker at all times during operation of the system, including standby mode with inputs off. Freedom from distortion and nonuniform coverage of amplified sound.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers products that may be incorporated in the work include, but are not limited to the following:

1. Atlas/Soundolier
2. Electro-Voice, Inc.
3. Sonic Systems, Inc.

D. Gymnasium System shall include but not be limited to the following.

1. Equipment Rack: Wall mounted communication cabinet (min.) 24"x27"x18" steel cabinet. Middle Atlantic EWR-16-22-PD or equal.
2. Rack Mounted AC Power Panel: Provide (8) receptacle rack mounted power panel controlled by lighted toggle switch: Middle Atlantic PDLT-815RV-RN or equal.
3. Amplifiers: Provide rack mounted amplifier to control gymnasium speakers. Amplifier to control (4) gymnasium speakers each. Amplifiers to QSC CXD4.5 or equal.
4. Digital Signal Processor: Provide a digital signal processor to be used with amplifier. Ashly Protea Model No. ne24.24M 4x4 or equal.
5. Combination CD/Cassette Deck: Provide a CD/media player with Bluetooth/USB/SD/aux and AM/FM tuber. Denon Model No. DN-300Z or equal.
6. Professional Full Height Microphone Stand(s): Provide (2) professional full height microphone stands. Atlas Sound Model No. MS-12CE or equal.

7. Speakers: Provide (4) speakers with all necessary mounting hardware, cable and accessories, Community Model No. R.5-96MAX or equal. Coordinate color with architect.
8. Microphones: Provide (2) hardwired microphones, each with 25'-0' of portable microphone cable and (2) lavalier microphones designed to be used with wireless body pack transmitter. Hardwired Microphones Crown Model No. CM-310-ASW. Wireless microphones Shure Model No. WL-183 or equal.
9. Wireless Transmitters: Provide (2) body pack and (2) handheld transmitters associated with the wireless microphone system. Body pack shall be Shure Model No. LX-1, handheld transmitters shall be Shure Model No. LX2/58 or equal.
10. Antenna: Provide half wave antenna and all associated cabling, connectors and mounting hardware for wireless microphone system. Shure Model No. UA844 or equal.
11. Wireless Receivers: Provide (2) wireless mic receivers. Shure QLDX4 or equal.
12. Microphone Mixer: Provide a 12-channel microphone mixer for hardwired and wireless microphones. Denon Model No. DN-312X or equal.
13. Microphone Jack Wall Plate: Provide a microphone jack and stainless steel wall in locations shown on drawings. Whirlwind Model No. MIP3 or equal.
14. Microphone Outlets: Three-pole, polarized, locking type, female microphone receptacles in single-gage flush boxes as indicated. For wall outlets, provide a brush stainless steel device plate.
15. Wire and Cable: (PLENUM RATED)
    a. Control: Four conductor, shielded, stranded.
    b. Control: Twelve conductor, shielded.
    c. Audio: (8 ohm program speakers).

E. Riser and wiring diagrams prepared by engineer are not intended as final installation drawings but only as a guide for bidding. Install system based on final wiring drawings prepared by the manufacturer of the system.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install public address system as indicated on drawing and specifications, in accordance with equipment manufacturer's written instruction, and complying with applicable portions of NEC.

B. Impedance and Level Matching: Carefully match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.

C. Provide physical isolation from each other for microphone, line level, speaker, and power wiring. Run in separate raceways or provide 12-inch minimum separation

where exposed or in same enclosure. Provide additional physical separation as recommended by equipment manufacturer.

D. Provide equipment grounding connections for public address system as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounds. Ground equipment, conductor, and cable shields to eliminate shock hazard and to minimize to the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.

3.02 INSTALLATION OF BASIC IDENTIFICATION

A. Install electrical identification in accordance with Section 260553 "IDENTIFICATION FOR ELECTRICAL SYSTEMS".

3.03 INSTALLATION OF BASIC WIRING SYSTEM MATERIALS

A. Install wiring, raceways, and electrical boxes and fittings in accordance with Section 260533 "RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS" and 260519 "LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES".

B. Install fire-stopping products for all open cables runs through fire-rated construction as specified in specification Section 260544 “SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING”.

C. Control Circuit Wiring: Install control circuits in accordance with NFPA 70 and as indicated. Provide number of conductors as recommended by system manufacturer to provide control functions indicated or specified.

D. Wiring within Enclosures: Provide adequate length of conductors. Bundle, lace, and train the conductors to terminal points with no excess. Provide and use lacing bars.

3.04 FIELD QUALITY CONTROL

A. Provide services of a factory authorized service representative to supervise the field assembly and connection of components and the testing and adjustment of the system.

B. Operational Test: Perform an operational system test to verify conformance of system to these Specifications. Perform tests that include originating program and page material at microphone outlets, all preamplifier program inputs, and all other inputs. Observe sound reproduction for proper volume levels and freedom from noise.

C. Signal-To-Noise Ratio Test: Measure the ratio of signal to noise of the complete system at normal gain setting using the following procedure:

1. Disconnect a microphone at the connector or jack closest to it and replace it in the circuit with a signal generator using a 1,000-Hz signal. Replace all other microphones at the corresponding connectors with dummy loads, each equal in impedance to the microphone it replaces. Measure the ratio of signal to noise.
2. Repeat the test for each separately controlled zone of loudspeakers.
3. The minimum acceptance ratio is 50 dB.

D. Distortion Test: Measure distortion at normal gain settings and rated power. Feed signals at frequencies of 50, 200, 400, 1,000, 3,000, 8,000, and 12,000, Hz into each pre-amp channel and measure the distortion in the power amplifier output. The maximum distortion at any frequency is 3 percent total harmonics.

E. Acoustic Coverage Test: Feed pink noise into the system using octaves centered at 4,000 and 500 Hz. Use a sound level meter with octave band filters to measure the level at five locations in each zone. For spaces with seated audiences, the maximum permissible variation in level is plus or minus 2 dB and the levels between locations in the same zone and between locations in adjacent zones must not vary more than plus or minus 3 dB.

F. Power Output Test: Measure the electrical power output of each power amplifier at normal gain setting at 50, 1,000, and 12,000 Hz. The maximum variation in power output at these frequencies must not exceed plus or minus 1 dB.

G. Inspection: Make observations to verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Provide a list of final tap settings of speaker line matching transformers.

H. Retesting: Rectify deficiencies indicated by tests and completely retest work affected by such deficiencies at Contractor's expense. Verify by the system test that the total system meets the Specifications and complies with applicable standards. Provide a written record of all retest results.

I. Provide three service organization inspections for each system at four-month intervals during the year following final acceptance. Correct defects found in the systems at the time of these inspections.

3.05 COMMISSIONING

A. Train owner's maintenance personnel in the procedures involved in operating and preventative maintenance of the system.

END OF SECTION 275117

SECTION 275119 – ASSISTIVE LISTENING SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Section 1 Specification Sections, apply to this Section.

1.02 SYSTEM DESCRIPTION

A. Provide a complete operable assistive listening system using materials and equipment of types, sizes, ratings, and performances as indicated in both drawings and specifications. Use materials and equipment that comply with referenced standards and manufacturer's standard design and construction, in accordance with published product information.

1.03 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of assistive listening systems, of types, sizes, and electrical characteristics required, whose products have been in satisfactory use in similar service for not less than 3 years.

B. Installer: Qualified with at least 5 years of successful installation experience on projects with assistive listening systems installation work similar to that provided for project, and factory authorized to provide service for that system.

C. New York State Compliance: Provide assistive listening system which complies with the requirements of Appendix BL of the Building Code of New York State.

D. NEC Compliance: Comply with NEC as applicable to installation and construction of assistive listening system components and accessories.

E. UL Compliance and Labeling: Provide assistive listening system components which are UL-listed and labeled.

F. EIA Compliance: Provide assistive listening system which complies with the Electronics Industries Association Standards.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's data on assistive listening systems including, but not limited to, roughing-in diagrams and instructions for installation, operations and maintenance, suitable for inclusion in maintenance manuals. Also include project specific riser and wiring diagrams, differentiating clearly between manufacturer-installed wiring and field-installed wiring.

B. Include data in operation and maintenance manuals.

PART 2 - PRODUCTS

2.01 ASSISTIVE LISTENING SYSTEMS

A. General: The assistive listening system shall be a complete system for transmitting sound signals from microphones and/or connected PA systems to battery powered personal FM receivers.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers products that may be incorporated in the work include, but are not limited to the following:

1. Listen Technologies Corporation
2. Williams Sound Corporation

C. General: Provide equipment using all solid-state components fully rated for continuous duty at the ratings indicated or specified.

1. Base Transmitter:
    a. The stationary FM audio transmitter shall be capable of broadcasting on 57 channels at 72MHz and shall operate at the maximum allowable RF output power. The output power shall be adjustable to full, one-half and one-quarter.
    b. The device shall incorporate an integrated antenna using the chassis as a ground plane and the device shall have an external antenna jack.
    c. The transmitter shall be capable of broadcasting on many of the same channels of receivers manufactured by other suppliers.
    d. Channel tuning shall be capable of being locked once set to the transmitting channel. The channel will be displayed on an easy-to-read alphanumeric display on the front panel.
    e. The device shall deviate the FM carrier an average of +/-25KHz on wide band channels and +/- 7.5KHz on narrow band channels. The transmitter shall be stable to 50 PPM.

f. The audio frequency response of the device shall be within 3dB from 50Hz to 15KHz and shall be pre-emphasized using the standard 75 microsecond pre-emphasis curve.
g. System noise shall be equal to or better than 60dB.
h. Total harmonic system distortion will not exceed 2%.
i. It shall have two mixing audio inputs capable of accepting balanced microphone and line input levels (-55dBm, +4dBm, respectively) as well as an unbalanced line and speaker levels (-10dBm, +10dBm, respectively).
j. The unit shall incorporate an audio leveler on each input and a dynamic audio processor with limiting.
k. The device shall have the following audio controls: input level, process control and an adjustable low-pass shelving filter.
l. The device shall have an adjustable headset jack for monitoring the audio as well as three VU meters for each of the inputs and post-processed transmitted audio.
m. The device shall provide an unbalanced line level output of post-processed audio.
n. The transmitter shall be a Listen LT-800-072 or equivalent.
o. Technical Specifications:

RF Frequency Range:	72 MHz: 72.05 – 75.95 MHz
Transmitter Stability:	50 PPM
Output Power:	72 MHz: 8000uV at 3 meters
Signal to Noise ratio:	72 MHz: Wide band channels, 60dB: Narrow, 54dB
Available Channels:	72 MHz: 17 Wide band, 40 narrowband
RF Power Switch:	Full, ½, ¼
Physical Dimensions:	8″ W x 1.75″ H
Weight:	3 lbs. (1.4 kg)
Power:	115VAC/16 VAC/850mA
Audio Input 1:	F-XLR / ¼″ Phone, 50/600 ohms, balanced - 55dBm, selectable, adjustable
Audio Input 2:	Phono, 10k/50ohms, unbalanced - 10dBm / 20dBm, selectable, adjustable
Audio Output (Mix):	Phono, 10k ohms, unbalanced - 10dBm
Headphone Output:	250mW, 32ohms, unbalanced - 10dBm
Controls:	Mix, Process, Equalization, Headphone Level, Tone, RF Power Output, and ON/OFF
Visual Indicators:	Audio input levels 1, 2 and post processed modulation level, channel, RF power, test tone
Government approvals:	FCC and Industry Canada

p. A 78" half-wave coaxial antenna, integral with 25 ft. RG58 coax cable shall be permanently installed for each base transmitter. The antenna shall be a Listen Technologies Corporation LA-116 or equivalent.

2. Portable Transmitter:
   a. The portable FM audio transmitter shall be capable of broadcasting on 57 channels at 72MHz.
   b. The device shall incorporate an integrated antenna using the microphone cable as an antenna.
   c. The transmitter shall be capable of broadcasting on many of the same channels as receivers manufactured by other suppliers.
   d. Channel tuning shall be programmable to limit the number of channels available to the user.
   e. The device shall deviate the FM carrier an average of +/-25KHz on wide band channels and +/- 7.5KHz on narrow band channels.
   f. The transmitter shall be stable to 50 PPM.
   g. The audio frequency response of the device shall be within 3dB from 50Hz to15KHz and shall be pre-emphasized using the standard 75 microsecond pre-emphasis curve.
   h. System noise shall be equal to or better than 60dB and total harmonic system distortion shall not exceed 2%.
   i. It shall have two mixing audio inputs capable of accepting a phantom powered microphone and a line input.
   j. The device will incorporate an easy-to-use and see mute switch.
   k. The unit shall incorporate a dynamic audio processor with automatic gain control and compression.
   l. The device shall be battery operated and shall be capable of continuous broadcasting of 16 hours with alkaline batteries and 8 hours with rechargeable NiMH batteries.
   m. The transmitter shall incorporate automatic battery charging circuitry for recharging of NiMH batteries such that when connected to an external wall transformer, the batteries will be automatically charged. External battery tabs will be provided for use with a charging tray.
   n. The transmitter shall be capable of being operated with an external wall transformer with or without batteries installed in the unit. The battery door shall be capable of being mechanically locked.
   o. The device shall incorporate an integrated belt clip with a looped end that prevents it from being accidentally dropped by the user The device shall incorporate an LCD display that indicates to the user the broadcast channel, battery level, low battery, battery charging, mute, charging status and programming status.

p. The device shall incorporate an LCD display that indicates to the user the broadcast channel, battery level, low battery, battery charging, mute, charging status and programming status.

q. A top mounted red LED will indicate on, mute, low battery and charging.

r. The transmitter shall be a Listen LT-700-072 or equivalent.

s. Technical Specifications:

RF Frequency Range:	72 MHz: 72.05 – 75.95 MHz
Transmitter Stability:	50 PPM
Output Power:	72 MHz: 8000uV at 3 meters
Signal to Noise ratio:	72 MHz: Wideband channels, 60dB, Narrowband, 54dB
Antenna:	Uses microphone cable
Available Channels:	72 MHz, 17 wideband, 40 narrowband
Physical Dimensions:	3" W x 1" D x 5" H
Weight:	1 lb. (0.45 kg) with batteries
Power:	Two AA batteries, alkaline or NiMH rechargeable, external power connector 7.5 VDC, center positive, <300mA
Battery Charging:	Fully automatic, <13 hours
Phantom Power:	Included for microphone, 1.5VDC
Battery Life:	16 hours with high capacity alkaline, 8 hours with rechargeable NiMH
Microphone Input:	-55dBm, 50ohms, unbalanced, tip of 3.5MM connector
Line Input:	-10dBm, 10k ohms, unbalanced, ring of 3.5 MM connector
Audio Processing:	40dB automatic 3-speed dynamic control with noise gate
Government approvals:	FCC and Industry Canada

t. The Transmitter shall come with an omni-directional, condenser, lapel clip microphone. The microphone shall be a Listen Technologies Corporation Model LA-261, or equal.

3. Personal Receivers:

a. The portable FM audio receiver shall be capable of receiving on 57 channels at 72MHz.

b. The device shall incorporate an integrated antenna using the earphone cable as an antenna.

c. The receiver shall be capable of receiving on many of the same channels transmitted by products manufactured by other suppliers.
d. Channel tuning shall be programmable to limit the number of channels available to the user.
e. The receiver shall be capable of being locked to a single channel by depressing a button for 3 seconds or more.
f. The receiver shall be capable of seeking channels by depression of a button designed for this purpose.
g. The device shall accept deviation of the FM carrier an average of +/-25KHz on wide band channels and +/- 7.5KHz on narrow band channels with a maximum deviation of +/-70KHz.
h. The receiver shall be digitally tuned to prevent drifting due to environmental conditions.
i. The sensitivity of the receiver shall be .6-microvolt typical and 1-microvolt maximum at 12dB SINAD.
j. The audio frequency response of the device shall be within 3dB from 50Hz to 15KHz and shall be de-emphasized using the standard 75-microsecond de-emphasis curve.
k. System noise shall be equal to or better than 60dB and total harmonic system distortion will not exceed 2%.
l. The device will incorporate a stereo headset jack that allows the user to plug in either a mono or stereo headset and listen to the audio normally.
m. The headset amplifier shall provide at least 750 MV RMS at 25KHz deviation into a 32 ohm load.
n. The device shall be battery operated and shall be capable of continuously receiving for 40 hours with alkaline batteries and 20 hours with rechargeable NiMH batteries.
o. The receiver shall incorporate automatic battery charging circuitry for recharging of NiMH batteries such that when connected to an external wall transformer, the batteries will be automatically charged. External battery tabs will be provided for use with a charging tray.
p. The receiver shall be capable of being operated with an external wall transformer with or without batteries installed in the unit. The battery door shall be capable of being mechanically locked.
q. The device shall incorporate an integrated belt clip with a looped end that prevents it from being accidentally dropped by the user.
r. The device shall incorporate a LCD display that indicates to the user the receive channel, battery level, low battery, battery charging, RF signal strength in five levels, charging status, programming status an channel locked.

s. A top mounted red LED will indicate on, low battery and charging.

t. The receivers shall be Listen Technologies Corporation LR-5200-072, or equal.

u. Provide twelve (12) receivers, with NiMH rechargeable batteries and storage/charger case, for each base transmitter system and each portable transmitter system. Storage/charger case to be Listen Technologies Corporation model LA-380.

v. Technical Specification:

RF Frequency Range:	72 MHz: 72.05 – 75.95 MHz
Sensitivity:	.6uV typical, 1uV maximum for 12dB SINAD
Signal to Noise ratio:	72MHz, Wide band channels, 60dB, narrow, 54dB
Frequency Response:	72 MHz, 50Hz to 15KHz
Distortion:	<2% THD
Squelch:	On loss of RF signal
Antenna:	Uses headphone cable
Available Channels:	72 MHz, 17 wideband, 40 narrowband
Physical Dimensions:	3″ W x 1″ D x 5″ H
Weight:	< 1lb. (.45 kg) with batteries
Power:	Two AA batteries, high capacity alkaline or NiMH rechargeable, external power connector 7.5 VDC, tip positive, <300mA
Battery Life:	40 hours with high capacity alkaline, 20 hours with rechargeable NiMH

w. Each receiver shall come with a pair of lightweight headphones. Headphones shall be Listen Technologies Corporation model LA-165, or equal.

x. Provide quantity of receivers required per 1108.2.4 of the Building Code of New York State. Each receiver shall be equipped with Ni-Cad Listen Technologies Corporation model LA-362 rechargeable batteries.

y. Provide 12-unit storage/charger case(s). Listen Technologies Corporation model LA-380, or equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install assistive listening systems as indicated on drawing and specifications, in accordance with equipment manufacturer's written instruction, and complying with applicable portions of NEC.

B. Install assistive listening systems in compliance with 1108.2.4 of the Building Code of New York State.

3.02 INSTALLATION OF BASIC IDENTIFICATION

A. Install electrical identification in accordance with Section 260553 "IDENTIFICATION FOR ELECTRICAL SYSTEMS".

A. Provide engraved plastic laminate wall plaques with self-adhesive back at all doorways into each room equipped with a base transmitter unit. Wall plaques to be Listen Technologies Corporation Model IDP 007, or equal.

3.03 INSTALLATION OF BASIC WIRING SYSTEM MATERIALS

A. Install wiring, raceways, and electrical boxes and fittings in accordance with Section 260533 "RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS" and 260519 "LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES".

B. Install fire-stopping products for all open cables runs through fire-rated construction as specified in specification Section Section 260544 “SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING”.

C. Control Circuit Wiring: Install control circuits in accordance with NFPA 70 and as indicated. Provide number of conductors as recommended by system manufacturer to provide control functions indicated or specified.

D. Wiring within Enclosures: Provide adequate length of conductors. Bundle, lace, and train the conductors to terminal points with no excess. Provide and use lacing bars.

3.04 FIELD QUALITY CONTROL

A. Provide services of a factory authorized service representative to supervise the field assembly and connection of components and the testing and adjustment of the system.

B. Operational Test: Perform an operational system test to verify conformance of system to these Specifications and the requirements of Appendix BL of the Building Code of New York State.

C. Inspection: Make observations to verify that units and controls are properly labeled, and interconnecting wires and terminals are identified.

D. Retesting: Rectify deficiencies indicated by tests and completely retest work affected by such deficiencies at Contractor's expense. Verify by the system test that the total system meets the Specifications and complies with applicable standards. Provide a written record of all retest results.

E. Provide three service organization inspections for each system at four-month intervals during the year following final acceptance. Correct defects found in the systems at the time of these inspections.

3.05 COMMISSIONING

A. Train owner's maintenance personnel in the procedures involved in operating and preventative maintenance of the system.

END OF SECTION 275119

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