

3/3/2023

**Request for Proposal
Elementary Schools
Audio Systems
RFP #9956**

For

**Troy School District
4420 Livernois
Troy, MI 48098**

Prepared by

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TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

SECTION 00 01 00 – TABLE OF CONTENTS

SECTION TITLE

DIVISION 00 - BIDDING REQUIREMENTS, BID FORMS

SECTION 00 01 00 – TABLE OF CONTENTS
SECTION 00 30 00 – INSTRUCTIONS TO BIDDERS
SECTION 00 30 10 – SCHEDULE OF EVENTS
SECTION 00 40 10 – BID PROPOSAL FORM
SUPPLEMENTAL A – COST ANALYSIS WORKSHEET
SUPPLEMENTAL B – UNIT PRICING
SUPPLEMENTAL C – MANDATORY ALTERNATES
SUPPLEMENTAL D – VOLUNTARY ALTERNATES
SUPPLEMENTAL E – FAMILIAL DISCLOSURE AFFIDAVIT
SUPPLEMENTAL F – IRAN ECONOMIC SANCTIONS ACT AFFIDAVIT

DIVISION 27 – TECHNOLOGY SPECIFICATIONS

SECTION 270500 COMMON WORK RESULTS FOR COMMUNICATIONS
SECTION 271000 STRUCTURED CABLING SYSTEMS
SECTION 274000 AUDIO SYSTEMS

ATTACHMENTS

FLOOR PLANS

BARNARD ELEMENTARY SCHOOL - 3601 FORGE TROY, MI 48083
BEMIS ELEMENTARY SCHOOL - 3571 NORTHFIELD PKWY TROY, MI 48084
COSTELLO ELEMENTARY SCHOOL - 1333 HAMMAN TROY, MI 48085
HAMILTON ELEMENTARY SCHOOL - 5625 NORTHFIELD PKWY TROY, MI 48098
HILL ELEMENTARY SCHOOL - 4600 FORSYTH DR TROY, MI 48085
LEONARD ELEMENTARY SCHOOL - 4401 TALLMAN DR TROY, MI 48085
MARTELL ELEMENTARY SCHOOL - 5666 LIVERNOIS TROY, MI 48098
MORSE ELEMENTARY SCHOOL - 475 CHERRY STREET TROY, MI 48083
SCHROEDER ELEMENTARY SCHOOL - 3541 JACK DRIVE TROY, MI 48084
TROY UNION ELEMENTARY SCHOOL - 1340 EAST SQUARE LAKE RD TROY, MI 48085
WASS ELEMENTARY SCHOOL - 2340 WILLARD DR TROY, MI 48085
WATTLES ELEMENTARY SCHOOL - 3555 ELLENBORO TROY, MI 48083

DIAGRAMS:

A.01 COMBINED STAGE/CAFETERIA/GYMNASIUM
A.02 SEPARATE STAGE/CAFETERIA/GYMNASIUM
A.03 SEPARATE GYMNASIUM "SYSTEM" (ALTERNATE 3)
A.04 ALTERNATES 1 AND 4
A.05 TYPICAL STAGE CEILING MICROPHONE LAYOUT
A.06 TYPICAL STAGE CEILING MICROPHONE ELEVATION AND FLOOR PLAN

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

SECTION 00 30 00 – BIDDING REQUIREMENTS – INSTRUCTION TO BIDDERS

PART 1 - GENERAL

1.1 INTRODUCTION

- A. Troy School District is seeking bids and proposals for a new paging system at Linwood Elementary.
- B. **Bid documents may be obtained on the State of Michigan’s web site at www.Michigan.gov/VSSlogin and on the Troy School District purchasing site.**

- 1.2 **Due per the Schedule of Events**, the Owner will receive bid proposals for the project. The Owner will not consider or accept a bid proposal received after the due date for bid proposal submission. The Owner is not responsible for any postal or delivery delays. No email, facsimile or other electronic bid proposals will be accepted. All bid proposals received after the due date will be returned by making them available to the respective Bidder, unopened, for said Bidder to pick-up at their sole cost and expense. Bid proposals shall be submitted to:

Beth Soggs
Director of Technology
Troy School District
4420 Livernois
Troy, MI 48098

1.3 PROPOSALS/QUOTES

- A. Two (2) “hard” copies and two (2) electronic copies on a USB “flash” drive of each complete proposal are to be submitted in sealed packaging, clearly marked: **“RFP #9956 ELEMENTARY SCHOOLS AUDIO SYSTEMS SEALED BID”** for Troy School District and shall be identified with the Bidder’s name and address and the date and time of the bid proposal opening. The Owner is not responsible for any postal or delivery delays. No email, facsimile or other electronic bid proposals will be accepted.
- B. **Proposals will be opened immediately following the due date of the proposals:**
- C. The hard copy with the original bid Bond shall be conspicuously labeled on the exterior of the proposal stating “ORIGINAL”. All other copies shall be labeled “COPY”.

1.4 PROPOSAL FORMAT

- A. The Bid response shall be structured as follows:
 - 1. Section 1 – Submittal Letter, Executive Summary, Proposed Schedule, Statement of Material Availability and Bid Bond
 - 2. Section 2 – Proposal Forms, and Bill of Materials with Installed Pricing
 - 3. Section 3 – Narratives, System Description, Information, and Brochures
 - 4. Section 4 - Bidder Qualifications, References
 - 5. Section 5 – Sample Bidder’s Maintenance Contract

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

- B. The “hard copy” Bids shall be submitted on 8 1/2" by 11" paper, single sided, single spaced using 10 to 12-point print, in 3 ring binders, clearly labeled to show the Bidder's name.
- C. The electronic Bid shall be in the same structure and individual sections as the “hard copy” Bids, bound in .pdf files per section above, submitted on an USB “flash”, “Thumb” or similar drive with the hard copies. The electronic copy shall provide an exact duplicate of the information provided in the hard copy vice versa.

1.5 SECURITY

- A. Each bid proposal must be accompanied by bid security in the form of a certified check or bid bond in the amount not less than 5% of the bid proposal amount, made payable to Troy School District or naming Troy School District as the obligee. Bid bonds shall be issued by a company licensed to do business in the State of Michigan

1.6 INSURANCE REQUIREMENTS

- A. The Owner requires that all bidders submit proof of insurance with the following requirements:
 - 1. Troy School District must be listed as an additional insured on the Contractors General Liability Coverage. Bidders must agree to this in their Bid.
 - 2. Provide Troy School District with a copy of the Proof of General Liability Coverage from the Contractor with a minimum of \$1,000,000 for projects with a value less than \$1,000,000 and a minimum limit of \$2,000,000 for projects with a value between \$1,000,000 and \$10,000,000. Bidders must agree to this in their proposal.
 - 3. The Contractor must agree to hold the Owner harmless and to indemnify the Owner for losses from Contractor negligence as follows:
 - a. The waiver of subrogation clause in the AIA contract (A-201 or A-232) “General Conditions, and/or any other contract regarding this project, must be deleted.
 - b. The parties agree that the Owner is not waiving any rights its insurers may have to subrogation. To the extent any term in the Agreement is contrary to this provision, such term is void and unenforceable.

1.7 BID PROPOSAL EVALUATION

- A. Proposals will be evaluated using a weighted matrix on the following criteria, using the final score as the Bidder to be recommended to the Board of Education for award:
 - 1. Compliance with bidding procedures and completeness of proposal
 - 2. Compliance with RFP technical and administrative requirements
 - 3. Price
 - 4. Material and labor availability and proposed installation schedule
 - 5. Experience and references

1.8 STATEMENT OF MATERIAL AVAILABILITY AND PROPOSED SCHEDULE

- A. Bidders shall provide a statement of material availability with their proposal response. The statement shall include:

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

1. Availability of all material at time of proposal submission including associated lead times.
2. Forecasted availability of material at the time of project award (reference Schedule of Events). Use supplier's forecasted availability.
3. Proposed schedule of installation based on material and labor availability.

1.9 FAMILIAL DISCLOSURE AFFIDAVIT

- A. Each bid proposal must be accompanied by a sworn and notarized statement disclosing any familial relationship that exists between the owner or any employee of the Bidder and any member of the Board of Education or the Superintendent of Troy School District. The Board of Education will not accept a bid proposal that does not include this sworn and notarized disclosure statement.

1.10 AFFIDAVIT OF COMPLIANCE – IRAN ECONOMIC SANCTIONS

- A. Each bid proposal must be accompanied by the Iran Economic Sanctions Affidavit of Compliance in compliance with Michigan Public Act No. 517 of 2012. The Troy School District Board of Education will not accept a bid proposal that does not include this sworn and notarized disclosure statement.

1.11 RESERVATION OF RIGHTS

- A. The Owner reserves the right, in its sole and absolute discretion (for this provision and all other provisions contained in this RFP), to accept or reject, in whole or in part, any or all bid proposal with or without cause, to waive any irregularities or informalities in this RFP process or any bid proposal, and to award the contract to other than the low bidder, when in the opinion of the Owner, such action will best serve the Owner's interests.

1.12 WITHDRAWAL OF BID PROPOSALS/QUOTES

- A. All bid proposals submitted shall not be withdrawn and shall be irrevocable for a minimum period of ninety (90) calendar days following the due date for receipt of bid proposals set forth above.

1.13 REQUESTS FOR CLARIFICATION

- A. Bidders may request that the Owner clarify information contained in this RFP. All such requests must be made in writing via email to John Foster, Convergent Technology Partners, at jfoster@ctpartners.net. Requests for Clarifications and inquiries may only be made via email. The deadline for all Requests for Clarification is per the date and time indicated in the schedule of events. The aggregated answers to all Requests for Clarification will be provided in an addendum to the RFP which will be issued and posted on the Purchasing page of the **State of Michigan's web site at www.Michigan.gov/VSSlogin** and the Troy School District Purchasing site no later than three (3) business days prior to the bid opening date for all potential proposers to view.

1.14 RESTRICTION ON COMMUNICATION

- A. From the issue date of this RFP until a Contractor is selected and the contract is awarded a prospective Contractor shall not communicate about the subject of this RFP or a Contractor's bid proposal with the Owner, its Board of Education, or any individual member,

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

administrators, faculty, staff, students, or employees, except for additional requests for clarification in accordance with the paragraph above.

1.15 RELEASE OF CLAIMS

- A. Each Bidder by submitting its Proposal releases the Owner from all claims arising out of, and related to, this RFP process and selection of a Contractor.

1.16 PROPOSAL COST

- A. Respondents of this RFP are responsible for all costs incurred by them or others acting on their behalf in preparing or submitting a bid proposal, or otherwise responding to this RFP, or any negotiations incidental to its bid proposal or this RFP.

1.17 COLLUSIVE BIDDING

- A. All Bidders certify that its bid proposal is made without any previous understanding, agreement or connection with any person, firm or corporation making a bid proposal for the same project and is in all respects fair, without outside control, collusion, fraud, or other illegal action.

1.18 DEFINITIONS

- A. Bid Documents are defined as the Instructions to Bidders, Schedule of Events, this RFP, including all Supplemental forms, Attachments, Appendices, Specifications, Drawings and Addenda and the Contract.
- B. Addenda are written or graphic instruments issued prior to the due date of bid proposals which modify or interpret the Bid Documents by additions, deletions, clarifications, or corrections. All Addenda issued to Bidders prior to the due date of bid proposals shall become part of the Bid Documents and all bid proposals are to include the Project/Work therein described. Each Bid Proposal submitted shall list all Addenda that have been received prior to the due date of bid proposals.
- C. As used in these Instructions to Bidders, the term "Bid Proposal" means a bid proposal prepared and submitted in response to this RFP.
- D. As used in these Instructions to Bidders, the term "PSC" refers to the Professional Service Contractor and means Convergent Technology Partners and its assigned representatives.
- E. Throughout this RFP and Contract, the "Owner" or "Client" will be used to refer to Troy School District and bidders submitting bid proposals will be referred to as "Bidders" or "Vendors" and a successful Bidder or Vendor will be referred to as a "Contractor" or "Integrator".

1.19 BIDDER'S REPRESENTATION

- A. Each Bidder, by submitting a Bid Proposal, represents that the Bidder has read and understands the Bid Documents and is familiar with the local conditions under which the project is to be performed. Bidders will be held to have physically reviewed and compared the Sites with Bid Documents and have satisfied themselves to all conditions affecting the execution of the Work/Project.

1.20 EXAMINATION OF BID DOCUMENTS

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

- A. A **Mandatory** pre-bid walk through will be held per the Schedule of Events for the purpose of answering any questions from the Vendors and visiting the Site. The location of the Bidder's conference is:

Troy School District
Services Building
4420 Livernois
Troy, MI 48098

- B. Before submitting a Bid Proposal, each Bidder shall examine the RFP documents carefully and shall read the Specifications and the Bid Documents. Each Bidder shall gather complete information prior to bidding as to existing conditions and limitations under which the Work/Project is to be performed and shall include in its Bid Proposal a sum to cover the cost of items necessary to perform the Work/Project as set forth in the Bid Documents.
- C. No allowance or additional fees will be made to a Bidder because of lack of such examination or knowledge. The submission of a Bid Proposal will be considered as conclusive evidence that the Bidder has made such examination. An on-site-inspection of the Sites during the Bidder's Conference will be for all Bidders.
- D. Bidders may make written request to the PSC for interpretation or correction of any ambiguity, inconsistency or error in the Bid Documents that are discovered. These questions shall be submitted to the PSC per the Schedule of Events. Only a written interpretation or correction by Addendum shall be binding on Bidders. No explanations or interpretations requested or made orally will be considered binding. All questions will be responded to in writing and all addenda will be posted to the State of Michigan's web site at www.Michigan.gov/VSSlogin and the Troy School District Purchasing site.

1.21 SUBSTITUTIONS

- A. Each Bid Proposal shall be based upon the materials and equipment described in the Bid Documents. Please note material that are indicated no substitutions allowed.
- B. Voluntary alternates as substitutions for materials and equipment will be considered and evaluated if the Base Bid includes specified materials and equipment. In addition to the Base Bid, the submission of voluntary alternates is acceptable. If a voluntary alternate is submitted for consideration, it shall be expressed on the Bid Form as an "add" or "deduct" amount from the Base Bid. If a voluntary alternate is submitted, the Bidder shall also submit sufficient information in the form of drawings, specifications, and a complete description of the proposed substitute, the cost savings, or advantages. Additionally, provide the name of the material or equipment for which it is substituted, drawings, cuts, performance and test data and any other data or information necessary for a complete evaluation, sufficient for analysis of the alternate. The Owner reserves the right to unilaterally accept or reject, in whole or in part, any voluntary alternates.

1.22 BIDDING PROCEDURES

- A. All Bids Proposal must be submitted on the Bid Proposal Forms provided as part of the Bid Documents and in accordance with the Advertisement to Bid and Instructions to Bidders. Bidders must provide a complete list of proposed subcontractors (one per discipline) as

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

indicated on the Bid Forms. Listing two or more subcontractors per discipline will be grounds for disqualification.

- B. All Bidders must provide a proposal for the Base Bid that meets or exceeds the specifications set forth in this RFP. However, all Bidders may suggest voluntary alternates if it is felt that the alternate proposal better suits the intent of this RFP. Any alternate must be listed as such with separate pricing sheets. Any variance of the feature/functionality of the Base Bid must be identified in any alternates proposed.
- C. Prior to the due date for bid proposals, any Addenda will be available for inspection wherever the Bid Documents are kept available for that purpose. No Addendum will be issued later than three (3) days prior to the due date for bid proposals. It is each Bidders responsibility to ascertain prior to submitting a Bid Proposal that he/she has received all Addenda issued and shall acknowledge their receipt in their Bid Proposal Form.
- D. All Bids must be signed as follows:
 - 1. Corporations: Signature of an officer of the firm who is authorized to bind the corporation.
 - 2. Partnerships: Signature of one partner who is authorized to bind the firm and all its Partners.
 - 3. Bids submitted by Joint Ventures shall be signed by one of the Joint Ventures and shall be accompanied by a certified copy of the Power of Attorney authorizing the individual signing to bind all the Joint Ventures. If a certified copy of the Joint Venture's certificate submitted with the Bid Proposal indicates that all Joint Ventures have signed, no authorization is required.
 - 4. Individuals signing on own behalf: No authorization is required.
 - 5. Individual signing on behalf of another: Power of Attorney or comparable evidence of authority shall accompany Bid.
- E. Bid proposals shall be prepared on unaltered Bid Forms, which are a part of this RFP. Bidders shall make no additional stipulations on the Bid Form nor qualify the Bid Proposal in any other manner. Unauthorized conditions, limitations, or provisions attached to the Bid Proposal will be cause for rejection of the Bid Proposal. If alterations by erasure or interlineations are made for any reason, explain over such erasure or interlineations with a signed statement from the Bidder. No additional charges, other than those listed on the Bid Proposal Form and Bid Supplemental Forms, shall be made. Prices quoted will include verification/coordination of order, all costs for shipping, delivery to all Sites, insurance, payment and performance bonds, unpacking, setup, installation, operation, testing, cleanup, training, and all other requirements contained in the bid documents.
- F. Bids shall be submitted in a sealed envelope. Identified on the face of the envelope:
 - 1. Project name
 - 2. Name and address of Bidder
 - 3. Notation **"RFP #9956 ELEMENTARY SCHOOLS AUDIO SYSTEMS SEALED BID"**

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

- G. No responsibility shall attach to the PSC, the Owner, or the authorized representatives of either one, for the premature opening of any Bid Proposal which is not properly addressed, delivered and/or identified. In such event, that Bid Proposal will not be considered, and the Bidder will be automatically disqualified from consideration.
- H. Negligence in preparation, improper preparation, errors in and/or omissions in the Bid Proposal shall not relieve the Bidder from fulfillment of all applicable obligations and requirements of contained in the Bid Documents.
- I. The Owner or PSC in making copies available of the Bid Documents to Bidders do so only for the purpose of obtaining bid proposals on the project and do not confer a license or grant of use to a Bidder for any other purpose.
- J. All Bidders must complete, sign, and return the attached "FAMILIAL DISCLOSURE" and "IRAN ECONOMIC SANCTIONS AFFIDAVITS" with their Bid Proposal.
- K. **Bidders must include a Bill of Material (BOM) per building, along with installed line-item pricing for all components proposed**, including, but not limited to, maintenance and support with the total listed where indicated in the Bid Proposal Forms. **Failure to provide the complete BOM with line-item pricing will result in disqualification of the Bid proposal.** This does not preclude filling out the Unit Pricing Form Attachment B.
- L. The Owner considers this RFP legally binding and will require that this Request for Proposal and the Bid Proposal be incorporated by reference into any subsequent Contract between the Contractor and the Owner. It should be understood by the Bidder that this means that the Owner expects the Bidder to satisfy all requirements and specifications contained in the RFP. Any exceptions to the RFP must be explicitly noted in the Bid Proposal and accepted by the Owner. Lack of listing all exceptions will be considered acceptance of all specifications as presented in this RFP

1.23 CONSIDERATION OF BIDS

- A. The Bidder acknowledges the right of the Owner to accept or reject any or all Bid proposals, in whole or in part, with or without cause, to waive any irregularities or informalities in this RFP process or any Bid Proposal, and to award the contract to other than the low bidder. In addition, the Bidder recognizes the right of the Owner to reject a Bid Proposal:
 - 1. If the Bidder fails to furnish any required Bid Security, or to submit the data and forms required by the Bid Documents; or
 - 2. If the Bid Proposal is in any way incomplete or irregular; or
 - 3. If the Bidder's performance was unsatisfactory under a prior contract for the construction, repair, modification, or demolition of a facility with the Owner, or a contractor in privacy of contract with the Owner, which was funded, directly or indirectly, by the Owner.
- B. The Owner shall have the right to accept alternates in any order or combination and to determine the lowest qualified Bidder based on the sum of the base bid, revisions due to missing material and the alternates accepted.
- C. Once the contract is awarded to the Contractor, the contract is contingent upon Troy School District Board of Education approval and the Contractor providing the Owner with all

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

documents required by the RFP prior to commencement of the Work/Project (i.e. Insurance Certificates, Labor and Material Payment Bond and Performance Bond, etc.). Further, the Owner reserves the unrestricted right to reduce the contract amount by reducing the scope of Work/project and/or components. Any such action will be taken before specific work on a building or on a project component has commenced. Contract amount shall be reduced or increased based on the unit pricing values.

- D. Bidders to whom an award of a contract is under consideration shall submit to the Owner upon his/her request a properly executed Contractor's Qualification Statement, AIA Document A305 or other information format specified by the Owner.

1.24 BID SECURITY

- A. The Bid Proposal shall be accompanied by a Bid Security of a certified check or cashier's check payable to the Owner or by a satisfactory Bid Bond Entity naming the Owner as the obligee and executed by the Bidder and a surety company authorized to do business in the State of Michigan, in an amount identified in the Instructions to Bidders. The check or amount of Bid Bond shall be forfeited to the Owner upon failure of the Contractor to enter into the Contract. The Contractor's Bid security will be retained until the Contractor has signed the contract and has furnished the required Certificates of Insurance and other required Bonds and documents required by the RFP. Bonds signed by an Attorney-In-Fact must be accompanied by a certified and effectively dated copy of their Power of Attorney.
- B. The Owner reserves the right to retain the Bid security of all Bidders until the Contractor enters into the contract or until ninety (90) days after bid opening, whichever is later. If the Contractor refuses to enter into the Contract, the Owner may retain their Bid Security as liquidated damages but not as a penalty.

1.25 PERFORMANCE, LABOR, AND MATERIAL PAYMENT BONDS

- A. At or prior to delivery of the signed Contract, the Owner will require the Contractor to secure and post a Labor and Material Payment Bond and a Performance Bond including bonding for all subcontractors, each in the amount of 100% of the Contract Sum including bonding for all subcontractors. Surety shall be a company incorporated in the United States and must appear on the U.S. Treasury Departments approved surety list and be adaptable to the Owner. The Contractor shall obtain such bonds in a manner consistent with Michigan law.

1.26 TAXES

- A. Installation services for the tangible personal property purchased by the Owner is not subject to sales taxation. Moreover, the Owner is exempt from taxation on all tangible personal property purchased by the Owner for its use and consumption; however, this exemption would not apply to any materials required under the Bid Documents that are deemed to be a component of a construction/improvement project to the Owner's Sites/Facilities. All prices submitted on the Bid Proposal Form shall be inclusive of all applicable taxes.

1.27 PERMITS AND FEES

- A. All prices submitted on the Bid Proposal Form shall be inclusive of all applicable/required permits and fees.

1.28 MICHIGAN RIGHT-TO-KNOW LAW

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

- A. All Contractors must conform to the provisions of the Michigan Right-To-Know Law, 1986 PA 80, which requires employers to:
 - 1. Develop a communication program designed to safeguard the handling of hazardous chemicals through labeling of chemical containers, and development and availability of Material Safety Data Sheets.
 - 2. Provide training for employees who work with these chemicals; and
 - 3. Develop a written hazard communications program.
- B. The law also provides for specific employee rights. These include:
 - 1. The right to be notified (by employer or Contractor posting) of the location of Safety Data Sheet (SDS)
 - 2. The right to be notified (by employer or Contractor posting) of new or revised SDS no later than five working days after receipt
 - 3. The right to request copies of SDS from their employers or Contractors.
- C. Provisions of Michigan's Right-to-Know Law may be found in those sections of the Michigan Occupational Safety and Health Act (MIOSHA), which contain Right-to-Know provisions, and the Federal Hazard Community Standard, which is part of the MIOSHA Right-to-Know Law through adoption.

1.29 WITHDRAWAL OF BIDS

- A. A Bidder may withdraw its Bid Proposal by written request from an authorized Bidder representative, at any time prior to the due date of bid proposals.
- B. No Bidder may withdraw a Bid Proposal for a period of ninety (90) calendar days, following the due date for receipt of bid proposals, and all bid proposals shall be subject to acceptance by the Owner during this ninety (90) day period.

1.30 EXECUTION OF CONTRACT

- A. The Contractor to whom the contract is awarded shall, within ten (10) calendar days after Notice of Award and receipt of the contract from the Owner, execute and deliver required copies to the Owner.
- B. At or prior to delivery of the executed Contract, the Contractor to whom the contract is awarded shall deliver to the Owner those Certificates of Insurance required by the Bid Documents and such Labor and Materials Payment Bonds and Performance Bond as are required by Owner and any other documents required by this RFP.
- C. The Owner shall approve the provided Bonds and Certificates of Insurance before the Contractor may proceed with the Work/Project. Failure or refusal to provide Bonds, Certificates of Insurance or any other documents required by this RFP in a form(s) satisfactory to the Owner shall subject the Contractor to loss of time from the allowable construction period equal to the time of delay in furnishing the required material.

1.31 POST BID INFORMATION

- A. All additional information required for the proper evaluation of the bidder's proposal shall be promptly provided upon request by the PSC or Owner.

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

1. This is not to be construed as additional time to provide documentation or information that is required to be included to be in the bid proposal.

1.32 TIME OF COMPLETION

- A. The Bidder agrees to complete the Work within the timeframes listed in the Schedule of Events or as mutually agreed during the project kick-off meeting.

1.33 EQUAL OPPORTUNITY

- A. The Contractor and all its subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, or national origin.

PART 2 - EXECUTION

2.1 SITE REQUIREMENTS

- A. The Owner Site is an instructional and administrative facility that provides up to year-round services to their students, staff, and the community. As such, activities in all buildings are critical to the provisioning of services to the students, staff and the community and shall not be interrupted by the Contractor's Work activities.
- B. The computer and telephone systems associated with this Work will not be taken off-line or removed from service during normal working hours without coordination of the Owner's IT department and the staff of affected buildings. Arrangements must be made by the Contractor to coordinate any such activities.
- C. The Contractor will be required to work around all the conditions listed above, as well as working with the Owner's staff to minimize disruptions to normal Owner activities.
- D. Installation Guidelines
 1. All Work performed on this Project will be installed in accordance with the current edition of the Michigan Electrical Code, the current edition of the BICSI Telecommunications Distribution Methods Manual, the current edition of the BICSI Cabling Installation Manual, the latest issue of the TIA Standards as published by Global Engineering Documents as TIA Commercial Building Telecommunications Standard, and all local codes and ordinances.

2.2 QUALITY ASSURANCE

- A. Project Manager
 1. The Contractor will provide a full-time Project Manager who will act as a single point of contact for all activities regarding this Project. The Project Manager must be a management employee and will not be involved in personally performing craft installation work
 2. The Project Manager is required to attend necessary technology and construction meetings for coordination before Work is started and construction meetings once Work is in progress.
 3. The Project Manager will be required to make on-site decisions regarding the scope of the Work and any changes required by the Work.

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

4. The Project Manager will be totally responsible for all aspects of the Work and shall have the authority to make immediate decisions regarding implementation or Owner approved changes to the Work.

B. Compliance with Laws and Regulations

1. The Contractor performance of the Work shall comply with all applicable federal, state, and local laws, rules, and regulations and Owner policies, procedure, rules and regulations. The Contractor shall give required notices, shall procure necessary governmental licenses and inspections, and shall pay without burden to the Owner, all fees and charges in connection therewith unless specifically provided otherwise. In the event of violation, the Contractor shall pay all fines and penalties; including attorney's fees and other defense costs and expenses in connection therewith.

C. Federal Communications Commission

1. Equipment requiring FCC registration or approval shall have received such approval and shall be appropriately identified.

D. Codes, Standards, and Ordinances

1. All Work shall conform to the latest edition of the Michigan Electrical Code, the Building Code, and all local codes and ordinances, as applicable. Current versions of TIA-568 and TIA-569 shall be adhered to during all installation activities. Methodologies outlined in the latest edition of the BICSI Telecommunications Distribution Methods Manual shall also be used during all installation activities. Should conflicts exist with the foregoing, the authority having jurisdiction for enforcement will have responsibility for making interpretation. The Contractor is wholly responsible to meet or exceed all codes, standards, regulation, manufacturer installation standards and industry best practices.

2.3 SAFETY

- A. The Contractor shall take the necessary precautions and bear the sole responsibility for the safety of the methods employed in performing the Work. The Contractor shall at all times comply with the regulations set forth by federal, state, and local laws, rules, and regulations concerning "OSHA" and all applicable state labor laws, regulations, and standards. The Contractor shall indemnify and hold harmless the Owner from and against all liabilities, suits, damages, costs, and expenses (including attorney's fees and court costs) that may be imposed on the Owner because of the Contractor, or its subcontractor, or supplier's failure to comply with the regulations stated herein.

2.4 INSPECTION, ACCEPTANCE, AND TITLE

- A. Inspection and Acceptance will be upon successful installation unless otherwise provided. Title to/or risk of loss or damage to all items shall be the responsibility of the Contractor until acceptance by the Owner unless loss or damage results from negligence by the Owner. If the materials or services supplied to the Owner are found to be defective or do not conform to the specifications, the Owner reserves the right to cancel the Contract upon written notice to and return products at the Contractor's expense, based upon the terms of the Contract.
 1. When the Owner is referred to in this section of the RFP relative to inspections, the Owner has designated the PSC as the party to perform such inspections on behalf of the Owner.

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

Notwithstanding the above, the Owner may also perform such inspections along with the PSC.

- B. The Owner shall at all times have access to the Work wherever it is in preparation or progress and shall provide proper facilities for such access and for inspection.
- C. The Contractor shall not close-up any Work until the Owner or applicable AHJ has inspected the Work. Should the Contractor close-up the work prior to inspection, the Contractor shall uncover the Work for inspection at no cost to the Owner, and then recover the Work according to the specifications contained herein. The Contractor shall notify the Owner and applicable AHJ in writing when the Work is ready for inspection. The Owner and AHJ will inspect the Work as expeditiously as possible after receipt of notification from the Contractor.

2.5 STATUS REPORTS, MEETINGS AND CONSTRUCTION COORDINATION

- A. It shall be the Contractor's responsibility to provide the Owner / PSC with written weekly project status reports while actively engaged in craft work and a summary report at the beginning of periods of inactivity between phases or construction delays noting status at that time and expected date of return to work in addition to the requirements listed below. These reports are required and shall include, but not be limited to:
 - B. Project completion percentage.
 - C. All problems that were encountered.
 - D. Any foreseeable problems that may arise.
 - E. General status of the project
 - F. The Owner / PSC reserves the right to hold additional status meetings on a regular basis with the Contractor's Project Manager.

END OF SECTION

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS
SECTION 00 30 10 - SCHEDULE OF EVENTS

The following is a projected schedule of events for this project. The schedule may change depending upon the results of the responses and a final schedule will be established prior to contracting with the Contractor. Additionally, the final schedule shall be subject to change based on construction schedule and progress.

EVENT	DATE
Bid Release	3/3/23
Bidder's Conference Date and time	3/8/23 10:00 AM
Final Date and time for Questions	3/14/23 12:00 PM
Bid Due Date/time and Public Opening	3/21/23 1:00 PM
Contract Award	4/18/23
Project Start Date	5/1/23
Project Completion	8/15/23

End of Section

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS
SECTION 00 40 10 - BID PROPOSAL FORM

OWNER: Beth Soggs
Director of Technology
Troy School District
4420 Livernois
Troy, MI 48098

PROJECT: RFP #9956 ELEMENTARY SCHOOLS AUDIO SYSTEMS

NAME OF BIDDER: _____

BASE BID:

Lump sum bid for all work specified and shown on the drawings as indicated for base bid in the amount of:

_____ Dollars (\$ _____)

The Bid Proposal amount shall be shown in both words and figures. In the case of discrepancy, the amount shown in words shall govern.

BASE BID: The undersigned, having examined the Bid Documents and examined the conditions affecting the Work/Project, hereby proposes and agrees to furnish all of the labor, materials, and equipment and perform all work necessary to complete the Work/Project as required by the Bid Documents for the stipulated sum identified above and detailed in Supplemental A (Cost Analysis Worksheet). The Bid Documents set forth the terms and conditions upon which the Bidder will provide a "turnkey" solution for the installation and operation of the project for use by the Owner and represents and warrants that the design, operation, and functionality of the project are in accordance with the Bid Documents. All prices provided by the Bidder on this Bid Proposal Form must include all cables, connectors, equipment etc. that are necessary to the make the project fully operational for the intent and purpose stated in the Bid Documents

BID SECURITY: Enclosed herewith find (Certified Check)/ (Bid Bond) in the amount of \$_____ being five percent (5%) of the maximum Bid Proposal herein, made payable to Troy School District or naming Troy School District as obligee. The proceeds of which are to remain the property of Troy School District, if the Bidder does not, within ten (10) days after notice of the acceptance of Bid Proposal, enter the Contract.

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

EXCEPTIONS AND SUBCONTRACTORS

Any exceptions to the terms and conditions contained in the RFP or contract must be identified below: (Identify each with specific RFP section/part/paragraph, attach a separate sheet if required) Referring to an annotated RFP is NOT acceptable. Additionally, any subcontractors must be listed below with all contact information.

ADDENDA

This RFP incorporates the following Addenda:

Addendum No. ____ Dated _____ Addendum No. ____ Dated _____

Addendum No. ____ Dated _____ Addendum No. ____ Dated _____

Addendum No. ____ Dated _____ Addendum No. ____ Dated _____

BID PROPOSAL FORM REQUIRED ATTACHMENTS:

The following Bid Form Proposal Supplements are attached hereto and are considered an integral part of this Bid Proposal Form:

- SUPPLEMENTAL A – Cost Analysis Worksheet
- SUPPLEMENTAL B – Unit Pricing
- SUPPLEMENTAL C – Mandatory Alternates
- SUPPLEMENTAL D – Voluntary Alternates
- SUPPLEMENTAL E – Familial Disclosure Affidavit
- SUPPLEMENTAL F – Iran Economic Sanctions Act Compliance Affidavit

The following additional information must also be included for the bid proposal to be considered compliant:

- **Bill of Material and installed pricing**
- Comprehensive Narrative of the proposed System/Solution
- Diagrams or Schematics supporting the System/Solution Narrative
- Other information as indicated herein.
- Statement of Material and Labor Availability

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

BIDDER NAME: _____

ADDRESS: _____

DATE: _____

TELEPHONE: _____

EMAIL ADDRESS: _____

If award is made to our firm based upon our Bid Proposal, we agree to enter into the form of Contract with the Owner in accordance with this Request for Proposal, the contract and our Bid Proposal.

My signature certifies that the Bid Proposal as submitted complies with all terms and conditions as set forth in this Request for Proposal, unless specifically enumerated as an exception as part of this Bid Proposal Form.

I hereby certify that I am authorized to sign as a Representative for the Firm:

(Authorized Signature)

(Title)

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

SUPPLEMENTAL A - COST ANALYSIS WORKSHEET

OWNER: Beth Soggs
Director of Technology
Troy School District
4420 Livernois
Troy, MI 48098

BIDDER: _____

ADDRESS: _____

BID BREAKDOWN

BUILDING	COMPONENT	Pricing
Audio System Equipment	Material	
	Labor	
	Sub Total	
Wiring	Material	
	Labor	
	Sub Total	
Speakers and Microphones	Material	
	Labor	
	Sub Total	
Demo of Existing	Labor	
	Programming	
	Training	
Sub Total		
Performance and Materials Bond		
TOTAL BASE BID		

Alternates		
Alt. 1 – Live Stream Camera	Material	
	Labor	
	Total Alt. 1	
Alt. 2 – Add Speakers - Gymnasiums	Material	
	Labor	
	Total Alt. 2	
Alt. 3 – Add Full system in Gymnasiums	Material	
	Labor	
	Total Alt. 3	

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

Alt. 4 – add full system to gyms with new wall mounted cabinets	Material	
	Labor	
	Total Alt. 4	

TOTAL PROPOSAL		
	AUDIO SYSTEMS	
	PERFORMANCE, LABOR, AND MATERIALS BONDS	
	ALTERNATE 1	
	ALTERNATE 2	
	ALTERNATE 3	
	ALTERNATE 4	
	ALTERNATE 5	
	ALTERNATE 6	

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

SUPPLEMENTAL B - UNIT PRICING

Unit Pricing: In addition to the required Bill of Material (BOM) with installed unit prices, please provide the following specific complete unit pricing (Inclusive of all labor, materials, wiring and connectivity, programming, associated licenses, etc.), which shall be considered firm pricing during the contract period and not subject to change.

BOM Unit prices will be used to modify quantities prior to award, the Unit Prices below will be used to determine pricing (Inclusive of licenses, labor and material including connectivity and programming into system) for additions and deletions during the contract period (after award).

	Item	Part Number	Unit Price
UP1	Qsys Amplifer	QSC CX-Q SERIES	
UP2	Blue Tooth Receiver	QSC AXON DBU	
UP3	Ip Camera	QSC NC-20x60	
UP4	Core Processor	QSC 110Fv2	
UP5	Audio Decoder	VISIONARY SOLUTIONS E4100	
UP6	I/O Bridge	QSC I/O HDMI Bridge	
UP7	I/O Extender	QSC QIO-ML4i	
UP8	Wireless Receiver	AKG WMS-470	
UP9	Wireless Lavalier Microphone Pack	AKG PT-470	
UP10	Wireless Hand-Held Microphone	AKG HT470-D5	
UP11	Audio Network Switch	QSC N10-720++	
UP12	Wall Mounted 400W Speaker	QSC ADS8T	
UP13	Floor Placed Monitor Speaker	BEHRINGER F1320D	
UP14	7" Wall Mounted Touch Panel	QSC TSC-70-G3	
UP15	Ceiling Hung Choir Microphone		
UP16			

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS
SUPPLEMENTAL C - MANDATORY ALTERNATES

Alternate 1: Provide IP camera and I/O bridge, including all associated equipment to allow real time streaming of events external to the District network (YouTube, etc.)

Add _____ (\$)_____

Alternate 2: Provide two (2) additional speakers in gymnasiums adjacent to cafeterias to allow full coverage of both spaces when divider is open. Speakers are to be programmed as a separate zone to not operate when the divider is closed.

Add _____ (\$)_____

Alternate 3: In locations where stage and cafeteria are separate from the gymnasium, provide full functionality within gymnasiums – wireless microphones, blue tooth receivers, amplifiers and speakers, as a separate zone from the main system, using the main system processor and reusing the existing gymnasium cabinet.

Add _____ (\$)_____

Alternate 4: In locations where stage and cafeteria are separate from the gymnasium, provide full functionality within gymnasiums – wireless microphones, blue tooth receivers, and speakers, as a separate zone from the main system, using the main system processor and new wall mounted cabinet.

Add _____ (\$)_____

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEM

SUPPLEMENTAL D - VOLUNTARY ALTERNATES
Bidder to list all voluntary alternates on this sheet.

VOLUNTARY ALTERNATE 1:

Add/Deduct/No Change

_____ Dollars (\$_____)

VOLUNTARY ALTERNATE 2:

Add/Deduct/No Change

_____ Dollars (\$_____)

VOLUNTARY ALTERNATE 3:

Add/Deduct/No Change

_____ Dollars (\$_____)

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

SUPPLEMENTAL E - FAMILIAL DISCLOSURE AFFIDAVIT

The undersigned, the owner or authorized officer of _____ (the "Bidder"), pursuant to the familial disclosure requirement provided in the Troy School District Request for Proposal(s), hereby represents and warrants that, except as provided below, no familial relationships exist between the owner or any employee of the Bidder, and any member of the Board of Education of the School District or the Superintendent of the School District.

List any Familial Relationships:

BIDDER:

By:

Title:

STATE OF MICHIGAN
COUNTY OF _____

This instrument was acknowledged before me on the ____ day of _____, _____, by

_____.

, Notary Public

_____ County, Michigan

My Commission Expires: _____

Acting in the County of: _____

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

SUPPLEMENTAL F - AFFIDAVIT OF COMPLIANCE – IRAN ECONOMIC SANCTIONS ACT

Michigan Public Act No. 517 of 2012

The undersigned, the owner or authorized officer of the below named applicant (the “Applicant”), pursuant to the compliance certification requirement provided in the Troy School District Request For Proposals for Elementary Schools Audio Systems (the “RFP”), hereby certifies, represents and warrants that the Applicant (including its officers, directors and employees) is not an “Iran linked business” within the meaning of the Iran Economic Sanctions Act, Michigan Public Act No. 517 of 2012 (the “Act”), and that in the event Applicant is awarded a contract as a result of the aforementioned RFP, the Applicant will not become an “Iran linked business” at any time during the course of performing the Work or any services under the contract.

The Applicant further acknowledges that any person who is found to have submitted a false certification is responsible for a civil penalty of not more than \$250,000.00 or 2 times the amount of the contract or proposed contract for which the false certification was made, whichever is greater, the cost of the Owner’s investigation, and reasonable attorney fees, in addition to the fine. Moreover, any person who submitted a false certification shall be ineligible to bid on a request for proposal for three (3) years from the date it is determined that the person has submitted the false certification.

APPLICANT:

Name of Applicant

By: _____

Title: _____

Date: _____

State of Michigan, County of _____)

This instrument was acknowledged before me on the _____ day of _____, _____, by

_____.

_____, Notary Public _____ County, _____

My Commission Expires: _____

Acting in the County of: _____

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

SECTION 27 05 00 COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.1. SUMMARY

- A. The successful bidder/Integrator (hereafter referred to as the Integrator) shall supply equipment, materials, labor, and services to provide the following systems including, but not limited to:
 - 1. System(s) as indicated in each section.
 - 2. Structured Cabling and system wiring
 - 3. Testing and test documentation as indicated in each section.
 - 4. Fire stopping.
 - 5. Extended warranty and manufacturer's certification of systems, products, and labor.
- B. Provide all equipment, materials, labor, whether specifically mentioned or not, which are necessary to complete or perfect all parts of the installation. Ensure that they are in compliance with requirements stated or reasonably inferred by the contract documents.

1.2. RELATED SECTIONS

- A. Section 00 00 00
- B. Section 27 10 00 Structured Cabling
- C. Section 27 40 00 Audio Systems

1.3. RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this section.
- B. Also as indicated in each section.

1.4. REFERENCES

- A. Local Codes and Standards - all applicable
 - 1. Anywhere Standards conflict with electrical or safety Codes, Integrator shall defer to applicable local codes or ordinances, or default to the most stringent requirements listed by either. Knowledge and execution of applicable codes is the sole responsibility of the Integrator. Any code violations committed at the time of installation shall be remedied at the Integrator's expense. Integrator is responsible to bring any perceived conflicts between project documents and referenced Standards or Codes to the attention of the PSC for resolution.
- B. Integrators shall adhere to latest ratified editions of the following: this list is not all inclusive:
 - 1. American Society for Testing and Materials (ASTM)
 - 2. American National Standards Institute (ANSI)
 - 3. Insulated Cables Engineers Association (ICEA)
 - 4. National Electrical Manufacturers Association (NEMA)
 - 5. Institute of Electrical and Electronics Engineers (IEEE)
 - a. National Electric Safety Code (NESC IEEE C2)
 - 6. American National Standards Institute (ANSI) Telecommunications Industry Association (TIA)

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

- a. ANSI/TIA-568- Commercial Building Telecommunications Cabling Standard
 - b. ANSI/TIA-568 - Balanced Twisted-Pair Telecommunications Cabling and Components
 - c. ANSI/TIA-568: Optical Fiber Cabling Components
 - d. ANSI/TIA-569 - Telecommunications Pathways and Spaces
 - e. ANSI/TIA-598- Optical Fiber Cable Color Coding
 - f. ANSI/TIA-606 - Administration Standard for Telecommunications Infrastructure
 - g. ANSI/TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
- 7. ISO/IEC 11801– Information Technology – Generic Cabling For Customer Premises
 - 8. NFPA 70 National Electrical Code (NEC)
 - 9. Michigan Electrical Code
 - 10. Restriction of Hazardous Substances Directive 2002/95/EC (RoHS)
 - 11. Underwriters Laboratories (UL)
 - a. UL 2024A Optical Fiber Cable Routing Assemblies for non-metallic cable pathways
 - 12. Building Industry Consulting Services International (BICSI)
 - a. Telecommunications Distribution Design Manual (TDMM)
 - b. Information Technology Systems Installations Methods Manual (ITSIMM)
 - c. Outside Plant Design Reference Manual (OSPDRM)
- C. Federal, state, and local codes, rules, regulations, and ordinances
 - 1. The Integrator shall perform all work according to Federal, State, and local codes, rules, regulations, and ordinances governing the work. Where the requirements of other sections of the specifications are more stringent than applicable codes, rules, regulations, and ordinances, the specifications shall apply.
 - D. Others as indicated in each section.
- 1.5. QUALITY ASSURANCE
- A. Electrical Components, Devices, and Accessories: Listed and labeled, meeting the National Electrical code, Michigan Electrical Code and/or National Building Code and tested by a qualified testing agency, and marked for intended location and application
 - B. Telecommunications Pathways and Spaces: Comply with TIA-569, the National Electrical Code and the National Building Code.
 - C. Grounding: Comply with ANSI/TIA-607 and the National Electrical Code.
- 1.6. GENERAL PROJECT CONDITIONS
- A. Environmental Limitations: Do not deliver or install interior equipment cable until spaces are enclosed and weather-tight, wet work in spaces is complete and dry, and work above ceilings in IT spaces is complete.
 - B. This Integrator shall examine the conditions under which the system installation is to be performed and notify the Owner's Representative or Design Professional in writing of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to provide a workmanlike installation.

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

- C. Review areas of potential interference and resolve conflicts before proceeding with the work. Coordinate ceiling layout and wall layout and other work that penetrates or is supported throughout the space of the building. All work shall be flush and workmanlike in all finished areas.
- 1.7. COORDINATION
- A. Coordinate layout and installation of communications equipment with Owner's telecommunications and LAN equipment and service suppliers.
 - B. Coordinate all work with:
 - 1. Owner for available work hours and site access requirements
 - 2. Owner IT department
 - C. Record agreements reached in meetings and distribute them to other participants.
 - D. Adjust arrangements and locations of distribution frames, cross -connects, and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment and as required by project documents.
 - E. Adjust arrangements and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in the equipment room.
 - F. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.
- 1.8. PERMITS, FEES, and CERTIFICATES OF APPROVAL.
- A. The Integrator will make application and pay for all required permits.
 - B. As indicated in each section.
- 1.9. DEFINITIONS
- A. 8p/8c connector – Commonly referred to as “RJ45”
 - B. MPTL – Modular Plug Terminated Link, ANSI/TIA test procedures for field installed modular plugs on UTP cable
 - C. NLT – No Later Than
 - D. SCS - Structure Cabling System
 - E. TBD – To be determined
 - F. PSC – Professional Services Contractor (Convergent Technology Partners)
 - G. UNO – Unless Notified/Noted Otherwise
 - H. UTP – Unshielded Twisted Pair
- 1.10. SUBMITTALS
- A. General:
 - 1. As required by individual Sections herein
 - B. Shop Drawings:
 - 1. Provide cable routing diagrams.
 - 2. Show patch panel numbering for all patch panels.
 - 3. Provide a schedule of materials list with quantities and manufactures indicated for all materials installed in the project.
 - C. Product Data:
 - 1. Provide manufacturer’s product data specifications sheets indicating products being submitted and any long lead time items.

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

2. Provide submittals for products with long lead times as soon as possible for ordering the materials.
 3. Provide submittals (1) week after receiving notice to proceed and prior to installation of any of the product.
- D. Schedule
1. Submit a coordinated schedule no later than (2) weeks after “notice to proceed” to include the following.
 - a. Preconstruction meeting and walkthrough.
 - b. Start and duration of system milestones.
 - c. Punch List.
 - d. Final Punch List.
- E. Cable Test Results:
1. Cable Tests
 - a. All UTP shall be tested using the “Permanent Link Method” and MPLT for Modular Terminated Plugs as outlined in the ANSI/TIA 568 Standard standard.
- F. Project Record Drawings
1. Submit project record documents at Contract Closeout.
 2. The Integrator shall deliver one (1) set of hard-copy and one (1) set of electronics as-built drawings per building to the PSC/owner within two (2) calendar weeks of completion of the project. A set of as-built drawings shall be provided to the owner in approved electronic form (i.e., USB) and utilizing software that is acceptable to the owner and PSC. The Integrator shall deliver the digital media to the owner/PSC within two (2) calendar weeks of completion of the project.
 - a. As-built Drawings must contain.
 - 1) Main Cable Routes
 - 2) Labeling at WAO or end device
 - 3) Cable locations by type
- G. Submit, within two (2) weeks after notice to proceed, the names and qualifications of those persons who will have management and supervisory positions over the employees on the job site. Submit the name of the supervisory person who will be on the job site daily and have responsibility for day-to- day decisions. Submit the name of the Project Manager who will attend meetings and have authority to make decisions for issues and requirements that arise from such meetings.
- H. Upon request by the engineer/designer (PSC), the Owner, and/or the Owner’s representative will furnish a list of references with specific information regarding the type of project and involvement in providing other products and/or support equipment used on this project.
- I. Where equipment and materials have industry certification, labels, or standards (i.e., NEMA-National Electrical Manufacturer’s Assn.), this equipment shall be labeled as certified or complying with the standards.
- J. Material and equipment shall be new, and conform to grade, quality, and standards specified. Equipment and materials of the same type shall be a product of the same manufacturer throughout.

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

1. All hardware proposed must be the current offering of the manufacturer and receive the highest level of standard support offered by the manufacturer.
 2. Factory refurbished hardware which is in "new condition" as well as used, shopworn, prototype, demonstrator models, etc. are not acceptable.
 3. The System must consist of standards-based products or components whose performance, reliability, and maintainability can be demonstrated.
- 1.11. QUALITY ASSURANCE
- A. Submit documentation with the bid listing the names of employees that may be used on this project indicating their experience, level of expertise, and certificates of training.
 - B. The Integrator's project manager shall make periodic inspections to assure quality, code, standards, and RFP compliance.
 - C. Comply with directives from the PSC regarding quality, codes, standards, and RFP compliance
- 1.12. WARRANTY
- A. Submit at project closeout, a signed and registered manufacturer product warranty and applications assurance. See individual (system) Sections for warranty requirements.
 - B. All software required to run or view the test data must accompany the application.
 - C. Copies of as-built drawings must be submitted to the manufacturer via electronic or hard copy. (Drawings must be in AutoCAD or Visio)
 - D. Submit a statement, at notice to proceed, of any Integrator warranties in addition to the manufacturer's stated and supplied warranties. Submit at closeout signed copies of the Integrator provided warranties that are in addition to manufacturer's stated and supplied warranties.
- 1.13. DELIVERY, STORAGE, AND HANDLING
- A. Protect equipment during transit, storage, and handling to prevent damage, theft, soiling, and misalignment. Coordinate with the owner for secure storage of equipment and materials.
 1. There is limited storage while school is in session. More storage will become available once Summer Break starts.
 - B. Do not store equipment where conditions fall outside manufacturer's recommendations for environmental conditions.
 - C. Follow manufacturer's recommended procedures for storage of materials & equipment.
 - D. Do not install damaged equipment; remove from site and replace damaged equipment with new equipment.
- 1.14. USE OF THE SITE
- A. The sites are both educational and administrative in nature. Access to the sites shall be at the owner's direction in matters in which the owner deems it necessary to place restriction.
 - B. Access to building wherein the work is performed shall be as directed by the owner.

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

- C. The owner will occupy the premises during the entire period of construction for conducting his or her normal business operations. Cooperate with the owner to minimize conflict and to facilitate the owner's operations.
- D. Proceed with the work without interfering with ordinary use and operations of the owner.

1.15. CONTINUITY OF SERVICES

- A. Take no action that will interfere with, or interrupt, existing building services unless previous arrangements have been made with the owner's representative. Arrange the work to minimize shutdown time
- B. Owner's personnel will perform shutdown of operating systems. The Integrator shall give three (3) days' advance notice for systems shutdown.
- C. Should services be inadvertently interrupted, immediately furnish labor, including overtime, material, and equipment necessary for prompt restoration of interrupted service.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

- A. Provide products as indicated in individual articles.
- B. Where no manufacturer is specified, provide products of manufacturers in compliance with requirements.
- C. Provide proof the manufacturer selected has successfully had these same products installed at other facilities and provide references with name, title, address, phone number & e-mail address of each point of contact within each referenced account.
- D. Provide proof the manufacturer has 20 years or more of designing, manufacturing and providing fiber optic cables, within the continental United States.
- E. Provide proof the manufacturer is located within the U.S., is incorporated within the U.S. and that the major products (fiber optic cables, cable assemblies and termination hardware) are manufactured within the U.S.
- F. Substitutions: Substitution requests will be considered only if submitted to Owner's Representative not less than 7 working days prior to project bid date. Acceptance or rejection of proposed substitution is at Owner's Representatives sole discretion. No exceptions. Requests for substitutions shall be considered not approved unless approval is issued in writing by Owner's Representative.
- G. Rejection: For equipment, cabling, wiring, materials, and all other products indicated or specified as no substitutions or no alternates, Owner does not expect nor desire requests for substitutions and alternate products other than those specified. Owner reserves right for Owner's Representative to reject proposed substitution requests and submissions of alternates without review or justification.

PART 3 - EXECUTION

3.1. PRE-INSTALLATION SITE SURVEY

- A. Prior to the start of systems installation, The Integrator will meet at the project site with the owner's representative and representatives of trades performing related work to coordinate efforts. Review areas of potential interference and resolve conflicts before proceeding with the work. Facilitation with the general contractor (when

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

applicable) shall be necessary to plan the crucial scheduled completions of the equipment rooms and telecommunications rooms.

- B. Examine areas and conditions under which the system is to be installed. Do not proceed with the work until satisfactory conditions have been achieved.
- C. Exact location of cable terminations shall be field verified with owner at time of installation.

3.2. HANDLING AND PROTECTION OF EQUIPMENT AND MATERIALS

- A. The Integrator shall be responsible for safekeeping their own and subcontractor's property, such as equipment and materials, on the job site. The owner assumes no responsibility for protection of above-named property against fire, theft, and environmental conditions.

3.3. CLEANUP

- A. Touch-up, repair or replace damaged products before substantial completion, unless specified otherwise.
- B. All work materials shall be removed at the end of each workday and the work area left in the same condition as found. Upon completion of the work, the Integrator must remove all tools, equipment and all rubbish and debris from the premises and must leave the premises clean and neat.

3.4. PROTECTION OF OWNER'S FACILITIES

- A. Effectively protect the owner's facilities, equipment, and materials from dust, dirt, and damage during construction.
- B. Protect installed products until completion of project
- C. Remove protection at completion of work.
- D. Should it be found by the engineer that the materials, or any portion thereof, furnished and installed under this contract fail to comply with the specifications and drawings, with respect or regard to the quality, amount of value of materials, appliances, or labor used in the work, it shall be rejected and replaced by the Integrator, and all work distributed by changes necessitated in consequence of said defects or imperfections shall be made good at the Integrator's expense.

3.5. INSTALLATION

- A. Prior to pulling cable through conduit, mandrel the conduits to remove foreign material before pulling commences.
- B. Beginning installation means that the Integrator accepts existing conditions.
- C. Integrator shall furnish all required installation tools to facilitate Cable installation without damage to the cable jacket. Such equipment is to include, but not be limited to, sheaves, winches, cable reels, cable reel jackets, duct entrance funnels, pulling tension gauges, and similar devices. All equipment shall be of substantial construction to allow steady progress once pulling has begun. Makeshift devices that may move or wear in a manner to pose a hazard to the cable or employees shall not be used.
- D. Cable pulling shall be done in accordance with cable manufacturer's recommended procedures and ANSI/IEEE C2 standards. Manufacturer's recommendations shall be a part of the cable submittal. Recommended pulling tensions and minimum bending radii shall not be exceeded. Any cable bent or kinked to a radius less than recommended shall not be installed.

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

- E. During cable pulling operation, an adequate number of workers shall be present to allow cable observation at all points of duct entry and exit as well as to feed cable and operate pulling machinery.
- F. Pulling lubricant shall be used to ease pulling tensions. Lubricant shall be of a type that is non- injurious to the cable material used. Lubricant shall not harden or become adhesive with age.
- G. Avoid abrasion and other damage to cables during installation.
- H. All exposed cable shall be labeled at 35-foot (maximum) intervals with tags indicating ownership, cable type, and fiber type installed.

3.6. LABELING

- A. All labeling shall be in accordance with ANSI/TIA-606 unless otherwise noted by the owner.
- B. Mark up floor plans showing Cable routes, segments, Cable type, and marking of cables. Turn these drawings over to the owner two (2) weeks prior to move-in to allow the owner's personnel to connect and test owner-provided equipment in a timely fashion.

3.7. TESTING AND ACCEPTANCE

- A. Test procedures must meet manufacturer's standards.
- B. The Integrator shall correct, in a timely manner, any failure to comply with Contract Documents as reasonably determined by Owner.
- C. If final acceptance is significantly delayed because of defective new equipment or because the installation is not in accordance with the Contract Documents, the Integrator shall pay for all the Owner's additional time and expenses resulting from the delay and any extensions of Acceptance Testing.
- D. As additionally indicated in each Section.
 - 1. The Integrator shall provide written reports of all test data in written form to the owner. At such time the Integrator turns over test data to the PSC.
 - 2. In the event that test results are not satisfactory, the Integrator shall make adjustments, replacements, and changes as necessary and shall then repeat the test or tests that disclosed faulty or defective material, equipment, or installation method, and shall perform additional tests as the PSC deems necessary.
 - a. Tests related to connected equipment of others shall only be done with the permission and presence of the Integrator involved. The Integrator shall perform only that testing as required to prove the fiber connections are correct.
 - b. One (1) record copy of all test data shall be submitted to the PSC/engineer for approval. The Integrator shall notify the PSC/engineer at least one week in advance of the test date so that the PSC/engineer may be present.

END OF SECTION

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

SECTION 27 10 00 STRUCTURED CABLING SYSTEMS

PART 1 - GENERAL

1.1. SUMMARY

- A. All cable, connectors, outlets, hardware, enclosures, racks, equipment and other equipment as indicated herein and on project drawings and documents, and as required for a complete installation per industry norms, standards and best practices.
- B. Section Includes:
 - 1. Category 6 cabling, termination and testing
 - 2. Racks and cabinet accessories
 - 3. Conduit, Raceway, J-Hooks and other supports

1.2. RELATED SECTIONS:

- 1. 27 05 00 Common Work Results for Communications
- 2. 27 40 00 Audio Systems

1.3. RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 0 & 1 Specification Sections, apply to this Section.

1.4. CODES, STANDARDS AND REFERENCES

- A. The Contractor shall adhere to the latest edition of the following codes, standards, and references. Additionally, the Contractor shall adhere to all other codes, regulation and standards not stated here:
 - 1. As listed in Section 270500
 - 2. Manufacturers Recommendations
 - 3. Best Practices and Industry Norms

1.5. SUBMITTALS

- A. Coordinate with Division 0 & 1.
- B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
 - 1. Cable - Include the following installation data for each type used:
 - a. Nominal OD.
 - b. Minimum bending radius.
 - c. Maximum pulling tension.
- C. Shop Drawings: For communications equipment room fittings. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Wiring diagrams to show typical wiring schematics including the following:
 - a. Patch panels.
 - b. Cross-connects and patch cords
 - 3. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

4. Cross-connects and patch panels: Detail mounting assemblies and show elevations and physical relationship between the installed components.
 - D. Field quality-control reports.
 - E. Maintenance Data: For splices and connectors to include in maintenance manuals.
 - F. Qualification Data: For installer, qualified layout technician, installation supervisor, and field inspector.
- 1.6. QUALITY ASSURANCE
- A. Bidder qualifications:
 1. Work under this section shall be performed by and the equipment shall be provided by the approved telecommunications contractor and key personnel. Qualifications shall be provided for the telecommunications system contractor, the telecommunications system installer, and the supervisor (if different from the installer). A minimum of 30 days prior to installation, submit documentation of the experience of the telecommunications contractor and of the key personnel.
 2. The telecommunications contractor shall be a firm which is regularly and professionally engaged in the business of the applications, installation, and testing of the specified telecommunications systems and equipment. The telecommunications contractor shall demonstrate experience in providing successful telecommunications systems within the past 3 years of similar scope and size. Submit documentation for a minimum of three and a maximum of five successful telecommunication system installations for the telecommunications contractor.
 3. Minimum Manufacturer Qualifications
 - a. Cabling, equipment and hardware manufacturers shall have a minimum of 3 years' experience in the manufacturing, assembly, and factory testing of components which comply with TIA-568, TIA-569, TIA 606 and TIA-607.
 - B. Installer Qualifications
 1. Installers: installation personnel shall be certified by the manufacturer for the installed product.
 2. Installation Supervision: Installation shall be under the direct supervision of ITS Technician or ITS 2 Installer or equivalent certification, who shall be present at all times when Work of this Section is performed at Project site.
 3. Cable Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 4. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - C. Telecommunications Pathways and Spaces: Comply with TIA-569
 - D. Bonding and Grounding: Comply with TIA-607
 - E. Test Plan - Provide a complete and detailed test plan for the telecommunications cabling system including a complete list of test equipment for the components and accessories for each cable type specified, 30 days prior to the proposed test date for

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

approval. Include procedures for certification, validation, and testing. Test plan shall include all test requirements detailed herein at a minimum.

- F. Regulatory Requirements - In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.
- G. Standard Products - Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship unless specific manufacturer and/or part numbers is included herein. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.
- H. Material and Equipment Manufacturing Date - Products manufactured more than 1 year prior to date of delivery to site shall not be used, unless specified otherwise.

1.7. CABLE DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site.
- B. Test optical fiber cable to determine the continuity of the strand end to end. Use optical fiber flashlight or optical loss test set.
- C. Test each pair of UTP backbone cable for open and short circuits.

1.8. PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install cable, equipment frames and cable trays until spaces are enclosed and weather tight, wet work in spaces is complete and dry.

1.9. COORDINATION

- A. Coordinate layout and installation of telecommunications equipment with Owner's telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carrier.
- B. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.
 - 1. Record agreements reached in meetings and distribute them to other participants.
 - 2. Adjust arrangements and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.
 - 3. Adjust arrangements and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

telecommunications, electronic safety and security, and related systems that share space in the equipment room.

4. Coordinate location of power raceways and receptacles with locations of telecommunications equipment requiring electrical power to operate.
5. Coordinate layout and installation of telecommunications pathways and cabling with General Contractor and all associated trades.

1.10. SYSTEM DESCRIPTION

- A. Category 6 UTP, balanced audio cable and associated wiring, terminations and testing as indicated on drawings and herein

1.11. DEFINITIONS AND ABBREVIATIONS

1. Unless otherwise specified or indicated herein, electrical and electronics terms used in this specification shall be as defined in TIA-568, TIA-569, TIA-606 and IEEE 100 and herein.
2. BICSI: Building Industry Consulting Service International.
3. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
4. EMI: Electromagnetic interference.
5. IDC: Insulation displacement connector.
6. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.
7. RCDD: Registered Communications Distribution Designer.
8. Raceways: Metallic conduit and metallic surface mounted wireways
9. TDMM (BICSI): Telecommunications Design Methods Manual
10. UTP: Unshielded twisted pair.
11. LAN: Local area network.
12. PSC – Professional Services Contractor (Convergent Technology Partners)
13. SCS – Structured Cabling System
14. WAO – Work Area Outlet

PART 2 - PRODUCT

- 2.1. Components shall be UL or third party certified. Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations, submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Owner. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard. Provide a complete system of telecommunications cabling and pathway components using star topology. Provide support structures and pathways, complete with outlets, cables, connecting hardware and telecommunications cabinets/racks. Cabling and interconnecting hardware and components for telecommunications systems shall be UL listed or third-party independent testing laboratory certified and shall comply with NFPA 70 and conform to the requirements specified herein.
 - A. Category 6 Plenum Rated UTP Cable: Approved manufacturers

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

1. CommScope
 2. Belden
 3. Panduit
 4. Vertical Cable
 5. Superior Essex
 6. Equivalent
- 2.2. Pathways
- A. General Requirements: Provide telecommunications pathways in accordance with TIA-569 and as specified herein and on project drawings and associated documents. Provide system furniture pathways in accordance with UL 1286.
 - B. Cable Support: NRTL labeled. Cable support brackets shall be designed to prevent degradation of cable performance and pinch points that could damage cable. Comply with NFPA 70 and UL 2043 for fire-resistant and low-smoke-producing characteristics.
 - C. Cable Guides and Fasteners
 1. Provide cable guides specifically manufactured for the purpose of routing cables, wires and patch cords horizontally and vertically on equipment racks and telecommunications backboards (to accommodate cross-connect wiring, etc.).
 2. Cable guides of ring or bracket type devices mounted on rack and backboard for horizontal cable management and individually mounted for vertical cable management. Mount cable guides with screws, nuts and lock washers.
 3. Hook and Loop (I.e. Velcro®) shall be used to fasten cables. Tie-wraps or similar type fasteners shall not be used.

PART 3 - EXECUTION

3.1. WIRING METHODS

- A. Wiring Method: Install cables in raceways and cable trays (if specified) except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, in attics, and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.
- B. Install plenum cable in environmental air spaces, including plenum ceilings.
- C. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.2. INSTALLATION OF PATHWAYS

- A. Comply with requirements for demarcation point, pathways, cabinets, and racks. Drawings indicate general arrangement of pathways and fittings.

3.3. INSTALLATION OF CABLES

- A. Summary
 1. UTP cable shall be run from designated outlet to indicated audio cabinets or telecommunication spaces and terminated on patch panels.
- B. Comply with NECA 1.
- C. General Requirements for Cabling:
 1. Comply with TIA-568.
 2. Comply with BICSI TDMM, "Cable Termination Practices."
 3. Install 110-style IDC termination hardware unless otherwise indicated.

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

4. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
 5. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 6. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
 7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI TDMM, "Cabling Termination Practices". Install lacing bars and distribution spools.
 8. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
 9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
 10. In the telecommunications equipment room, install a 10-foot-long service loop on the end of each optical fiber cable.
 11. Install a 12-inch-long service loop on each horizontal cable at the workstation end.
 12. All Access Points and Camera locations shall be terminated in the ceiling on a 1-port, plenum rated, surface mount box. The cable shall have a 10-foot long service loop coiled and left attached to the ceiling structure.
- D. Pulling Cable: Comply with BICSI TDMM, "Pulling Cable." Monitor cable pull tensions.
1. UTP Cable Installation:
 - a. Comply with TIA-568 and manufacturer's instructions.
 - b. Do not remove more than the minimum of cable jacket required for termination. To maintain cable geometry do not untwist UTP cables more than 1/2 inch from the point of termination.
 2. Open-Cable Installation:
 - a. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
 - b. Suspend UTP cable not in a wire way or pathway a minimum of 8 inches above ceilings by approved cable supports not more than 60 inches apart.
 - c. Approved supports include Category 6 rated J – hooks, saddles etc.
 - d. All cable shall be independently suspended from building structure using rated support components. The use of tie wraps and bridle rings is prohibited
 - e. Cable shall not be supported directly by structural members or in contact with pipes, ducts, or other potentially damaging items.
 - f. Group connecting hardware for cables into separate logical fields.

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

- E. Separation from EMI Sources (Copper UTP and Audio Cabling):
 - 1. Comply with BICSI TDMM and TIA-569 for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
 - 2. Separation between open telecommunications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
 - d. Separation between telecommunications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - e. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
 - f. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
 - g. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
 - h. Separation between telecommunications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - i. Electrical Equipment Rating Less Than 2 kVA: No requirement.
 - j. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
 - k. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
 - l. Separation between Telecommunications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
 - m. Separation between Telecommunications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.4. FIRESTOPPING

- A. Comply with TIA-569, "Firestopping."
- B. Comply with BICSI TDMM, "Firestopping Systems" Article.
- C. Firestop all new and reused or abandoned existing fire partition penetrations to meet or exceed the partitions fire rating.

3.5. GROUNDING

- A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- B. Comply with TIA-607-A.
- C. Bond metallic equipment and cable shield to the grounding bus bar, using not smaller than No. 6 AWG stranded copper equipment grounding conductor.
- D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG stranded copper equipment grounding conductor.

3.6. IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA-606.
- B. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
- C. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

- D. Individually number wiring conductors connected to terminal strips and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.
 - E. Label each unit and field within distribution racks and frames.
 - F. Label all components of the grounding system per TIA – 606 and TIA-607.
 - G. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.
 - H. Cable and Wire Identification:
 - 1. Label each cable within 4 inches (100 mm) of each termination, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
 - 2. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware.
 - 3. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
 - 4. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA-606.
 - 5. Cables use flexible vinyl or polyester that flex as cables are bent.
 - I. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, pathways and cables, termination hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA-606. Furnish electronic record of all drawings, in software and format selected by Owner.
- 3.7. FIELD QUALITY CONTROL
- A. Perform tests and inspections
 - 1. Visually inspect UTP and optical fiber jacket materials for NRTL certification markings. Inspect cabling terminations in telecommunications equipment rooms for compliance with color-coding for pin assignments and inspect cabling connections for compliance with TIA-568.
 - 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 - 3. Test instruments shall meet or exceed applicable requirements in TIA-568 for Category 6 Permanent Link. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)"

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for permanent link test configuration.

4. Horizontal UTP for data shall be tested using the Permanent Link Method.
5. Prepare and submit test and inspection reports for approval within 10 business days of substantial completion.

END OF SECTION

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

SECTION 27 41 00 - AUDIO SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION

- A. Troy Schools desires to purchase and have installed professional grade audio systems in each of the following buildings:
 - 1. Barnard Elementary School - 3601 Forge Troy, MI 48083
 - a. Stage adjacent cafeteria. Gym is separated from cafeteria by retractable partition.
 - 2. Bemis Elementary School - 3571 Northfield Pkwy Troy, MI 48084
 - a. Stage adjacent cafeteria. Gym is separated from cafeteria by retractable partition.
 - 3. Costello Elementary School - 1333 Hamman Troy, MI 48085
 - a. Stage adjacent cafeteria. Gym is a separate space.
 - 4. Hamilton Elementary School - 5625 Northfield Pkwy Troy, MI 48098
 - a. Stage adjacent cafeteria. Gym is separated from cafeteria by retractable partition.
 - 5. Hill Elementary School - 4600 Forsyth Dr Troy, MI 48085
 - a. Stage adjacent cafeteria. Gym is a separate space.
 - 6. Leonard Elementary School - 4401 Tallman Dr Troy, MI 48085
 - a. Stage adjacent cafeteria. Gym is a separate space.
 - 7. Martell Elementary School - 5666 Livernois Troy, MI 48098
 - a. Stage adjacent cafeteria. Gym is a separate space.
 - 8. Morse Elementary School - 475 Cherry Street Troy, MI 48083
 - a. Stage adjacent cafeteria. Gym is a separate space.
 - 9. Schroeder Elementary School - 3541 Jack Drive Troy, MI 48084
 - a. Stage adjacent cafeteria. Gym is a separate space.
 - 10. Troy Union Elementary School - 1340 East Square Lake Rd Troy, MI 48085
 - a. Stage adjacent cafeteria. Gym is a separate space.
 - 11. Wass Elementary School - 2340 Willard Dr Troy, MI 48085
 - a. Stage adjacent cafeteria. Gym is separated from cafeteria by retractable partition.
 - 12. Wattles Elementary School - 3555 Ellenboro Troy, MI 48083
 - a. Stage adjacent cafeteria. Gym is a separate space.

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

- B. Section Includes all equipment, mounting hardware, and other equipment as indicated herein and as required for a complete, 100% turnkey installation per industry norms, standards and best practices.
- C. The product identified herein is intended for use as a basis of design to identify the performance and use of the desired systems while attempting to stay within project budget constraints. Please note that this is only a basis of design and the Owner is expecting proposals to meet their needs using this or other product based on the bidder's experience, knowledge and best practices of the professional audio industry.

1.3 SCOPE OF WORK

- 1. Provide, install and program and commission all audio systems as indicated herein, attachments and on project drawings for complete, 100% turnkey operation.
- 2. Install all equipment connectivity, audio cabling and concealing metallic raceway as required.
- 3. Provide miscellaneous hardware and equipment as required.
- 4. Demo all associated equipment for existing audio systems being replaced, including but not limited to: Racks, cabinets, cabling, speakers, mounts, mixers, amplifiers, unused outlets as required. Blank off existing, unused outlet boxes with blank metal face plates.
- 5. Provide all training and documentation as indicated herein.

1.4 DEFINITIONS

- A. PSC – Professional Services Contractor – Convergent Technology Partners

1.5 QUALITY ASSURANCE

- A. Bidder qualifications: Bidders shall be manufacturer certified resellers of proposed equipment.
- B. All electronic equipment shall be of the latest "build" at the time of award, for hardware, firmware and software.
- C. The contractor shall be a firm which is regularly and professionally engaged in the business of the applications, installation, and testing of the specified technology systems and equipment. The contractor shall demonstrate experience in providing successful systems and equipment within the past 3 years of similar scope and size.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. Regulatory Requirements - In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.
- F. Standard Products - Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship unless specific manufacturer and/or part numbers is included herein.

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

- G. Material and Equipment Manufacturing Date - Products manufactured more than 1 year prior to date of delivery to site shall not be used, unless specified otherwise.

1.6 SITE CONDITIONS

- A. The Owner's Sites are both instructional and administrative facilities that provide year-round services to their students, staff and the community. As such, activities in all buildings are critical to the provisioning of services to the students, staff and the community and shall not be interrupted by the Contractor's Work activities.
- B. All work shall be completed as specified. The successful Bidder shall work closely with and coordinate their installation schedules with the district's building schedules, Construction Manager (if applicable) schedule and any other District contractors.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Contractor shall provide off-site storage unless prior coordination with the district. The Contractor shall deliver to sites as equipment is needed for the installation.
- B. Delivery trucks shall be equipped with an appropriate lift gate, as no buildings have delivery wells or lifts to move materials.
- C. Secure storage of materials is the responsibility of the contractor.

1.8 COORDINATION

- A. Coordinate delivery and setup/installation of equipment at each location with Owner or Owner's representative (PSC).
- B. Coordinate the setup and connection to the Owner's production network with the Owner, including VLANs, IP addresses, etc.

1.9 EXISTING CONDITIONS

- A. Each of the elementary buildings have existing cabinets and mostly unused equipment. There are A/V outlets on walls and floors (see drawings for known locations) that need to be demolished and, in some cases, will reuse the pathway for new cabling. There is some existing equipment that is either new (speakers) or in usable condition that the district desires to keep.
- B. Buildings have either one or two audio cabinets now that will be reused. See drawings for quantity and location per building.
- C. Some cabinets have an existing network cable that is to be reused, but it is up to the bidder to determine the quantity of drops required to be added.

1.10 DESIGN INTENT

- A. Develop standardized instructional and performance building audio systems which will allow for user familiarity when moving between locations (I.e.- moving between Elementary Schools) to allow for easy operation without the need for specialized instruction and efficiencies in maintenance and troubleshooting, support and purchasing.
- B. Standardize systems across grade levels, space type, functionality and operation, using the same platform, equipment and technology to the extent possible.

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

- C. User knowledge/skill level will vary between buildings and types of users. The system shall be capable capturing presets for later recall for typical settings (I.e. – choral performance, assembly, drama performance, IFP only, Bluetooth only, etc.)
- D. The design requires not only physical touch panels, but also the ability to emulate the panel and operate the system from District provided laptops, tablets or computers.

1.11 NETWORK

- A. Each Qsys core has an “A” and a “B” network port.
 - 1. The “A” port shall be used for a new, integrator provided, audio only network.
 - a. This network will be self-contained and will not have any direct connection to the District’s production network. The intent of the “A” network is to provide connectivity between audio devices and keep all multi-cast audio traffic off the District’s production network.
 - 2. The “B” port shall be connected to the District’s production network to provide management and control of the system.

1.12 SYSTEM WIRELESS CONNECTIVITY

- A. Wireless systems (microphones and blue tooth) shall have full connectivity through-out the applicable space(s) with no dead spots in coverage.
- B. Wireless connectivity for audio streaming shall be blue tooth or RF based – IR will not be accepted.
- C. The Contractor shall extend all wireless antennae outside of enclosures, through walls and placed as appropriate for complete wireless coverage within the space, using only factory fabricated cable and associated material intended for this purpose. Cables are to be ordered to the correct length and manufacturer terminated and tested.

1.13 FUNCTIONAL DESCRIPTION OF SYSTEMS

- A. General - Elementary schools have cafeterias and gymnasiums with collocated stages (Either with the gymnasium or the cafeteria). Cafeterias and some gymnasium spaces are separated by divisible curtains. Other buildings have separate gymnasiums. The overall cafeteria/gymnasium/stage area will require the system(s) to operate in multiple modes:
 - 1. Stage and collocated space (cafeteria or gymnasium) as an integrated solution with a single control for all spaces. (Base bid)
 - 2. Stage and collocated space (cafeteria or gymnasium) plus adjacent space (cafeteria or gymnasium) as an integrated solution with a single control for all spaces. (Alternate 2)
 - 3. Gymnasium and Cafeteria combined or as separate systems. (Alternate 3)

1.14 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, 27 05 00 and 27 100 00 Specification Sections, apply to this Section.

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

1.15 SUMMARY

- A. The Owner is requesting proposals for turn-key Audio systems for all elementary schools in the district. Systems shall be able to be local and remotely monitored and managed over the District's data network.
- B. Each system shall be easily upgraded by software, firmware or adding components to the extent feasible. The Owner's intent is for the proposed system to have a building-block design to add spaces, features or functionality in the future with minimal cost.
- C. This project is part of a nine-year bond and as such proposed systems shall have a forecasted lifespan that in nine years from installation it is as up-to-date and viable as at the time of proposal.
- D. Specific equipment manufacturers and models had been included either as base design or as a basis of design, but pre-approved equivalent product may be accepted for basis of design product. See Section 27 41 00.

1.16 SUBMITTALS

- A. Prior to installation, the following will be submitted to the Owner for approval. No installation shall occur without this prior approval.
 - 1. Product Data: For each type of product indicated, showing all performance data, heights, weight, power loads, heat loads, input and output quantity and type, etc.
 - a. For substitutions of basis of design equipment, include a comparison matrix for each substituted equipment showing the similarities and differences between equipment specified herein and proposed equipment.
- B. Shop Drawings: For supports and seismic restraints for control consoles, equipment cabinets and racks, and components. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Rack arrangements
 - 3. Full system diagrams by building and space showing all equipment and material. Include power, signal, and control wiring.
 - a. Identify terminals to facilitate installation, operation, and maintenance.
 - b. Single-line diagram showing interconnection of components.
 - c. Cabling diagram showing cable routing and location and detail of provided raceway.
- C. Qualification Data: For qualified designer, project manager and installer
- D. Field quality-control reports
- E. Operation and Maintenance Data for audio systems

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

1.17 QUALITY ASSURANCE

- A. Designer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NFPA 70.

1.18 COORDINATION

- A. Coordinate layout and installation of system components and suspension systems with other construction that penetrates ceilings or is supported by them, including but not limited to light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.19 COMMUNICATION

- A. The Contractor shall be required to use Owner or PSC provided online tracking software - Smartsheets[®] or other as specified by Owner/PSC.
- B. The Contractor shall provide the required information to create the tracking software sheet (creation by Owner or PSC).
- C. The Contractor shall update progress and status, minimally once week or at other intervals as agreed upon with Owner/PSC. The Owner/PSC designated online software shall be used for communication and coordination with the Owner/PSC.
- D. The Contractor shall also be required to provide written status and progress reports weekly, due prior to Monday 8AM EST. Status reports shall clearly state:
 - 1. Work Completed the following period
 - 2. Work scheduled for the coming period
 - 3. Identified issues that will affect schedule or cost
 - 4. Status of outstanding issues, bulletins, change directives and change orders
 - 5. Schedule deviation (behind, on-time or ahead and amount) and plan for resolving any sliding or lagging schedules

PART 2 - PRODUCTS

2.1 GENERAL

- A. Provide and install all equipment, mounts, hardware, wiring, brackets etc. for fully functional, turnkey and aesthetically and auditory pleasing systems.

2.2 PRODUCT CERTIFICATION

- A. Components shall be UL or third party certified. Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations, submit proof of such compliance. The label or listing by the specified organization will be acceptable

AUDIO SYSTEMS

27 41 00 6 -17

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

evidence of compliance. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Owner. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard. Provide a complete system of telecommunications cabling and pathway components using star topology. Provide support structures and pathways, complete with outlets, cables, connecting hardware and telecommunications cabinets/racks. Cabling and interconnecting hardware and components for telecommunications systems shall be UL listed or third party independent testing laboratory certified, and shall comply with NFPA 70 and conform to the requirements specified herein.

2.3 GENERAL EQUIPMENT AND MATERIAL REQUIREMENTS

- A. Where product is noted as basis of design (BoD), alternate product that meet or exceed the performance of the BoD product may be used.
- B. Compatibility of Components: Coordinate component features to form an integrated system. Match components and interconnections for optimum performance of specified functions.
- C. Equipment: Select equipment for normal operation on input power usually supplied at 110 to 130 V, 60 Hz.

2.4 Equipment Mounting: Where rack or cabinet, or console mounting is indicated, equipment shall be designed to mount in a 19-inch housing complying with TIA/EIA-310-D.

2.5 WALL MOUNT CABINET (ALTERNATE 4 & 6)

- A. Auray Shallow Server Rack Specs - SVRK-4U-S
- B. Approved equivalent

2.6 SYSTEM CORE PROCESSOR

- A. QSC Core 110fv2
 - 1. No substitutions

2.7 AUDIO NETWORK SWITCH

- A. QSC – N10-720++
 - 1. Approved equivalent; must be Q-Lan certified

2.8 7" WALL MOUNTED TOUCH PANEL

- A. QSC TSC-70-G3
 - 1. No substitutions

2.9 NETWORK AUDIO I/O EXPANDERS FOR Q-SYS

- A. QSC QIO series
 - 1. No substitutions

2.10 A/V BRIDGE

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

- A. QSC IO-USB Bridge
- 2.11 EQUIPMENT CABINETS
 - A. Reuse existing OFE cabinets. Demolition of all unused material or equipment is by the Contractor.
- 2.12 SPEAKERS – WALL MOUNTED
 - A. Basis of Design: QSC ADS8T (Black)
 - B. Configuration - Passive 2-Way
 - C. Recommended amplifier power - 400 W RMS
 - D. System Impedance - 8 Ohms (Nominal)
 - E. Drivers
 - 1. HF transducer - 1" exit / 1.4" voice-coil compression driver
 - 2. LF transducer - 8 in weather resistant paper cone woofer, 2 in / 51 mm voice-coil
 - F. Performance
 - 1. Frequency Range - 55 Hz to 20 kHz
 - 2. Broad-band sensitivity³ - 90 dB
 - 3. Maximum continuous SPL - 113 dB
 - 4. Maximum peak SPL - 119 dB
 - 5. Coverage Angle - 105° H x 85° V
 - 6. Speaker Sensitivity - 90 dB
 - G. Connectivity
 - 1. Audio I/O 2 x speakON NL4
 - 2. 1 x Barrier Strip
- 2.13 SPEAKER – STAGE MONITOR
 - A. Basis of Design: Behringer Eurolive F1320D
 - 1. Output Power
 - a. Low-Frequency Range - RMS @ 1% THD: 160 W @ 8 Ω, Peak Power: 225 W @ 8 Ω
 - b. High-Frequency Range - RMS @ 1% THD: 40 W @ 8 Ω, Peak Power: 72 W @ 8 Ω
 - 2. Mic/Line Inputs
 - a. XLR Connector
 - b. Sensitivity: -50 dBu to 0 dBu
 - c. Impedance: 20 kΩ balanced, 30 kΩ unbalanced
 - d. ¼" TRS Connector

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

- e. Sensitivity: -50 dBu to 0 dBu
 - f. Impedance: 20 k Ω balanced, 30 k Ω unbalanced
 - 3. Link Output
 - a. XLR connector
 - 4. Equalizer
 - a. High - 12 kHz / \pm 15 dB
 - b. Mid - 2.5 kHz / \pm 15 dB
 - c. Low - 80 Hz / \pm 15 dB
 - 5. Feedback Filter
 - a. Filter frequency - 300 Hz to 6 kHz
 - b. Level reduction - max. 15 dB
 - 6. Loudspeaker System Data
 - a. Frequency range
 - b. 60 Hz to 16 kHz (-10 dB)
 - 7. Maximum sound pressure level
 - a. 115 dB / 118 dB (half space) @ 1 m
 - 8. Power consumption
 - a. max. 300 Watts
- 2.14 BLUE TOOTH RECEIVER
- A. Technical Specifications/Performance
 - 1. Bluetooth Version - Bluetooth v5.0
 - 2. Supported Codecs - aptx HD, aptx LL, aptx, AAC, SBC
 - 3. Bluetooth Range - 30 meters, 100 feet
 - 4. Input - Bluetooth
 - 5. Outputs - Stereo Analog RCA & Digital Optical
 - 6. Input Power - 5V, 200mA
 - 7. Output Voltage - 2.1 Volts RMS
 - 8. Output Impedance - 57 Ohms
 - 9. D/A Converter - PCM5102A
 - 10. Frequency Response - 10Hz - 20kHz (+/- 0.5dB)
 - 11. Signal to Noise Ratio - 112dB

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

12. Total Harmonic Distortion - -93dB
13. PCM Support - 384kHz / 32bit
- 2.15 HDMI AUDIO DECODER
 - A. Visionary Solutions E4100
 1. No substitutions
- 2.16 RACK MOUNTED AMPLIFIERS
 - A. Q-Sys CX-Q series
 1. No substitutions
- 2.17 MICROPHONES
 - A. Approved Product
 1. Shure
 2. Samsung
 3. Sennheiser
 4. Behringer
 5. AKG
 - B. Hanging "Choir" Microphones
 1. The microphone shall be a fixed-charge condenser designed for permanent installation. It shall have a cardioid polar pattern with a uniform 120° angle of acceptance and a minimum frequency response of 70 Hz to 16,000 Hz. The microphone shall operate from an external 9V to 52V DC phantom power source. It shall be capable of handling sound input levels up to 134 dB with a dynamic range of 106 dB. Nominal open-circuit output voltage shall be 14.1 mV at 1V, 1 Pascal. Output shall be low impedance balanced (100 ohms).
 2. The microphone shall incorporate self-contained electronics, eliminating the need for an external power module.
 3. The microphone shall have a 7.6 m (25') permanently attached miniature cable with a 3-pin XLRM-type connector for direct connection to a mating XLRF-type jack or cable connector. An adjustable steel wire hanger shall be provided for suspended installations. The steel wire hanger shall attach to the microphone body and allow for the positioning of the microphone without the need for tools. A foam windscreen shall also be included. The microphone shall be a hanging design. The microphone, cable and steel hanger shall be black.
 - C. Wireless Microphones
 - a. Basis of Design: AKG WMS470
 - b. SR470 Receiver

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

- c. PT470 Wireless body-pack transmitter with CK99 lavalier microphone
- d. HT470 D5 Hand-held microphone
- e. HR6 Ni-MH Lithium rechargeable battery (qty required, per each device)
- f. AKG CU400 Charger
- g. SRA 2-B/W Directional antenna and associated cabling/wiring
- h. PS 4000 Power supply/splitter

2.18 LIVE STREAMING CAMERA

- A. Basis of design: QSC NC-20x60
- B. Approved Manufacturers
 - 1. QSC
 - 2. Vaddio
 - 3. Approved equivalent; must be Q-Lan certified

2.19 CONDUCTORS AND CABLES

- A. Jacketed, twisted pair and twisted multi-pair, un-tinned solid copper, plenum rated when in ceilings. Size as required.
- B. Factory fabricated antenna extension.
- C. Factory fabricated 50' Microphone (XLR) cables for each wired microphone.
- D. XLR, XLRM, ¼", 3.5mm, RCA or other equipment inter-connectivity cabling – length as required.
- E. Provide and install all others as needed for complete, fully connected and functional system

2.20 Metallic raceway and accessories:

- A. Legrand/Wiremold 500/700 series
- B. Accessories as needed to properly route and conceal cable: corners, Ts, drop ceiling grid adapters, etc.

2.21 WARRANTY

- A. Provide a minimum 2-year manufacturer warranty on all electronic or electrical equipment. The warranty shall commence upon final acceptance by the Owner. The warranty shall include labor and material to replace all components that fails or do not comply with the performance specifications.
- B. Provide a minimum 1-year manufacturer warranty on all other material. The warranty shall commence upon final acceptance by the Owner. The warranty shall include labor and material to replace all components that fails or do not comply with the performance specifications.
- C. Provide a minimum 2-year integrator warranty on all other materials and workmanship.

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

PART 3 - EXECUTION

3.1 GENERAL

- A. Provide and install audio systems and cables per requirements herein.
- B. This work shall be performed in accordance with acknowledged industry standards and professional best practices.
- C. Provide all necessary interconnecting and equipment cords for all equipment and microphones for full functionality to meet the intent of these specifications as indicated herein.
- D. Provide as part of the close-out documentation, a spreadsheet showing the list of serial numbers of the devices and the specific location where it was placed into service.

3.2 PREPARATION

- A. Prior to start of installation, the Contractor shall review associated project drawings and the site (at the appropriate time in construction) to field verify placement of speakers, cabinets, etc. for optimal performance and coordination with other trades in ceiling spaces. All revisions or modifications required shall be conveyed to the Owner for approval. Any additional work shall be at no cost to the owner.

3.3 DEMOLITION

- A. Remove all existing equipment including speakers, wiring, and associated hardware and materials replaced by the new system or as indicated herein or on project documents. Deliver all equipment to a central site within the District or dispose of as agreed to with the Owner/PSC. Unused wiring and cabling shall be completely removed in accordance with NFPA 70. Properly dispose of all wiring and material offsite.

3.4 WIRING METHODS

- A. Provide all new cable or wiring for equipment connectivity. Provide new Category 6 UTP cabling for all Qsys connections.
 - 1. I.e.- All fixed display or projector locations.
- B. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters, and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces in PVC latch duct or equal.
 - 1. Install plenum cable in environmental air spaces, including plenum ceilings.
 - 2. Metallic raceway to be sized to be at no more than 50% full at end of installation.
 - 3. Provide and install raceway accessory fittings to completely and correctly conceal cabling, use ceiling grid adapters for drop/lay in ceiling tile locations. Do not cut ceiling grid.
- C. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

- D. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.5 INSTALLATION OF CABLES

- A. Comply with NECA 1.

- B. General Cable Installation Requirements:

1. Terminate conductors; no cable shall contain un-terminated elements. Make terminations only at outlets and terminals.
2. Splices, Taps, and Terminations: Arrange on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Cables may not be spliced.
3. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals. User only existing low voltage pathway or establish new pathway. Do not secure or attach to, lay on or support by other systems, hangers or equipment.
4. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
5. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points UNO. Remove and discard cable if damaged during installation and replace it with new cable.
6. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used.

- C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend speaker cable not in a wire way or pathway a minimum of 8 inches above ceiling by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or be in contact with pipes, ducts, or other potentially damaging items.

- D. Separation of Wires: Separate speaker-microphone, line-level, speaker-level, and power wiring runs. Install in separate raceways or, where exposed or in same enclosure, separate conductors at least 12 inches apart for speaker microphones and adjacent parallel power and telephone wiring. Separate other intercommunication equipment conductors as recommended by equipment manufacturer.

3.6 EQUIPMENT INSTALLATION

- A. Match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

- B. Identification of Conductors and Cables: Color-code conductors and apply wire and cable marking tape to designate wires and cables so they identify media in coordination with system wiring diagrams.
 - C. Equipment Cabinets and Racks:
 - a. Remove and dispose of all unused equipment and materials in existing equipment cabinets.
 - 2. Group items of same function together, either vertically or side by side, and arrange controls symmetrically.
 - 3. Arrange all inputs, outputs, interconnections, and test points so they are accessible at rear of rack for maintenance and testing, with each item removable from rack without disturbing other items or connections.
 - 4. Blank Panels: Cover empty space in equipment racks so entire front of rack is occupied by panels.
 - D. Speakers:
 - 1. Mount speakers at appropriate height for optimal audio quality and distribution. Use mounting methods that provide mounting strength of 150% of the mounted, full loaded equipment. Follow manufacturer recommended mounting practices and equipment.
 - a. If it is determined that a structure is insufficient to handle the weight of the speaker, then this must be brought to the attention of the Owner and the PSC for resolution and location.
 - 2. Stage monitors shall be connected via XLR or XLRM connectorized cable, to fixed locations as indicated on drawings. Cable shall be long enough to place the monitor at any point across the front of the stage.
 - a. Provide means to coil and secure monitor cable when not in use.
 - E. Metallic raceway: Install anchors at a minimum of every 24", and a minimum of two (2) anchors in sections shorter than 24". In no circumstances will double sided tape be used.
 - F. Wall-Mounted Outlets: Surface mounted with back box, faceplate and concealing raceway for routing of cable.
 - G. Conductor Sizing: Unless otherwise indicated or required, size speaker circuit conductors from racks to loudspeaker outlets not smaller than No. 18 AWG and conductors from microphone receptacles to amplifiers not smaller than No. 22 AWG.
 - H. Securely fasten wireless transmitters to ceiling mounted projectors and IFPs, ensuring proper connectivity to equipment and antenna orientation for proper transmission to receivers in cabinets.
- 3.7 GROUNDING
- A. Ground cable shields and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

- B. Signal Ground Terminal: Locate at main equipment cabinet. Isolate from power system and equipment grounding.

3.8 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

- B. Tests and Inspections:

1. Schedule tests with at least seven days' advance notice of test performance.
2. Operational Test: Perform tests that include originating program and page messages at microphone outlets, preamplifier program inputs, and other inputs. Verify proper routing and volume levels and that system is free of noise and distortion.
3. Signal-to-Noise Ratio Test: Measure signal-to-noise ratio of complete system at normal gain settings as follows:
 - a. Disconnect microphone at connector or jack closest to it and replace it in the circuit with a signal generator using a 1000-Hz signal. Replace all other microphones at corresponding connectors with dummy loads, each equal in impedance to microphone it replaces. Measure signal-to-noise ratio.
 - b. Repeat test for each separately controlled zone of loudspeakers
 - c. Minimum acceptance ratio is 50 dB
4. Acoustic Coverage Test: Feed pink noise into system using octaves centered at 500 and 4000 Hz. Use sound-level meter with octave-band filters to measure level at five locations in each zone. For spaces with seated audiences, maximum permissible variation in level is plus or minus 2 dB. In addition, the levels between locations in same zone and between locations in adjacent zones must not vary more than plus or minus 3 dB.
5. Power Output Test: Measure electrical power output of each power amplifier at normal gain settings of 50, 1000, and 12,000 Hz. Maximum variation in power output at these frequencies must not exceed plus or minus 1 dB.

- C. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.

- D. Prepare test and inspection reports.

3.9 CLEAN UP, PROTECTION AND RESTORATION

- A. Prior to final acceptance, clean system components.
- B. Provide adequate protection to new equipment in construction areas and Owner facilities to protect from damage.
- C. All spaces associated with this work shall be left clean at the end of each day's work, and at the end of the project. Trash, boxes, packing material, debris and litter shall be removed daily and disposed of.

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

1. Large quantities (I.e.- equipment boxes and packing material) shall be disposed of off-site.
 - D. Restoration of, or compensation for, damage to the facility or Owner's contents by the contractor is the contractor's sole responsibility. Examples include other systems, cabling, paint, wall and ceiling damage.
 - E. Coordinate restoration with the Owner any areas that are required due to removal of existing equipment. Such restoration will be the responsibility of the Owner.
- 3.10 DEMOLITION
- A. Completely remove all components and wiring for systems being replaced including speakers.
 - B. Coordinate with District which equipment is to be returned to the district or to be disposed of offsite by the contractor.
- 3.11 ADJUSTMENTS
- A. On-Site Assistance: Engage a factory-authorized service representative to provide on-site assistance in adjusting sound levels, resetting transformer taps, and adjusting controls to meet occupancy conditions.
 - B. Occupancy Adjustments: When requested within six months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions.
- 3.12 DEMONSTRATION
- A. Demonstrate to the Owner's/PSC's satisfaction all equipment, components, features, functionality and operation, of each installed system for Owner and PSC acceptance.
 - B. Correct all deficiencies and re-demonstrate for acceptance at no additional cost to the Owner.
- 3.13 TRAINING
- A. Schedule training with Owner through the PSC, with at least seven (7) days advance notice
 - B. Train Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventative maintenance of the system. Operators Manuals and Users Guides shall be provided at the time of this training.
 - C. All training, user and technical, shall have a written agenda and written course information and guides for handout to attendees.
 1. This material must be pre-submitted to the PSC for approval prior to holding the training.
 2. Provide simple "quick start" instruction cards (laminated) to be left with each system (inside fixed cabinets and attached to portable systems in a method that allows easy removal by users) for typical operation.
 - D. All training must contain a trainee hands-on portion on each associated type of live system.
 - E. The contractor shall supply up to 4 hours of onsite user training per building. User training shall consist of operation of all system functions and basic troubleshooting.

TROY SCHOOL DISTRICT
ELEMENTARY SCHOOLS AUDIO SYSTEMS

- F. The contractor shall supply up to 4 hours of technical training for District Technology staff per building to cover each system type within that building for routine administration, maintenance and troubleshooting

3.14 CLOSEOUT DOCUMENTATION

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings are shown and coordinated with each other, using input from installers of the items involved.
- B. Final “As-built” Shop Drawings: For supports, equipment cabinets and racks, and components. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Rack arrangements
 - 3. Wiring Diagrams: For power, signal, and control wiring
 - a. Identify terminals to facilitate installation, operation, and maintenance
 - b. Single-line diagram showing interconnection of components
 - c. Cabling diagram showing cable routing
- C. Field quality-control reports
- D. Operation and Maintenance Data: For all systems to include in emergency, operation, and maintenance manuals
- E. Warranty: Submit warranty documents specified

END OF SECTION 27 41 00