MARION COUNTY BOARD OF EDUCATION
204 BETSY PACK DR
JASPER, TENNESSEE 37347
423-942-3434

January 25, 2023

NOTICE TO PROSPECTIVE VENDORS

You have been identified as a low voltage vendor and we wish to invite you to bid with us.

Please refer to the information below Low Voltage BID 2023. If you have specific questions please submit them to Mike Ogden and mogden@mctns.net.

1. BID NUMBER	**2023-10**
2. ITEM/SERVICE AND LOCATION OF BID	**LOW VOLTAGE** **JASPER MIDDLE SCHOOL**
3. BID RECEIPT/OPENING DATE & TIME	**Wednesday, March 15, 2023 AT 9 A.M., CST. AT THE MARION COUNTY BOARD OF EDUCATION, 204 BETSY PACK DR JASPER, TN 37347**

MARION COUNTY BOARD OF EDUCATION

204 BETSY PACK DR
JASPER, TN 37347
423-942-3434

REQUEST FOR BIDS

Vendor Name: _____

Vendor Contact: _____

Address: _____

City/State/Zip: _____

Telephone ( )_____Fax: ( )_____

GENERAL TERMS AND CONDITIONS

1. Responding to bid number: **2023-10**

2. Date of solicitation: **January 26,2023**

3. Bid receipt/opening date and time: **March 15, 2023 AT 9 A.M., CST**
Sealed Bids MUST be received by Marion County Schools at the address above by the receipt date listed above.
***** WORK TO BE COMPLETED IN CONJUNCTION WITH GENERAL CONTRACTOR , NO LATER THAN March, 2024*****

4. **Bid Format: SEALED BIDS ONLY**. Faxed bids **are not** acceptable. BIDS MUST BE CLEARLY MARKED WITH THE ABOVE NUMBER, DESCRIPTION, AND OPENING DATE. Bidder **MUST** use the enclosed bid envelope cover sheet on the outside of the bid envelope to include license number, expiration date and classification. Marion County Board of Education is not responsible for the confidentiality of bids inadvertently opened during mailing or receipt thereof. Unsealed Bids will not be accepted. Any bid received after receipt date and time indicated above will not be considered.

5. **BID OPENING:** Bids will be opened publicly and read aloud in the office of the Marion County Board of Education, 204 Betsy Pack Dr, Jasper, TN 37347, on the opening date and time indicated above. Responses received after the receipt deadline indicated above will not be considered.

6. Time is of the essence for this bid. Price and quality of equipment is essential; however, availability of product and ability to perform on schedule will be heavily weighted in the award process. Prospective contractors who are authorized, licensed and capable are requested to submit bids to provide these needed products and/or services for the Marion County Board of Education.

7. It shall be the responsibility of the bidder to submit a bid response which complies with: (A) the conditions and specifications of the Request for Bid; (B) policies and procedures of the

Marion County Board of Education and applicable laws of the State of Tennessee; and (C) any other applicable laws, regulations and requirements. You should include any related literature or material.

8. The use of the name of a manufacturer or any special brand, model or make in describing an item or the use of detailed descriptive specifications pertinent thereto, does not restrict bidders to that manufacturer or specific article or such detailed descriptive specifications; this means or method being used simply to indicate the character, or quality of the article desired; but the article on which bids are submitted must be of such character, quality and design as will serve the purpose for which it is to be used equally as well as that specified; must be the equal of the article described and equally suitable to the needs of the County Board of Education. If bidding on other than the make, model, or brand specified or such detailed descriptive specifications, the manufacturer's name and catalog reference, together with specifications therefore must be given or other information given (CLEARLY STATED ON THE BID SHEET IN EVERY INSTANCE) to enable the Marion County Board of Education to determine its suitability, or otherwise. The Marion County Board of Education reserves the right to be the sole judge in such determinations. WHEN NO REFERENCE IS MADE BY THE BIDDER TO THE MAKE OR GRADE PROPOSED TO BE FURNISHED IT IS UNDERSTOOD THAT THE SPECIFIC ARTICLE NAMED IN THE BID SHEET WILL BE FURNISHED. The bid will be automatically rejected for noncompliance if deviations are not properly noted and signed. THIS PROVISION DOES NOT, HOWEVER, GUARANTEE ACCEPTANCE, ONLY CONSIDERATION.

9. If quantities are provided, they are approximations and may be estimates of annual usage, not initial purchase quantity. Quantities provided are best estimates of anticipated order quantities, however, the Marion County Board of Education cannot guarantee fulfillment of annual usage estimates. Actual quantities are to be determined before order is placed. The Marion County Board of Education reserves the right to increase or decrease quantities to be purchased over the life of this agreement, and to reject any and/or all Bids or any part of any Bid, or to accept other than the Bid with the lowest cost, meeting all specifications.

10. The Marion County Board of Education reserves the right to not only negotiate price but also final terms, shipping or installation in some cases, conditions and scope with low bid. Bids are to be valid for a minimum of 90 days and payment will be made within forty-five (45) days of the date vendor billing is received and signed by the authorized Marion County Board of Education representative.

11. Any Bid submitted should be for the total cost to the Marion County Board of Education.

12. Evaluation and award of Bids will be made to one bidder which will meet the requirements of the Marion County Board of Education. Items may be awarded to the lowest bid(s) or best overall bid, and Marion County Schools reserves the right to award this bid on quality, price andavailability/delivery of product specified, whichever is in the best interest of Marion County Schools. Marion County Schools reserves the right to award bid(s) to multiple bidders at its sole discretion and to group items together that are similar in nature. It is also possible that awards may be granted on a line by line basis.

13. Any questions concerning the Bid package should be directed to Mike Ogden at mogden@mctns.net.

14. Director of Finance will coordinate with successful contractor after award of Bid.

15. The undersigned hereby declares that the only person, or persons, interested in this Bid as principal, or principals, is/are named herein. This Bid is in all respects fair and in good faith without collusion or fraud.

16. The undersigned, having familiarized himself with the local conditions affecting the cost of thework and with all requirements of the Bid Documents and services required to complete the work directed by the documents for the referenced project for the following amount.

17. The Marion County Board of Education is a tax exempt organization. It is the bidder's responsibility to comply with all local, state and federal laws, regulations, codes, licensing, andother requirements. The bidder must be prepared to substantiate compliance upon request by the Board's representative.

18. The language of this Request for Bids shall be binding unless mutually amended by the Marion County Board of Education and the bidder. It is understood that a contract is not formal between the successful bidder and the Marion County Board of Education until such time as a purchase order is issued by the Marion County Board of Education, and issuance of the purchase order will be the award notice. The terms and conditions of this Request for Bids anddetailed purchase order shall constitute the entire agreement. All bids are ultimately subject to funding.

GENERAL REQUIREMENTS OF VENDORS

1. The successful bidder will furnish a certificate of Worker's Compensation Insurance in compliance with the laws of the State of Tennessee. The bidder must have a general public liability insurance policy at or exceeding the following limits:

   a. $1,000,000 per person bodily injury
   b. $1,000,000 per occurrence bodily injury
   c. $1,000,000 per occurrence property damage

2. Amendments to the Tennessee Code Annotated Section 49-5-413 require employers doing business with the Marion County Board of Education to have their employees' criminal historyrecords checked. No employer or employee shall come in direct contact with school children, children in a childcare program, and/or enter the grounds of a school or childcare center operated by the Marion County Board of Education when children are present without this compliance letter on file.

3. The bidder must demonstrate to the satisfaction of the Marion County Board of Education thathis/her firm is capable of completing the work specified, has all equipment necessary for completion of the work, and has satisfactorily completed similar projects. All subcontractors will be subject to approval of the Marion County Board of Education.

4. Bids must be submitted on the required forms. All prices must be stated in the appropriateblanks. The bid form must be signed and completed. Bids must be enclosed in a sealed envelope and clearly marked **"BID – 2023-10".**

5. Bidders must thoroughly inform themselves of the requirements of the specifications, special conditions, and any other relative documents and be prepared to comply with all.

6. All Bids offered must be valid for ninety (180) days after the advertised bid opening date.

7. The vendor shall be responsible for any loss or damage of or to any materials of work either delivered or completed at the site until such time as the project is fully completed.

8. The vendor will repair or replace any defects or faults that may occur either in materials or construction during the progress of the work at no additional expense to the Marion County Board of Education.

9. The vendor shall agree to indemnify and save harmless the Marion County Board of Educationagainst all claims, demands, suits, damages or sums of money to any party accruing from the Marion County Board of Education for loss of life, personal injury or property loss and/or damage which may be caused by reason of any defect, fault, actions of the vendor or his employees during the progress of the work.

10. Bidders should verify all mechanical systems in the field prior to bidding. Specifications arenot intended to be comprehensive or exact. The successful bidder shall be responsible for completion of the intent of the specifications including any minor variation which may be encountered in the field.

11. Any material that is the Marion County Board of Education's property must remain on the premises of property belonging to the Marion County Board of Education.

12. The vendor shall remove all rubbish, debris and other visible, objectionable material from thesite prior to completion of the project. These materials may be disposed of at the appropriate landfill or at any other legal location that the vendor can procure.

13. The work of this project shall not be conducted in such manner as to create any nuisance, or soas to violate any of the ordinances of Marion County and the State of Tennessee.

14. If, at any time during each 12 month term, an awarded vendor refuses or fails to pursue and/or perform the work with diligence as will insure its completion within the time limit specified inthis contract, the Marion County Board of Education, by written notice to that same contractor,may terminate the contractor's right to proceed with the work and the opportunity will be awarded to the next best bidder.

15. In the case of default by the vendor, the vendor shall be liable for any and all increases in cost which may occur from the Marion County Board of Education procuring satisfactory completion of the project from any other available sources.

16. The vendor shall be responsible for any and all damages to the equipment or facilities during the accomplishment of the work specified.

GENERAL DESCRIPTION OF PRODUCT AND SERVICE

Table of Contents

SECTION 1 – DATA WIRING AND RACKS

Section1 - Data Wiring and Racks							
Item #	Estimated Quantity	Hardware Required	Installation Required	Item Description	Manufacturer	Warranty	Notes
1	150	Yes	Yes	Data Drops- This will include voice, data, cctv, access controls, paging, clocks, displays, access points, all systems backbone cabling, including fiber, multipair and copper	Not Specified	3Years	See Area A for locations and Area A special instructions. 10g fiber connecting IDF's to MDF. SFP
2	140	Yes	Yes	Data Drops- This will include voice, data, cctv, access controls, paging, clocks, displays, access points, all systems backbone cabling, including fiber, multipair and copper	Not Specified	3Years	See Area B for locations and Area B special instructions
3	140	Yes	Yes	Data Drops- This will include voice, data, cctv, access controls, paging, clocks, displays, access points, all systems backbone cabling, including fiber, multipair and copper	Not Specified	3Years	See Area C for locations and Area C special instructions
4	100	Yes	Yes	Data Drops- This will include voice, data, cctv, access controls, paging, clocks, displays, access points, all systems backbone cabling, including fiber, multipair and copper	Not Specified	3Years	See Area D for locations and Area D special instructions

5	50	Yes	Yes	Data Drops- This will include voice, data, cctv, access controls, paging, clocks, displays, access points, all systems backbone cabling, including fiber, multipair and copper	Not Specified	3Years	See AreaE for locations and AreaAE special instructions
6	5	Yes	Yes	Server Racks - 6ft 2-Post Rack	Not Specified	3Years	2 Racks in MDF, 1 Rack per IDF

Data Wiring Submittals

1. A material list must be provided with the quantity of each piece of equipment, names of manufacturers, model numbers and the technical data information on all equipment the contractor proposes to install. This material list shall be broken out and listed by Specification Section, per piece of equipment. If a piece of equipment is needed but not listed in this specification section, it shall be listed in the area of the submittal it pertains to. The technical information shall be a piece of the manufacturer's printed literature that is produced by the equipment manufacturer. Internet web page listings will not be accepted. Provide a description of any special installation procedures that will differ from what is specified or shown on drawings.
2. Complete system circuit diagrams of the entire system must be provided. Drawings are required to clearly illustrate how all components relate to each other and how they interconnect to each other. A complete point to point wiring diagram of any and all panels and how they interconnect will be provided with all the components and or devices that are part of the system. All cables run shall be shown on the shop drawing submittals. Cable tags show on the shop drawing submittals shall correspond with cable tags that are located inside equipment enclosures as well as documented on the as-built drawing. The shop drawing submittals shall include scaled drawings of all racks,panels, consoles and special assemblies. The shop drawing shall include all circuit numbers of all cables and terminal connections as well as how they are labeled. Each drawing shall have a descriptive title and all subparts of each drawing shall be completely described.
3. A letter or certificate from the manufacturer stating that the system contractor is an authorized distributor and installer of the submitted equipment shall be supplied.

4. Submittals shall be broken down by area. Data Wiring and Racks, Door Access Control System, Intercom Paging with Digital Clocks, Cameras, Auditorium and Gym A/V

SECTION 2 – INFRASTRUCTURE STANDARDS

SECTION 2 01 00 - REFERENCE STANDARDS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Telecommunications systems shall be provided as indicated on drawings and as called for hereinafter.

1.2 REFERENCE STANDARDS

A. Jasper Middle School standards

B. BICSI TDMM current edition (Telecommunications Distribution Methods Manual).

C. ANSI/NECA/BICSCI-568, Standard for Installing Commercial Building Telecommunications Cable current edition.

D. ANSI/TIA 569, Pathways and Spaces current edition.

E. ANSI/TIA 606, Addendum 1, Administration Standard for Commercial Telecommunications Infrastructure current edition.

F. ANSI/TIA J-STD-607, Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications current edition.

G. ANSI/TIA 758, Customer owned Outside Plant Telecommunications Cabling Standard current edition.

H. ANSI/TIA-526, 7&14, Telecommunications Measurements of Optical Fiber Single and Multi-Mode Power Loss current edition.

I. ANSI/TIA Building Automation Systems Cabling Standard for Commercial Buildings

J. ANSI/TIA 310-D, Cabinets, Racks, Panels, and Associated Equipment current edition.

K. FCC Part 68, Connection of Terminal Equipment to the Telephone Network.

L. ADA of 2010 and Telecommunications Act of 1996, Physically Impaired and Accessibility current edition.

M. IEEE 802-2002, Standard for Local and Metropolitan Networks: Overview and Architecture.

N. IEEE 802.11ax Wireless LAN's

O. NFPA 70, National Electrical Code.

P. NFPA-76, Recommended Practice for Fire Protection of Telecommunications Facilities.

Q. NFPA 101, Life Safety Code.

R. ETA Electronic Technician Association Fiber Optics Installer

S. FOA Fiber Optics Association Certified Fiber Optics Technician

T. ANSI/SCTE 77 Underground Enclosure Integrity

U. Current edition shall be used on all referenced standards. It is the installer's responsibility to know and follow the current edition of all standards and codes.

PART 2 - PRODUCTS AND INSTALLATION

A. Products

1. All products shall be manufactured by an ISO 9001 Certified Manufacturer and be fully compliant with ISO/IEC/DIS-11801 standard and meet FCC specifications where applicable. These products shall also be UL® certified, where applicable.

B. Certified Contractors Requirements

1. Jasper Middle School requires the use of certified contractors, who have been trained on the latest networking standards and installation practices, and have made a commitment to use quality copper, fiber, and AV products representing the latest in structured cabling technologies. This is to ensure proper installation, compliance to TIA and ISO Cabling, and allows for easier, less costly moves, adds and changes.

2. Selected structured cabling contractor is to be:
   a. BICSI Certified
   b. Product Certified by Manufacture
   c. Minimum of one Registered Communications Distribution Designer (RCDD) or LAN Specialist on staff
   d. Training and certifications are kept current to ensure they are installing the cable infrastructure with the latest tools and materials and adhering to any and all applicable electrical codes installation standards.

3. Warranty
   a. Jasper Middle School requires all installations to have a Hubbell Mission Critical 25-year warranty.
   b. This warranty shall include all types of telecommunications services such as Power over Ethernet (PoE), Voice over IP (VoIP), LAN Security Cameras, Wireless LAN, Fiber applications, and any future services that meet CAT6A, 6 and 5E ANSI/TIA/EIA and or IEEE specifications.

PART 3 - EXECUTION - COMMUNICATIONS FLOW

A. Inspections and Walkthrus

1. All work is subject to inspection and approval at any time by designated Jasper Middle School personnel.
2. All rough in work shall be inspected and approved by Jasper Middle School project personnel.
3. The preliminary documentation will be made available for review during walk through inspections.
4. Cables with visible defects and deformations such as, kinks, twists or crushed will need to be replaced regardless of test results.
5. Installer must take reasonable steps to protect their installation in a construction environment (free of dirt, defects and debris).
6. Final walk through inspections must be done prior to turning in final documentation and test results.

END OF SECTION 2 01 00

Section 2 05 26 Telecommunications Grounding & Bonding

PART 1: GENERAL

1.1 SCOPE OF WORK

A. Work covered by this Section shall consist of furnishing labor, equipment, supplies, materials, tools, and testing unless otherwise specified, and in performing the following operations recognized as necessary for the installation, termination, and labeling of grounding and bonding infrastructure as described on the Drawings and/or required by these specifications.

1.2 REFERENCE

A.	IEEE C2-2007	National Electrical Safely Code
B.	ANSI/TIA-607-B-2011	Commercial Building Grounding and Bonding Requirements for . Telecommunications
C.	NFPA 70™-2011	National Electrical Code
D.	NFPA 70E*-2004	Standard for Electrical Safely in the Workplace
E.	ANSI/NECA/BICSI-607-2011	Telecommunications Bonding and Grounding Planning and Installation . Methods for Commercial Buildings
F.	UL 467	Standard for Grounding and Bonding Equipment

G. See SECTION2.01.00 Reference Standards

H. See SECTION2.05.53 Administration/Labeling

I. See SECTION2.05.29 Hangers and supports

1.3 QUALIFICATIONS

A. Products specified in this Section shall be manufactured by a company with a minimum of three years' documented experience specializing in manufacturing such products.

1.4 DEFINITIONS

A. **Backbone:** A facility (e.g. pathway, cable or conductors) between telecommunications rooms, or floor distribution terminals, the entrance facilities, and the equipment rooms within or between buildings.

B. **Bonding:** The permanent joining of metallic parts to form an electrically conductive path that will assure electrical continuity and the capacity to conduct safely any current likely to be imposed.

C. **Common Bonding Network (CBN)**: The principal means for effecting bonding and grounding inside a telecommunication building. It is the set of metallic components that are intentionally or incidentally

interconnected to form the principal bonding network (BN) in a building. These components includestructural steel or reinforcing rods, plumbing, alternating current (ac) power conduit, ac equipment grounding conductors (ACEGs), cable racks, and bonding conductors. The CBN always has a mesh topology and is connected to the grounding electrode system.

D. **EMI (Electromagnetic Interference) -** The interference in signal transmission or reception resulting from the radiation of electrical or magnetic fields.

E. **Entrance Facility (telecommunications):** An entrance to a building for both public and private network service cables (including antennae) including the entrance point at the building wall and continuing to the entrance room or space.

F. **Equipment Room (telecommunications):** An centralized space for telecommunications equipment that serves the occupants of the building. An equipment room is considered distinct from a telecommunications room because of the nature or complexity of the equipment.

G. **Exothermic Weld:** A method of permanently bonding two metals together by a controlled heat reaction resulting in a molecular bond.

H. **Ground:** A conducting connection, whether intentional or incidental, between an electrical circuit or equipment and the earth, or to some conducting body that serves in place of the earth.

I. **Grounding Electrode Conductor:** The conductor used to connect the grounding electrode to the equipment grounding conductor, to the grounded conductor, or to both, of the circuit at the service equipment, or at the source of a separately derived system.

J. **Grounding Equalizer (GE):** A bonding conductor that interconnects TGBs on the same floor, (formerly TBBIBC).

K. **Mesh Bonding Network (Mesh-BN)**: A bonding network to which all associated equipment (e.g., cabinets, frames, racks, trays, pathways) are connected using a bonding grid, which is connected to multiple points on the common bonding network.

L. **Primary Protector:** A surge protective device placed on telecommunications entrance conductors in accordance with ANSI/NFPA 70 and ANSI/ATIS 0600318. and listed under ANSI/UL 497.

M. **Rack Bonding Conductor (RBC):** A bonding conductor used to connect the rack/cabinet directly to the TMGB/TGB/Mesh

N. **Room (telecommunications):** An enclosed space for housing telecommunications equipment, cable terminations, and cross-connect cabling, that is the recognized location of the cross-connect between the backbone and the horizontal facilities.

O. **Telecommunications Bonding Backbone (TBB):** A conductor that interconnects the telecommunications main grounding busbar (TMGB) to the telecommunications grounding busbar (TGB).

P. **Telecommunications Equipment Bonding Conductor (TEBC):** A conductor that connects the telecommunications main grounding busbar (TMGB) or telecommunications grounding busbar (TGB) to equipment racks or cabinets

Q. **Telecommunications Grounding Busbar (TGB):** The interface to the building telecommunications grounding system generally located in telecommunications room. A common point of connection for telecommunications system and equipment bonding to ground, and located in the telecommunications room or equipment room.

R. **Telecommunications Main Grounding Busbar (TMGB):** A busbar placed in a convenient and accessible location and bonded, by means of the bonding conductor for telecommunications, to the building service equipment (power) ground.

S. **Unit Bonding Conductor (UBC**): A bonding conductor used to connect u rack/cabinet mounted equipment unit to the grounding structure (i.e.. conductor, busbar) utilized in that rack/cabinet.

PART 2: PRODUCTS

2.1 CABLE

A. THHN

1. The telecommunications backbone shall be a copper conductor.

2. Shall be rated, plenum-riser, depending on the environment, or bare copper may be acceptable in approved applications.

3. Jacket color shall be green or bare copper may be acceptable in approved applications.

4. Cable size per table in Part 3

2.2 BUSBARS

A. Telecommunications Main Grounding Busbar (TMGB)

1. Pre-drilled copper with holes to accommodate lug mounting holes

2. 0.25” thick x 4” wide with varying length

3. Sized for current applications and future growth

4. Insulated from its support

5. The TMGB may use an electro-tin plated busbar

6. Maintain a 2” min clearance from wall

7. Size

   a. 4” X 16” – Copper - **Hubbell Part Number HBBB14416H**

   b. 4” X 16” – Tin Plated Copper- **Hubbell Part Number HBBB14416HTP**

   c. 4” X 20” – Copper - **Hubbell Part Number HBBB14420J**

d. 4” X 20” – Tin Plated Copper- **Hubbell Part Number HBBB14420JTP**

B. Telecommunications Grounding Busbar (TGB)

1. Pre-drilled copper with holes to accommodate lug mounting holes
2. 0.25” thick x 2” wide with varying length
3. Sized for current applications and future growth
4. The TGB may use an electro-tin plated busbar
5. maintain a 2” min clearance from wall
6. Size & material
   a. 2” X 10” – Copper - **Hubbell Part Number HBBB14210A**
   b. 2” X 10” – Tin Plated Copper - **Hubbell Part Number HBBB14210ATP**
   c. 2” X 24” – Copper - **Hubbell Part Number HBBB14224B**
   d. 2” X 24” – Tin Plated Copper- **Hubbell Part Number HBBB14224BTP**

C. Horizontal Cabinet or Equipment Rack Busbar - 19”

1. Mounts to standard 19” Rack or Frame
2. Capacity: 6 Double hole lugs
3. Size & material
   a. 0.75” x 19” x 0.25” – Copper - **Hubbell Part Number HBBBHR19KT**
   b. 0.75” x 19” x 0.25”- Tin Plated Copper- **Hubbell Part Number HBBBHR19KTTP**

D. Vertical Cabinet or Equipment Rack Busbar – 36 to 72”

1. Mounts to vertical rail or Inside of cabinet in 19” or 23” Rack or Frame
2. Capacity: 9 Double hole lugs
3. Size & material
   a. 0.75” x 36” x 0.25” – Copper - **Hubbell Part Number HBBBVR36KT**
   b. 0.75” x 36” x 0.25”- Tin Plated Copper - **Hubbell Part Number HBBBVR36KTTP**

2.3 COMPRESSION LUGS

A. Shall be UL & CSA listed

B. Shall be able to accept 6 AWG to 3/0 AWG

C. Compression type

D. Two holes with various hole spacing's to fit the busbar

E. Long barrel that will allow a minimum of two crimps with standard industry colors

F. An inspection window to verify that the conductor is fully seated in the lug

G. Have a traceable feature to ensure proper die size was used to make the crimp

H. Crimped according to manufacturer's recommendation

I. Size (XX – specify AWG)

1. 0.250" holes X 0.625" spacing

    a. 0 degrees – **Hubbell Part Number HGBLXXD**

    b. 45 degrees - **Hubbell Part Number HGBLXXD45**

    c. 90 degrees – **Hubbell Part Number HGBLXXD90**

2. 0.250" holes x 0.750" spacing

    a. 0 degrees – **Hubbell Part Number HGBLXXDA**

3. 0.375" holes x 1.000" spacing

    a. 0 degrees – **Hubbell Part Number HGBLXXDB**

b. 90 degrees – **Hubbell Part Number HGBLXXDB90**

2.4 TAPS

A. Connections to the Conductor shall be made with irreversible compression connectors

B. Shall be UL & CSA listed

C. Shall be able to accept 6 AWG to 3/0 AWG

D. Have a traceable feature to ensure proper die size was used to make the crimp

E. Requires a minimum of (2) crimps for C Tap and H Tap, 1 crimp for I-Beam and busbar Tap

F. Crimp according to manufacturer's recommendation.

G. C Taps:

1. Main Run 6-4 AWG - Tap 6 AWG

a. **Hubbell Part Number HYC4C6**

2. Main Run 6-4 AWG – Tap 4 AWG

a. **Hubbell Part Number HYC4C4**

3. Main Run 2 AWG – Tap 8-4 AWG

a. **Hubbell Part Number HYC2C4**

4. Main Run 2 AWG – Tap 2 AWG

a. **Hubbell Part Number HYC2C2**

5. Main Run 1/0-2/0 AWG – Tap 8-2 AWG

a. **Hubbell Part Number HYC26C2**

6. Main Run 1/0-2/0 AWG – Tap 1/0-2/0 AWG

a. **Hubbell Part Number HYC26C26**

H. H Tap

1. Main Run 4/0-2 AWG - Tap 2-8 AWG

a. **Hubbell Part Number HYH292C**

2. Main Run 2-8 AWG – Tap 2-8 AWG

a. **Hubbell Part Number HYH2C2C**

3. Main Run 6-10 AWG – Tap 6 AWG

a. **Hubbell Part Number HYH6C6C**

H. I-Beam Tap

1. I-Beam steel with a Standard Flange

a. **Hubbell Part Number HYGIBS####**

2. I-Beam steel with a Wide Flange

a. **Hubbell Part Number HYGIBW####**

H. Busbar Tap

1. Bubsar thickness 0.25”, Main Run 2 AWG - Tap 6 AWG

a. **Hubbell Part Number HYG14B2TC2C6C**

2. Bubsar thickness 0.25”, Main Run 2 AWG – Tap 2 AWG

    a. **Hubbell Part Number HYG14B2TC2C2C**

3. Bubsar thickness 0.25”, Main Run 4/0 – 1/0 AWG

    a. **Hubbell Part Number HYGBTC28**

2.5 LADDER RACK BONDING CONDUCTORS

A. Ground cord assembly

1. Stranded THHN
2. Color: green
3. #6 AWG insulated bonding jumper
4. Length: 9” - 12”.
5. Each end terminated with a two hole compression lug or listing approved terminal
6. **Hubbell Part Number HGRKTD12D, HGRKTKA9KA5, HGRKTKLU9KLU5**

B. Braided Jumper

1. 0.94” Braid width
2. Hole diameter 0.375”
3. Hole Spacing 1.25”
4. Length: 12”
5. **Hubbell Part Number HGBBD12**

2.6 BASKET TRAY CONDUCTORS

A. Mounts to the basket tray metal runner

B. Accepts #6 AWG cable that spans the gaps between sections of basket tray

C. **Hubbell Part Number HGBKS17, HGRKTWC45, HGRKTWB5**

2.7 WRIST STRAP ESD PORT

A. Lug w/ 4mm banana plug to attach ESD wrist strap.

B. Two (2) hole lug

C. Placed inside cabinet or on equipment rack

D. Must be identifiable as an ESD connection point

E. **Hubbell Part Number HGBESDKT10**

2.8 RAISED FLOOR GROUNDING CLAMP

A. Ability to do both parallel and grid configurations

1. **HGBGXP1828RF -** Grid or Parallel
2. **HGBGP1526G1 -** Parallel
3. **HGBGRF4C3 -** Parallel

B. Attached to the stringer of the raised floor

1. **HGBGXP1828RF -** 0.75”-1.5” Round or Square
2. HGBGP1526G1 - 1.0”-1.25” Round
3. HGBGRF4C3 - 0.75”-1.0” Round or Square

C. Wire Range.

1. **HGBGXP1828RF** 6 – 4/0 AWG
2. HGBGP1526G1 4 – 2/0 AWG
3. HGBGRF4C3 8 – 2 AWG

2.9 Relay Rack Isolation Pads

A. 3” Deep Relay Rack

1. **HRRP3**

B. 6” Deep Relay Rack

1. **HRRP**

C. Extra Deep Relay Racks

1. **HRRPW**

PART 3: EXECUTION

3.1 Telecommunications Main Ground Busbar (TMGB)

A. The TMGB shall be:

1. Pre-drilled copper with holes to accommodate lug mounting holes
2. 0.25" t x 4" w with varying length
3. Sized for current applications and future growth
4. Insulated from its support
5. Maintain a 2" min clearance from wall
6. Installed to maintain clearances required by applicable codes
7. In an accessible location
8. As close to the panelboard as practicable min 36"
    a. Where a panelboard (electrical power panel) is located in the same room or space as the TMGB that panelboard's alternating current equipment ground (ACEG) bus (when equipped) or the panelboard enclosure shall be bonded to the TMGB.
9. Be Listed by a nationally recognized testing laboratory
10. 36" from active electronics or the panelboard

B. The TMGB should :

1. Be located in the telecommunication entrance facility
    a. The ideal location of the TMGB is in the telecommunications entrance facility.
2. Have a mounting height adjusted to accommodate overhead or underfloor cable routing.
3. Minimize the length of bonding conductor for telecommunications
4. Provide for the shortest and straightest routing of the primary
5. Be located near backbone cabling and associated terminations
6. Serve telecommunications equipment that is located within the same room or space.

C. The TMGB may use an electro-tin plated busbar

D. Attachments to TMGB

1. Bonding Conductor – Electrical Distribution Panel

2. Primary protector

3. Building Steel

4. Outside plant cables

5. Backbone cables that incorporates a shield or metallic member

6. All metallic pathways for telecommunications cabling located within the same room or space as the TMGB.

7. Cable tray

8. Ladder rack

9. Conduit

10. Telecommunications equipment located in the TEF (e.g., multiplexer or optical fiber termination equipment).

11. TBB

12. TEBC

13. Primary protector grounding conductor

    a. A minimum of 1 ft separation shall be maintained between this insulated conductor and any dc power cables, switchboard cable, or high frequency cables, even when placed in rigid metal conduit or EMT.

3.2 Telecommunication Ground Busbar (TGB)

A. The TGB shall:

1. Be a predrilled copper busbar provided with holes for use with standard sized lugs,

2. Have minimum dimensions of 6 mm (0.25 in) thick x 50 mm (2 in) wide and variable length to meet the application requirements and with consideration of future growth.

3. Be insulated from its support attachment a minimum of 2".

4. Be listed by a nationally recognized testing laboratory (NRTL).

5. Maintain 36" separation from active electronics

B. It is acceptable that the busbar be electro-tin plated for reduced contact resistance. If not plated, the busbar shall be cleaned prior to fastening the conductors to the busbar, and an anti-oxidant should be applied to the contact area to control corrosion and reduce contact resistance.

C. The TGB is the grounding connection point for telecommunications systems and equipment in the area served by that telecommunications room or equipment room.

D. Where a panelboard is located in the same room or space as the TGB that panelboard's ACEG bus (ac electrical ground when equipped) or the panelboard enclosure shall be bonded to the TGB. When a panelboard for telecommunications equipment is not in the same room or space as the TGB, that TGB should be bonded to the panelboard that feeds the distributor.

E. The TBBs and other TGBs within the same space shall be bonded to the TGB with a conductor the same size as the TBB.

F. Where a grounding equalizer (GE) is required, it shall be bonded to the TGB.

3.3 Telecommunications Bonding Backbone (TBB)

A. The intended function of a TBB is to reduce or equalize potential differences between telecommunications systems. While the TBB will carry some current under ac power ground fault conditions, it is not intended to provide the only ground fault return path.

B. The TBB shall:

1. Be connected to the TMGB & TGB.
2. Be a continuous copper conductor that should be sized no less than 6 AWG to a maximum of 3/0 AWG. The TBB shall be sized in accordance to the conductor table. **(TABLE 1)**
3. Be consistent with the design of the telecommunications backbone cabling system;
4. The TBB conductors shall be installed and protected from physical and mechanical damage.
5. The TBB conductors should be installed without splices.
    a. Where splices are necessary, the number of splices should be a minimum and they shall be accessible and located in telecommunications spaces.
    b. Joined segments of a TBB shall be connected using exothermic welding, irreversible compression-type connectors, or equivalent.

C. Permit multiple TBBs as dictated by the building size;

D. The metallic cable shield shall not be used as a TBB.

TABLE 1

CONDUCTOR LENGTH VS AWG

Linear Length – ft.	Size (AWG)
Less than 13	6
14 - 20	4
21 - 26	3
27 - 33	2
34 - 41	1
42 - 52	1/0

3.4 Grounding Equalizer (GE)

A. The GE shall be a continuous copper conductor that should be

sized no less than 6 AWG to a maximum of 3/0 AWG. The GE shall be sized in accordance to the conductor table. **(TABLE 1)**

B. The GE connects the telecommunications grounding busbar(s) in the same-floor telecommunications rooms (TRs) on the first, top, and every third floor in a multistory building.

C. Cable shields do not satisfy the requirements for a GE.

3.5 Telecommunications Equipment Bonding Conductor (TEBC)

A. Connects the TMGB/TGB to equipment racks/cabinets

B. Shall be a continuous copper conductor that should be sized per the length of cable.

C. Shall be separated from ferrous materials by 2" or be bonded to the ferrous metal

1. May be routed within cable trays or suspended 2" under or off the side of the cable tray or ladder rack

D. Shall be supported every 3ft

E. 8" Bend radius – with no less than a 90-degree bend

F. May come in contact with other cable groups at a 90-degree angle only

G. Cable shields do not satisfy the requirements of a TEBC

H. There may be more than one TEBC within each telecommunication room.

3.6 Rack Bonding Conductor

A. A bonding conductor used to connect the rack/cabinet directly to the TMGB/TGB/Mesh

B. Metallic enclosures, including telecommunications cabinets and racks, shall be bonded to the mesh-BN, TGB, or TMGB using a minimum sized conductor of No. 6 AWG.

C. Cabinets, racks, and other enclosures in computer rooms shall not be bonded serially; each shall have their own dedicated bonding conductor to the mesh-BN, TGB, or TMGB.

D. Floor mounted racks shall be secured to the floor with a relay rack isolation pad between the floor and rack.

E. All rack/cabinet installations shall have a 4mm grounded banana plug mounted on the front of them for a ESD bracelet connection.

3.7 Electrical distribution panel (EDP)

A. When located in the same room as the TMGB/TGB the EDP's equipment grounding bus or the panel board enclosure shall be bonded to the TMGB/TGB

B. Using a bonding conductor for telecommunications (BCT) minimum 6 AWG to a maximum of 3/0 AWG depending on the length of cable required.

C. Use same AWG as TBB

D. A qualified electrician shall make all connections within an ac electrical panel.

E. Outside of the scope of ANSI/TIA-607B

3.8 Conductive Fiber Optic Cables

A. The metallic components of a conductive cable are capable of transmitting current.

B. Conductive fiber-optic cables should be bonded and grounded as specified in NEC Article 770.100

3.9 Ladder Rack and/or Cable Tray

A. To achieve the objective of potential equalization in the TR, all cable runway sections are bonded together and bonded back to the TMGB/TGB

B. Maintain a 8” Bend Radius on the TEBC

C. Keep a 2” separation from other cables, power and telecommunications

D. Remove any paint, oxidation, ect. from the runway surfaces that are being bonded

E. Drill two holes as required to accommodate the 2-hole compression lug

F. Apply a thin coat of antioxidant around the holes and on the surface where the lug will be in contact.

G. Attach straps to the runway using stainless steel hardware sized for the lug holes.

H. Tighten the hardware

I. Wipe off any excess antioxidant after installation of the lug.

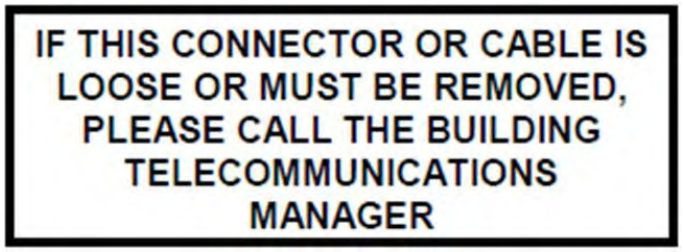
3.10 Labeling

A. The format for the telecommunications main grounding busbar shall be **FS-TMGB**, while the format for the TGBs shall be **FS-TGB**.

1. **FS** is the TS identifier for the space containing the busbar; Floor & space

2. **TMGB** is the portion of an identifier designating a telecommunications main grounding busbar;

3. **TGB** is the portion of the identifier designating a telecommunications grounding busbar.



B. Each telecommunications space or room shall be assigned an identifier unique within the building. The TS shall be labeled with the TS identifier inside the room so as to be visible to someoneworking in that room. The TS identifier shall have a format of FS.

C. All busbars and cables will have the label in Illustration 2 attached, and it will be visible .and readable

3.11 Testing

A. Earth ground resistance tester

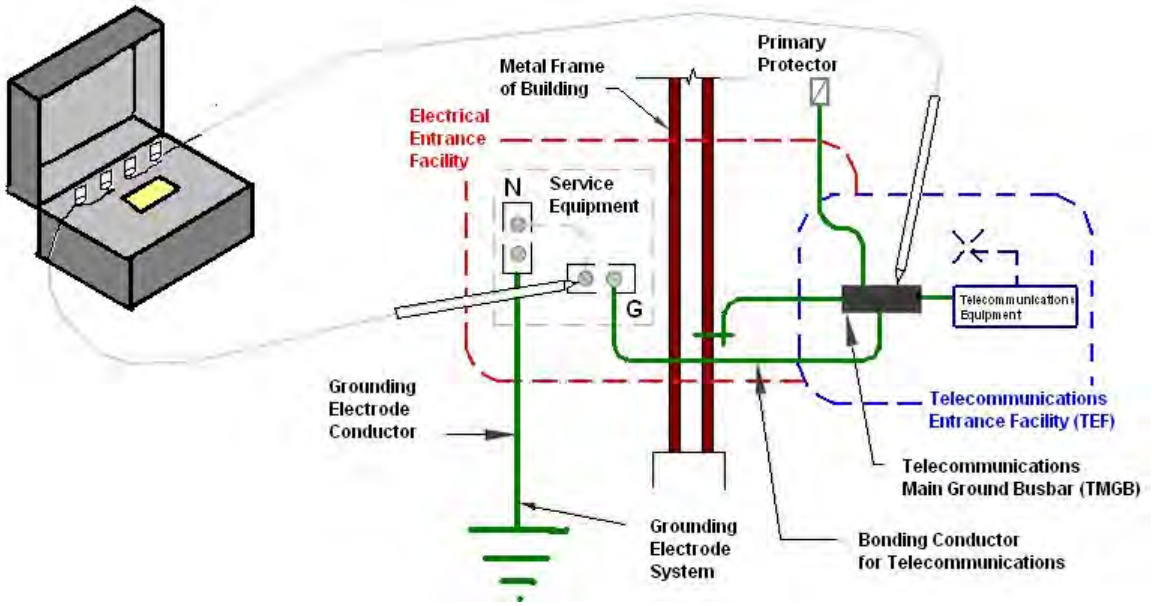
1. The earth ground resistance tester generates a specific test current: this current is less susceptible to the influences of stray currents on the grounding system. This makes the ground resistance tester a more accurate testing devise that a standard Volt-Ohm-multimeter.

B. Two-point ground continuity testing

1. Maximum value 100 milliohms

C. Follow manufacture instructions on setup and how to perform the test.

D. Care should be taken and safety precautions in place


Primary
Protector
Metal Frame
of Building
Electrical
Entrance
Facility
N
Service
Equipment
G
Telecommunications
Equipment
Grounding
Electrode
Conductor
Telecommunications
Entrance Facility (TEF)
Telecommunications
Main Ground Busbar (TMGB)
Grounding
Electrode
System
Bonding Conductor
for Telecommunications

SECTION 20528.28 - FIRESTOPPING, SMOKE, AND ACOUSTICAL SEALING TELECOMMUNICATIONS AND DATA CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This section includes labor, materials and equipment necessary to complete the installation required for the items specified under this Section, including but not limited to:

1. Firestopping of Through Penetrations in Fire Rated Assemblies.
2. Smoke and Acoustical Sealing in Non-Rated Assemblies.

1.3 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog data for specified products demonstrating compliance with referenced standards and listing numbers of systems in which each product is to be used.

B. Schedule of UL System Drawings for Fire Rated Construction: Submit schedule of all expected opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance ratings.

C. UL System Drawings for Fire Rated Construction: Furnish copies of all UL Systems identified in schedule above. Include any engineering recommendations.

D. Certificates: Product Certificate of Compliance from the by manufacturer certifying material compliance with applicable code and specified performance characteristics.

E. Installation Instructions: Submit manufacturer's printed installation instructions.

1.4 QUALITY ASSURANCE

A. Products/Systems: Provide firestopping systems that comply with the following requirements:

1. Firestopping tests are performed by a qualified, testing and inspection agency. A qualified testing and inspection agency is UL, or another agency performing testing and follow-up inspection services for firestop system acceptable to authorities having jurisdiction.
2. Firestopping products bear the classification marking of qualified testing and inspection agency.

B. Installer Qualifications: Experience in performing work of this section who is qualified by the firestopping manufacturer as having been provided the necessary training to install firestop products in accordance with specified requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery:

1. Manufacturer's original, unopened, undamaged containers, identification labels intact identifying product and manufacturer, date of manufacture; lot number; shelf life, if applicable; qualified testing and inspection agency's classification marking; and mixing instruction for multi-component products.
2. Handle and store products according to manufacturer's recommendations published in technical materials. Leave products wrapped or otherwise protected and under clean and dry storage conditions until required for installation.

B. Storage and Protection:

1. Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

1.6 PROJECT CONDITIONS

A. Do not install products when ambient or substrate temperatures are outside limitations recommended by manufacturer.

B. Do not install products when substrates are wet due to rain, frost, condensation, or other causes.

C. Do not use materials that contain flammable solvents.

D. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

E. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

F. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. References:

1. ANSI/TIA-1179-A "Healthcare Facility Telecommunications Infrastructure".
2. ANSI/TIA-EIA-569-D "Telecommunications Pathways and Spaces"

3. ASTM E90, “Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements”.
4. ASTM E814, “Fire Tests of Through Penetration Firestops”.
5. CAN/ULC S115, "Standard Method of Fire Tests of Firestops Systems."
6. UL 1479, “Fire Tests of Through Penetration Firestops”.
7. National Fire Protection Association (NFPA) – NFPA 101: Life Safety Code.
8. National Fire Protection Association (NFPA) – NFPA 70: National Electrical Code.
9. Underwriters Laboratories Inc. (UL) – Fire Resistance Directory

B. Fire rated cable pathway devices shall be used in fire-rated construction for ALL low-voltage, video, data and voice cabling, optical fiber raceways and certain high-voltage cabling where frequent cable moves, adds and changes may occur. Pathways required for high voltage cabling will be detailed on the prints. Such devices shall:

1. Meet the hourly fire-rating of fire rated wall and or floor penetrated.
2. Be tested for the surrounding construction and cable types involved.
3. Have UL Systems permitting cable loads from; “Zero to 100% Visual Fill.” This requirement eliminates need for fill-ratio calculations to be made by cable technicians to ensure cable load is within maximum allowed by UL System.
4. Be “Maintenance-Free”, having a corresponding Evaluation Services Report from a Nationally Recognized Third Party Laboratory. Maintenance-Free is defined as; No action required by cabling technician to open and/or close pathway for cable moves, adds or changes, such as, but not limited to:

    a. Opening or closing of doors.
    b. Spinning rings to open or close fabric liner.
    c. Removal and or replacement of any material such as, but not limited to, firestop caulk, putty, pillows, bags, foam muffins, foam, foam plugs, foam blocks, or foam closures of any sort.
    d. Evaluation Services Report (ESR) from an accredited Nationally Recognized Third-party Laboratory certifying compliance with this definition of “Maintenance-Free” and all relevant codes and standards.

5. Pathways shall be engineered such that two or more devices may be ganged together for larger cable capacities.
6. Pathways shall be engineered to be re-enterable so they can be retrofitted and removed from around existing cables without cutting and re-splicing them.
7. Affix adhesive wall label immediately adjacent to devices to communicate to future cable technicians, authorities having jurisdiction and others the manufacturer of the device and the corresponding UL System number installed.

C. Non-rated cable pathway devices shall be used in non-fire-rated construction for all low-voltage, video, data and voice cabling, optical fiber raceways and certain high-voltage cabling where frequent cable moves, adds and changes may occur. Pathways required for high voltage cabling will be detailed on the prints. Such devices shall:

1. Limit the movement of smoke and sound of wall and or floor penetrated.
2. Restore the STC Rating of the penetrated assembly.
3. Provide L Ratings of greater than 1 CFM when empty and greater than 2.5 CFM at all other loading up to 100 percent.
4. Accommodate cable loads from; “Zero to 100% Visual Fill.”

5. Not have inner fabric liner that tightens around and compresses cables tightly together encouraging potential cable damage or interference.
6. Be "Maintenance-Free", maintenance-free is defined as; No action required by cabling technician to open and/or close pathway for cable moves, adds or changes, such as, but not limited to:

    a. Opening or closing of doors.
    b. Spinning rings to open or close fabric liner.
    c. Removal and or replacement of any material such as, but not limited to, firestop caulk, putty, pillows, bags, foam muffins, foam, foam plugs, foam blocks, or foam closures of any sort.
    d. Furnish letter from manufacturer certifying compliance with this definition of "Zero-Maintenance".

7. Pathways shall be engineered such that two or more devices may be ganged together for larger cable capacities.
8. Pathways shall be engineered to be re-enterable so they can be retrofitted and removed from around existing cables without cutting and re-splicing them.
9. Affix adhesive wall label immediately adjacent to devices to communicate to future cable technicians, authorities having jurisdiction and others the manufacturer of the device and the corresponding UL System number installed.

D. As an alternate to using a fire-rated or non-rated cable pathway device for a single or tow low voltage cables (up to an aggregate cross sectional area of 0.52 in. (14mm) O.D.) penetrating one or two-hour, gypsum board/stud wall assemblies or non-rated assemblies, either as a through-penetration or as a membrane-penetration, a fire-rated cable grommet may be substituted. The product shall consist of a molded, two-piece, plenum-rated grommet having a foam fire and smoke sealing membrane that conforms to the outside diameter of the individual cable. The grommet product shall be capable of locking into place to secure the cable penetration within the wall assembly. The grommet shall be UL Classified and tested to the requirements of ASTM E814 (UL 1479) and CAN/ULC S115.

E. Where non-mechanical pathways must be utilized, such as sealing (caulking) around single or grouped conduits, provide products that upon curing do no re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during or after construction. Provide letter from manufacturer certifying compliance with this section.

F. Cable pathway shall replace conduit sleeves in walls and floors, and the following;

    a. When installed individually in floors, devices shall pass through core-drilled or preformed opening utilizing tested floor plates.
    b. When multiple units are ganged in floors, devices shall be anchored by means of a tested grid.
    c. When installed individually in walls, devices shall pass through core drilled opening utilizing tested wall plates or integrated flanges.
    d. When multiple units are ganged in walls, devices shall be anchored by means of a tested adjustable gang bracket.

G. Cable tray shall terminate at each barrier and resume on the other side such that cables pass independently through devices. Cable tray shall be properly supported on each side of the barrier.

2.2 MANUFACTURERS

A. Acceptable Manufacturer: Specified Technologies Inc., 210 Evans Way, Somerville, NJ 08876. Tel: (800) 992-1180, Fax: (908) 526-9623, Email: techserv@stifirestop.com, Website: www.stifirestop.com.

B. Substitutions: Not permitted. No known equal.

C. Single Source: Obtain firestop systems for each type of penetration and construction condition indicated only from a single manufacturer.

2.3 MATERIALS

A. General: Use only products that have been tested for specific fire resistance rated construction conditions or acoustical and smoke related requirements conforming to construction assembly type, penetrating item type, annular space requirements, and rating involved for each separate instance.

B. Firestop Sealants: Single component latex formulations that upon cure do not re-emulsify during exposure to moisture, the following products are acceptable:

1. Specified Technologies Inc. (STI) SpecSeal Series SSS Sealant.
2. Specified Technologies Inc. (STI) SpecSeal Series LCI Sealant.

C. Firestop Putty: Intumescent, non-hardening, water resistant putties containing no solvents, inorganic fibers or silicone compounds, the following products are acceptable:

1. Specified Technologies Inc. (STI) SpecSeal Series SSP Putty.

D. Firestop Pillows: Re-enterable, non-curing, mineral fiber core encapsulated on six sides with intumescent coating contained in a flame-retardant poly bag, the following products are acceptable:

1. Specified Technologies Inc. (STI) SpecSeal Series SSB Pillows.

E. Fire-Rated Cable Grommet: Molded, two-piece grommet with an integral fire and smoke sealing foam membrane for sealing individual cable penetrations through framed wall assemblies. Grommet snaps together around cable and locks tightly into the wall.

1. Specified Technologies Inc. (STI) EZ-Firestop Grommets.

F. Fire-Rated Cable Pathways: Device modules comprised of steel pathway with self-adjusting intumescent foam pads allowing 0 to 100 percent cable fill, the following products are acceptable:

1. Specified Technologies Inc. (STI) EZ-PATH Fire Rated Pathway.

G. Smoke and Acoustical Pathways: Device module comprised of a nonmetallic pathway with integral self-adjusting smoke and sound sealing system for cable penetrations through non-fire-resistance rated wall or floor assemblies, the following products are acceptable:

1. Specified Technologies Inc. (STI) EZ-PATH Smoke & Acoustical Pathway.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before beginning installation, verify that substrate conditions previously installed under other sections are acceptable for installation of firestopping in accordance with manufacturer's installation instructions and technical information.

B. Surfaces shall be free of dirt, grease, oil, scale, laitance, rust, release agents, water repellants, and any other substances that may inhibit optimum adhesion.

C. Provide masking and temporary covering to protect adjacent surfaces.

D. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install systems in accordance with Performance Criteria and in accordance with the conditions of testing and classification as specified in the published design.

B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of products.

3.3 FIELD QUALITY CONTROL

A. Keep areas of work accessible until inspection by authorities having jurisdiction.

B. Where deficiencies are found, repair firestopping products so they comply with requirements.

3.4 ADJUSTING AND CLEANING

A. Remove equipment, materials, and debris, leaving area in undamaged, clean condition.

B. Clean all surfaces adjacent to sealed openings to be free of excess firestopping materials and soiling as work progresses.

3.5 SCHEDULES

Penetrant Type	Concrete Floor	Concrete Wall	Gypsum Board Wall
Blank Opening	C-AJ-0100, C-AJ-0101, C-AJ-0113, C-AJ-0116	C-AJ-0100, C-AJ-0101, C-AJ-0113, C-AJ-0116	W-L-0020, W-L-0034
Metal Conduits	C-AJ-1080, C-AJ-1240, C-AJ-1353	C-AJ-1080, W-J-1098, W-J-1100	W-L-1049, W-L-1222, W-L-1168

Penetrant Type	Concrete Floor	Concrete Wall	Gypsum Board Wall
Plastic Conduits/ Raceways	C-AJ-2140, C-AJ-2292, F-A-2186, F-A-2210, F-A-2225	C-AJ-2038, C-AJ-2108, C-AJ-2578, C-AJ-2586, W-J-2018, W-J-2076	W-L-2059, W-L-2074, W-L-2093, W-L-2241
Cables	C-AJ-3214, C-AJ-3231, F-A-3015, F-A-3021, F-A-3054	C-AJ-3214, C-AJ-3231, W-J-3098, W-J-3099,W-J-3124, W-J-3150, W-J-3180	W-L-3219, W-L-3248, W-L-3287, W-L-3356, W-L-3377, W-L-3378, W-L-3379, W-L-3390
Cable Trays	C-AJ-3317, C-AJ-8181, C-AJ-4029, F-A-3015, F-A-3037	C-AJ-8181, W-J-4021, W-J-4022, W-J-4033, W-J-3098, W-J-3145, W-J-3158	W-L-3218, W-L-3271, W-L-3286, W-L-3306, W-L-4008, W-L-4029, W-L-4043, W-L-8073

3.6 DOCUMENTATION

A. Place system stickers on each side of wall penetrations.

B. Place a reproduction (photo copy) of the UL System description in a document protector and mount to the wall next to the wall penetration

1. Highlight the section of the system description that list the allowed cable types.

END OF SECTION

SECTION 2 05 29 - HANGERS AND SUPPORT

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Furnish and install a system of cabling supports above ceilings for network, voice, and CATV cabling as set forth hereinafter.

1.2 REFERENCE STANDARDS

A. See SECTION 2.01.00 REFERENCE STANDARDS

B. See SECTTION2.11.13 Communications Grounding and Bonding

PART 2 - PRODUCTS

2.1 Basket Tray-**PROVIDED BY GC UNDER GENERAL CONTRACT**

1. All wire trays are to be UL classified.
2. All wire tray shall be approved for grounding.
3. All wire tray shall be approved for installations in overhead or under-floor applications.
4. All wire tray shall have shaped cross members to reduce cable strain.
5. All wire tray shall be 100% recycled steel content.
6. Manufacture: Hubbell Pre-Galvanized HBT series (size dependant)

2.2 Ladder Tray: **MDF and IDF Closets**

1. Material: 16 ga. tubular steel.
2. Durable powder coat.
3. Stringer dimensions: 0.375”W x 1.5”H.
4. Rung spacing: 9.0”.
5. Weight capacity: 45 lbs./foot.
6. Manufacture: Hubbell HLS series
    - Use 18-inch-wide in all entrance and telecommunications rooms.
    - Use other sizes as needed in corridors (size dependant).

2.3 J-Hooks

1. J-Hooks are not to be used except when no basket tray or ladder tray can be used.
2. Non-Metallic J-Hooks for CAT6 is limited to maximum of 10 cables. All cables (CAT5E, CAT6, Coax) must be secured every 4’-5’, anchor J-hooks to studs.
3. Steel J-hooks shall not be used.
4. J-hooks shall be as follows: Use Non-Metallic J-hooks, as made by Erico.
    a. J-Hooks, (up to 40 cables),

i. Caddy Cat32HP or
ii. Panduit JP2W-L20

b. J-Hooks, (up to 10 cables),
i. Caddy Cat12 or
ii. Panduit JP75W-L20

PART 3 - EXECUTION

3.1 INSTALLATION

A. Entire installation shall be in accordance with manufacturer's recommendations. All supports, and hangers shall be installed to support this project per manufacturer's requirements.

B. Provide two separate sets of low-voltage cabling supports along entire length of low-voltage cabling runs above ceiling. One set of supports shall be of Category 6 network wiring. The second set of supports shall be for CATV wiring. Locate supports well clear of acoustical lay-in ceiling tiles. Supports shall be located such that tiles can be removed without interfering with support system. Where architectural, structural, or acoustical members or supports prohibit the use of two separate cabling supports, using only one set of supports is permissible.

C. Coordinate installation of low-voltage supports with other trades as required.

D. All trays shall be bonded and grounded to the telecommunications grounding system per SECTTION27.11.13 Communications Grounding and Bonding.

END OF SECTION 2 05 29

SECTION 2 05 53 - ADMINISTRATION / LABELING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Provide administration and labeling of entire communications infrastructure in accordance with Jasper Middle School ITS Department requirements and as set forth hereinafter. Administration and labeling shall include but not be limited to all work area outlets (WAO's), patch panels, 110 blocks, conduits, cable trays, backbone cables, etc.

1.2 REFERENCE STANDARDS

A. See SECTION 27.01.00 REFERENCE STANDARDS

PART 2 - PRODUCTS

2.1 MATERIALS

A. Products shall be as set forth elsewhere in these specifications.

B. Provide labeling sample for outlets, patch panels and racks to Jasper Middle School prior to application.

PART 3 – EXECUTION

3.1 INSTALLATION

A. All WAO's, patch panels, 110 blocks, conduits, cable trays, backbone cabling, outside plant cabling, etc., shall be labeled according to ANSI/TIA Standards with specific labeling scheme of Jasper Middle School Department. Labeling is also to include the following:

1. "Caution Fiber Optic" adhesive marker every 20' of exposed fiber in building (including in cable tray). Label to include SM and MM fiber count and "to and from".

B. Provide a sample of all labeling and labeling schematic prior to application.

C. Installation Labeling Requirements

1. Network cable labeling is similar to ensuring everyone involved in your network speaks the same language and anyone who comes in to augment or service your network can easily understand the architecture. It has become more important to accurately document every outlet and every port, so the information can assist in a 911 database. All WAO’s, patch panels, 110 blocks, conduits, trays, backbone cables,

grounding, and racks shall be labeled with specific labeling scheme of Jasper MiddleSchool .

2. The key factor of a good administration system is the component labelling. Records cannot be established and maintained without good labelling during and after installation.

3. Work Area Outlet Labeling Schematic
   a. NOTE: All labeling shall be in a size 12-point font.

4. The label shall contain a unique identification, as outlined in the documentation and/or drawing, and must be indelible and placed behind a transparent cover.

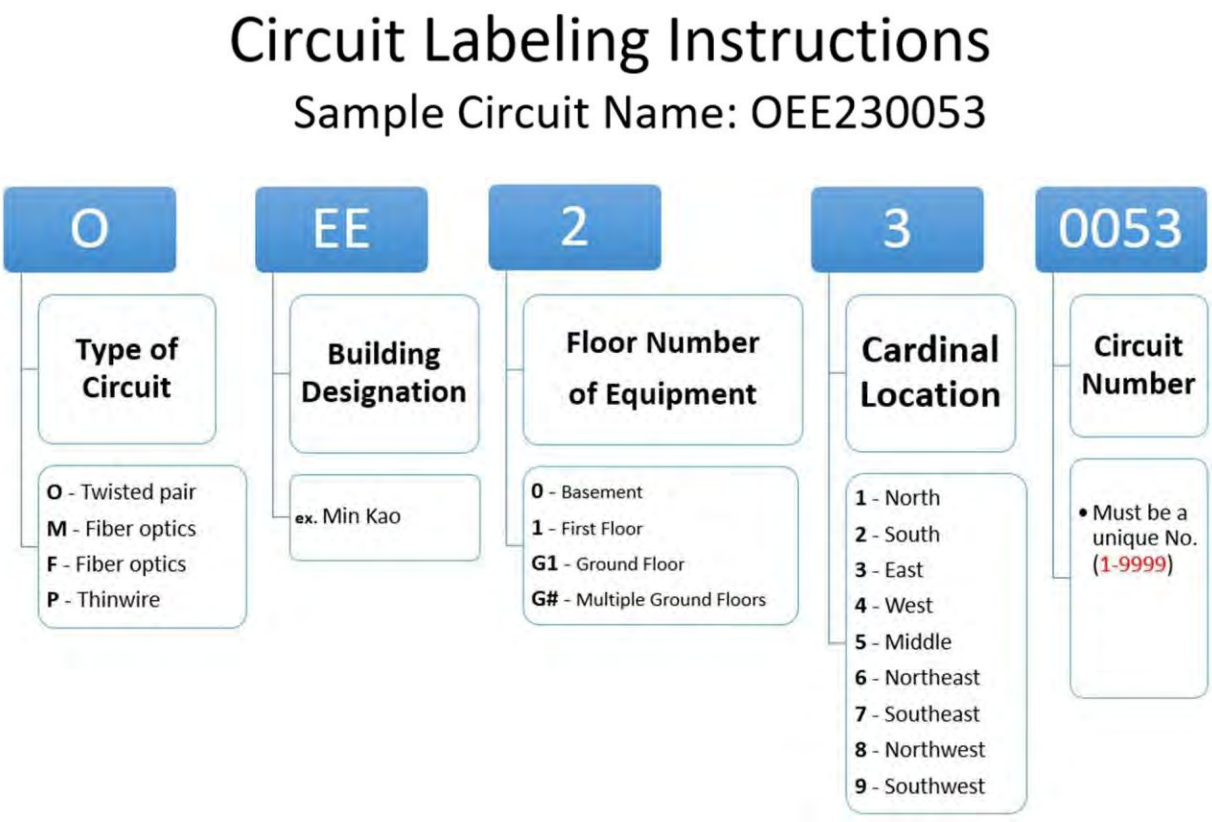


Figure 11: Data Circuit Labeling Schematic

D. Rack Labeling

1. The label shall contain only the first 6 characters of the circuit labeling schematic for that SER and printed or generated by a mechanical device.

Figure 12: Samples of Equipment Rack Label

E. Patch Panel Labeling

1. Each RJ45 socket must be individually labeled. The label shall contain a unique identification, as outlined in the documentation and/or drawing, must be indelible and placed behind a transparent cover, and printed or generated by a mechanical device.

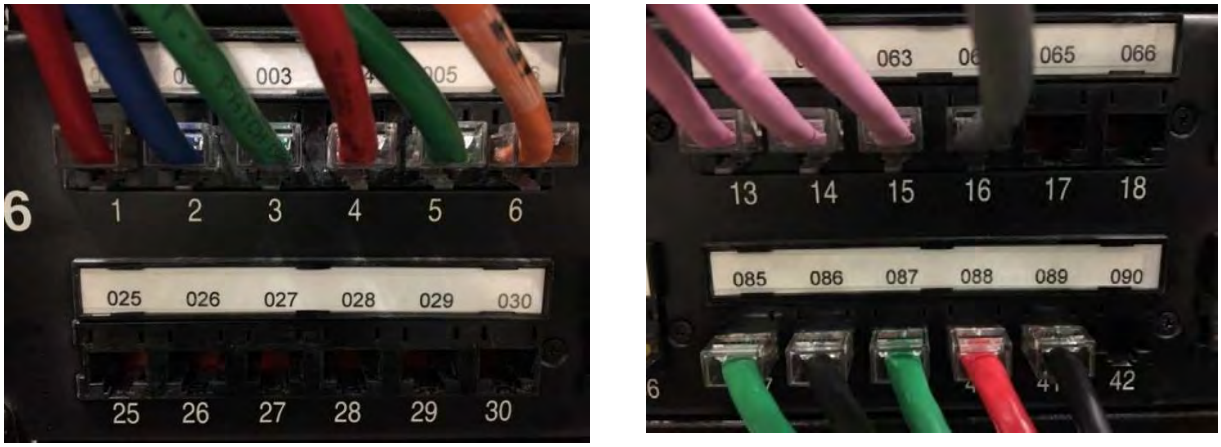


Figure 13: Samples of Patch Panel Labeling

F. Work Area Outlet Labeling

1. Each RJ45 socket must be individually labeled. The label shall contain a unique identification, as outlined in the documentation and/or drawing, must be indelible and placed behind a transparent cover, and printed or generated by a mechanical device.

2. All WAO labeling must be completed and verified before the installation of the furniture.

3. If the contractor is providing and installing the station patch cable in accordance to the contract, they must remember that both ends of the station patch are to be labeled with the WAO in which it is connected.

Figure 14: Samples of WAO Labeling

END OF SECTION 2 05 53

SECTION 2 08 00 - Commissioning of Communications

PART 1 - GENERAL

1.1 DESCRIPTION

A. Telecommunications systems shall be provided as indicated on drawings and as called for hereinafter.

1.2 REFERENCE STANDARDS

A. Jasper Middle School standards.

B. BICSI TDMM current edition (Telecommunications Distribution Methods Manual).

C. ANSI/NECA/BICSCI-568, Standard for Installing Commercial Building Telecommunications Cable.

D. ANSI/TIA 569-C, Pathways and Spaces.

E. ANSI/TIA 568-C.0, Generic Telecommunications for Customer Premises Standard Series
   i. 568-C.1 Commercial Building Cabling
   ii. 568-C.2 Copper Cabling Components
   iii. 568-C.3 Fiber Cabling Components
   iv. 568-C.4 Coax Cabling Components

F. ANSI/TIA 606-B, Addendum 1, Administration Standard for Commercial Telecommunications Infrastructure.

G. ANSI J-STD-607-B, Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.

H. ANSI/TIA 758-B, Customer owned Outside Plant Telecommunications Cabling Standard

I. ANSI/TIA-526, 7&14, Telecommunications Measurements of Optical Fiber Single and Multi Mode Power Loss

J. ANSI/TIA Building Automation Systems Cabling Standard for Commercial Buildings

K. ANSI/TIA 310-D, Cabinets, Racks, Panels, and Associated Equipment.

L. FCC Part 68, Connection of Terminal Equipment to the Telephone Network.

M. ADA of 2010 and Telecommunications Act of 1996, Physically Impaired and Accessibility.

N. IEEE 802-2002, Standard for Local and Metropolitan Networks: Overview and Architecture.

O. IEEE 802.11ax Wireless LAN’s

P. NFPA 70, National Electrical Code (2014).

Q. NFPA-76, Recommended Practice for Fire Protection of Telecommunications Facilities.

R. NFPA 101, Life Safety Code.

S. ETA Electronic Technician Association Fiber Optics Installer

T. FOA Fiber Optics Association Certified Fiber Optics Technician

U. ANSI/SCTE 77 Underground Enclosure Integrity

1.3 Reference Specifications

A. See section 2.01.00 for standards.

B. See section 2.05.53 Administration/Labeling.

C. See section 2.05.26 Grounding and bonding.

D. See section 2.15.00 Voice and Network Horizontal Cabling System

PART 2 - PRODUCTS

2.1 Inspections and Walk Through

A. All work is subject to inspection and review at any time by qualified Jasper Middle School personnel.
B. All rough in work will be inspected by Jasper Middle School personnel before finished walls and ceilings are installed.
C. Final walk through inspections must be done prior to turning in final documentation and test results. The preliminary documentations will be made available for review during this walk-through inspection.
D. Cables with visible defects, kinks, twists, crushed, cuts or smashed will be replaced regardless if they pass tests.
E. Installer must take reasonable steps to protect their installation in a construction environment. Free of dirt, defects and debris

PART 3 - EXECUTION

3.1 Commissioning

A. Jasper Middle School requires the newly installed infrastructure to be tested and certified. Follow the Standards of ANSI/TIA -568-C.1,2,3,4 for testing criteria of the permanent link. See Appendix D in the Jasper Middle School Telecommunications Design and Installations Guidelines, current edition for approved test equipment to obtain a manufacture warranty.
B. Testing shall commence only after all materials are permanently installed, adjusted, bonded and labeled. Installer must retest and save both the original and retested results when any of the above occurs.
C. Testing shall commence only in a clean environment, free of moisture, dirt, dust and debris. Terminations exposed to such environments after testing will require retesting.
D. In addition to the cabling being commissioned and certified, the electrical grounding and bonding systems must also be tested and certified.

E. The electrical contractor is responsible for testing the Alternating Current (AC) Grounding Electrode System.
F. The telecommunications installer is responsible for testing the Equipment Grounding (Bonding) System.
G. Refer to the BICSI TDMM latest edition, for approved test equipment and acceptable results.
H. Manufactures Hubbell Mission Critical 25-year installation warranty
    a. Jasper Middle School requires all installations to have a Hubbell Mission Critical 25-year warranty.
    b. This warranty shall include all types of telecommunications services such as Power over Ethernet (PoE), Voice over IP (VoIP), LAN Security Cameras, Wireless LAN, Fiber applications, and any future services that meet ANSI/TIA/EIA and or IEEE telecommunications cabling standards.
I. T-Drawings
    1. Telecommunications drawings shall be identified as "T" series (Telecommunications) drawings in the approved construction drawings, separated from "E" (Electrical) drawings. The T-series drawings shall include:
        a. Floor layout, showing work outlets, cable path (j-hooks or cable tray, horizontal and riser), sleeves, conduits.
        b. Legends using industry standard symbols
        c. Satellite Equipment Room (SER) layout / elevations
        d. Equipment rack layout
        e. Detailed Work Area Outlet (WAO) with labeling
        f. Riser diagram and cabling for voice, data and cable television (CATV)
        g. Outside plant, cabling, methods and paths, with footages and bends
        h. Schedule of jacks and rooms
        i. Pull Box detail

    2. T-Drawings shall be given at the time of the walk-thru.

END OF SECTION 20800

SECTION 2 11 16

COMMUNICATIONS CABINETS, RACKS, FRAMES, AND ENCLOSURES

PART 1 GENERAL

1.1 INTRODUCTION

A. The Work of this Section shall consist of the labor, materials and equipment required for furnishing and installing cabinets, racks, frames and enclosures as part of a complete and operating telecommunications cabling system.

1.2 RELATED DOCUMENTS

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

B.	Section 2 00 00	Communications
C.	Section 2 05 26	Grounding & Bonding for Communications Systems
D.	Section 2 05 28	Pathways for Telecommunications Systems
E.	Section 2 05 36	Cable Trays for Communications Systems
F.	Section 2 11 10	Telecommunications Spaces, Equipment and Fittings
G.	Section 2 11 16	Communications Cabinets, Racks, Frames, and Enclosures
H.	Section 2 13 00	Communications Optical Fiber Backbone Cabling
I.	Section 2 15 00	Copper Horizontal Cabling
J.	Section 2 15 00	Communications Faceplates and Modules
K.	Section 2 15 00	Communications Patch Cords and Station Cords

1.3 CODE AND STANDARDS

A. Refer to Section 20000 – Communications General

B. Refer to Division 1 – Reference Standards and General Conditions of the Contract

1.4 APPROVED PRODUCT MANUFACTURERS

A. The manufacturer of the products and materials in this section, that <customer> is using as basis of design in this document, as required for construction of the cabling infrastructure per contract documents shall be:

1. Hubbell Premise Wiring
2. Product substitutions from other manufacturers shall require the approval of the owner or owner's representative 30 days prior to bid opening.

1.5 SUBMITTALS

A. Shop Drawings:

1. Shop drawings shall show the locations where cables are to be routed and where terminating hardware is to be installed.

B. Submit Manufacturer's Cut Sheets for the following: Refer to Section 270000 – Communications Submittal.

C. Major items not included in the product section of the specification.

D. Submit for approval in accordance with specified submittal procedures:

1. Racks
2. Enclosures
3. Cabinets
4. Frames
5. Accessories

1.6 **QUALITY ASSURANCE**

A. The Contractor shall install work in accordance with the latest <customer> Requirements, the latest BICSI Cabling Installation Manual, TIA Standards Telecommunications building cabling systems planning and design manual.

B. Installed UTP and fiber cabling systems, pathways and distribution facilities shall adhere to manufacturer's instructions, contract drawings and specifications, and applicable codes, standardsand regulations.

C. Where applicable, all equipment, components, accessories and hardware shall be UL listed for the intended purpose of the installation.

D. Installed products shall be manufactured by an ISO 9001 certified facility.

E. Installed products shall be free from defects in material or workmanship from the manufacturer, and shall be of the quality indicated.

F. All methods of construction that are not specified in the contract documents shall be subject to control and approval by the owner or owner's representative.

G. Installed products shall be lot-traceable by date code.

H. All critical internal manufacturing operations for installed products shall have documented in-process inspection and testing according to ISO9001.

1.7 **DEFINITION**

A. See Section 2 00 00

1.8 **WARRANTIES:**

A. See Section 2 00 00 for details

1.9 **MATERIALS:**

A. All materials shall be UL or ETL listed and verified and shall be marked as such.

B. Products shall be regularly catalogued items of the manufacturer and shall be supplied as a complete unit in accordance with the manufacturer's standard specifications with any optional items required for proper installation unless otherwise noted.

C. All materials used on this project shall be new. Used and refurbished equipment is not permitted unless approved by <customer>. Provide equipment to site in original packaging whenever practical.

1.10 **DELIVERY, STORAGE AND HANDLING LOGISTICS**

A. Material shall be delivered to the site in the original packing.

B. Materials delivered to the construction site shall be stored in a dry, secure area, preferably indoors. Storage temperature of materials shall adhere to manufacturer's recommendations. Movement of packaged materials shall be in a manner to avoid damage of contents. On-site

storage, either indoors or trailer, shall have permission by the owner, and shall not interfere withother construction activity.

C. Installation of the cable shall be within the recommended temperature range specified by the manufacturer. Cable installation temperature range between 50f and 80f is recommended.

D. The contractor is responsible for scheduling all deliveries and providing proper receipt, handling, and storage of all materials. Protect all equipment from physical damages (dents, scratches, dust, water, paint, chemicals, and temperature extremes) and vandalism, or theft. The contractor shall replace any damaged or stolen equipment. The contractor is responsible for all equipment until final project acceptance by owner.

E. The contractor is responsible for cleaning the worksite every business day and removing debris from the facility.

1.11 COORDINATION WITH OTHER TRADES

A. Coordinate layout of work with other trades. Make minor adjustments in locations required for coordination. Locations of structural systems, heating work and plumbing lines shall take preference over locations of conduit lines where conflict occurs. Structural systems, heating work, and plumbing lines shall not interfere with or otherwise impede the routing of communication cabling with cable tray, raceways, or other pathways dedicated to communications. All potential issues shall be brought to the attention of the General Contractor, Construction Manager, Architect, Engineer or owner immediately, before proceeding with installation.

B. Other than minor adjustments shall be submitted to the General Contractor, Construction Manager, Architect, Engineer or owner for approval before proceeding with the work.

C. Coordinate locations, arrangement, mounting, and support of all communications provisions with Division 26.

D. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.

E. To provide for ease of disconnecting the equipment with minimum interference to other installations.

F. To allow right of way for piping and conduit installed at required slope.

G. So that connecting raceways, cables, and cable trays will be clear of obstructions and of the working and access space of other equipment.

H. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

I. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 and Division 26

J. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08.

K. Coordinate the gauge cables to be used in the telecommunications grounding system.

L. Low Voltage Contractor shall furnish and install the following:

1. Racks & Accessories
2. Enclosures & Accessories

3. Patch Panels
4. Ladder Rack
5. Plywood backboards.

M. Electrical Contractor shall furnish and install the following:
1. Power circuits to telecommunications spaces and equipment.
2. Contractor shall coordinate location of electrical receptacles to be installed on raceways, racks or inside cabinets.

N. Unless noted otherwise, the following items will be the responsibility of the Owner:
1. All electronics and active data networking equipment, etc.
2. Telephones, fax machines and modems, etc.
3. PC's, printers, video display terminals, flat panel displays, etc.

O. Contractor shall coordinate with the Owner's network and computer equipment personnel for specific instructions before starting Work.

P. Contractor shall coordinate with the General Contractor for location and type of blocking to be installed in the walls to support wall mounted equipment.

PART 2 PRODUCTS

2.1 CABINETS

A. Network Cabinets
1. 3,000 lb weight capacity
a) 1,500 lb dynamic Z4 weight capacity with additional Z4 bracket accessory
2. Keyed swing handle lock
3. Perforated front and rear doors
4. Reinforced in the middle with extra cross support
5. Reversible without any additional hardware
6. Flat rear mesh door(s)
7. Adjustable mounting rails
8. Mounting rails with orange measuring guides
9. 42 RRU (77") and 47 RU (86") Heights
10. 42" and 48" Depths
11. 30" wide
12. #12-24 threaded rails
13. Large and multiple removeable plates to allow cable entry
14. Comes with casters and leveling feet installed
15. Removable side covers

16. Adjustable mounting Rail
17. Available fan unit (sold separately)
18. Acceptable Manufacturer:
    a) Hubbell Premise Wiring
        1) H3N4242 - Cabinet, Network, 42RU,30"W,42"D
        2) H3N4248 - Cabinet, Network, 42RU,30"W,48"D
        3) H3N4742 - Cabinet, Network, 47RU,30"W,42"D
        4) H3N4748 - Cabinet, Network, 47RU,30"W,48"D

B. Server Cabinet
1. 3,000 lb weight capacity
    a) 1,500 lb dynamic Z4 weight capacity with additional Z4 bracket accessory
2. Keyed swing handle lock
3. Reinforced in the middle with extra cross support
4. Reversible without any additional hardware
5. Flat rear mesh door(s)
6. Perforated front and rear doors
7. Adjustable mounting rails
8. Mounting rails with orange measuring guides
9. 42 RRU (77”) and 47 RU (86”) Heights
10. 42” and 48” Depths /
11. 24” wide
12. M6 cage nut rails
13. Large and multiple removeable plates to allow cable entry
14. Comes with casters and leveling feet installed
15. Removable side covers
16. Adjustable mounting Rail
17. Acceptable Manufacturer:
    a) Hubbell Premise Wiring
        1) H3S4242 - Cabinet, Server, 42RU,24"W,42"D
        2) H3S4248 - Cabinet, Server, 42RU,24"W,48"D
        3) H3S4742 - Cabinet, Server, 47RU,24"W,42"D
        4) H3S4748 - Cabinet, Server, 47RU,24"W,48"D

2.2 FLOOR MOUNT RACKS

A. Extruded aluminum construction, black powder coated finish.

B. 19 inches mounting width by 84 inches height with24 inch full width base.

C. 1000lb. static weight capacity.

D. 12/24 tapped holes, EIA/ECA-310-E Universal Mounting Pattern

E. 45 rack mount units, +1 on rear for Horizontal Busbar

F. 10 inch deep mounting rails.

G. Ladder rack mounting plate attached.

H. Furnish and install vertical wire management channels on both side of rack, type as specified.

I. Furnish and install horizontal wire management units, quantity and type as specified.

J. Furnish and install ground terminal block/lug for each rack and #6 ground wire to room ground bus bar.

K. Acceptable Manufacturer:

1. Hubbell Premise Wiring HHR45U10

2.3 ACCESSORIES

A. Fan Tray

1. 2 Fans per tray
2. Total of 162 CFM
3. 110 or 230 Volt
4. Works with Network Cabinet (H3N Series)
5. Acceptable Manufacturer:
   a) Hubbell Premise Wiring
      1) H3FT110 – 110 volt
      2) H3FT230 – 230 volt

B. Power Strip

1. Approved Manufacturer:
   a) Hubbell Premise Wiring MCCPSS19
2. Electrical Specifications: 20A-120V
3. Receptacle Type: NEMA 5-15R
4. 10 Outlets
5. Surge protected
6. ON-OFF switch

C. Horizontal Cable Management

1. 1RU front management only
   a) Acceptable Manufacturers:
      1) Hubbell Premise Wiring HM14C
   b) 4” front ring depth
   c) metal construction
   d) Front cover

e) Pass-thru holes from front to rear

2. 2RU front management only

a) Acceptable Manufacturers:

1) Hubbell Premise Wiring HM24C

b) 4” front ring depth

c) metal construction

d) Front cover

e) Pass-thru holes from front to rear

D. Vertical Cable Management

1. Equipment Racks

a) Acceptable Manufacturer:

1) Hubbell Premise Wiring VM610

b) 84”H X 6”W X 10”D

c) 14 gauge cold rolled steel

d) Door with dual hinge and positive latch

e) Steel rod support members – all steel construction

f) Black powder coated

E. 19” FILLER PANELS

1. 1RU - 1.75” H – MCCBP175

2. 2RU - 3.5” H – MCCBP350

3. 4RU - 7.0” H – MCCBP700

PART 3 EXECUTION

3.1 INSTALLATION

A. All termination hardware shall be installed in accordance with manufacturer’s recommended procedures.

B. All hardware shall be placed so as to make efficient use of available space in coordination with other uses. All wiring and associated hardware shall be placed so as to not impair the use or capacity of other building systems, equipment, or hardware placed by others (or existing).

C. Hardware shall be installed as to avoid interference with any other service or system, operation, or maintenance purposes such as access boxes, equipment, mechanical equipment access doors and covers, switches or electrical panels, and lighting fixtures. Hardware shall be installed to maintain a minimum 36 inch working clearances in the front and rear of all racks and cabinets wherever possible.

D. Contractor shall attach all floor mount racks and cabinets to building structure with hardware as required by manufacturer, 3/8 inch hardware minimum. Furnish and install seismic rated hardware where required by local codes. Furnish and install raised floor mounting kits where racks and cabinets are installed on raised floors.

E. Contractor shall attach all wall mount racks and cabinets to building structure with hardware as required by the manufacturer. All wall mount racks and cabinets shall be mounted on plywood backboards. Wall mount racks and cabinets on gypsum wall board walls shall be attached through the plywood and fastened to wood studs or wood blocking in the wall.

F. Rack configurations indicated on Drawings are typical and may not reflect final installation in all telecommunications spaces. Contractor shall coordinate final rack layouts with fiber termination enclosures, patch panels, wire management panels, equipment and equipment to be furnished and installed by the Owner, prior to installations in the enclosures or racks.

G. Furnish and install quantity of Velcro wraps as required for proper cable bundling, organization and support. Plastic or nylon cable ties will not be accepted for use on any category rated cable.

H. Contractor shall coordinate with General Contractor for placement of blocking in walls where wall mount cabinets are to be installed.

I. Furnish and install 3/4 inch wide hook and loop fasteners to bundle all cables in telecommunications spaces and other areas of telecommunications cable termination, minimum 8 inches in length.

SECTION 21300 - COMMUNICATIONS BACKBONE CABLING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Furnish and install voice and network cabling for the building as indicated on drawings and as called for hereinafter. This specification is for a voice and network cabling system. The Hubbell products specified hereinafter are utilized as campus standard for "JASPER MIDDLE SCHOOL". Any proposed replacement products must meet or exceed the published specifications. Alternates must be verified with "JASPER MIDDLE SCHOOL" by furnishing proper documentation of specifications verified by an industry-recognized test laboratory (U.L., ETL, ASTM).

B. This standard also establishes performance criteria for various system configurations and their elements.

C. Installer of cabling installation specified herein must be a certified trained installer using ANSI TIA Standards and the current edition of the BICSI TDMM (Telecommunications Distribution Methods Manual, Current Edition) as a guide for installation of inside cabling and associated components. Installer must be Hubbell Certified. Provide written documentation of these qualifications as part of the submittal process.

1.2 REFERENCE STANDARDS

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

B.	Section 2 01 00	Communications
C.	Section 2 05 26	Grounding & Bonding for Communications Systems
D.	Section 2 05 28	Pathways for Telecommunications Systems
E.	Section 2 05 36	Cable Trays for Communications Systems
F.	Section 2 11 10	Telecommunications Spaces, Equipment and Fittings
G.	Section 2 11 16	Communications Cabinets, Racks, Frames, and Enclosures
H.	Section 2 13 23	Communications Optical Fiber Backbone Cabling
I.	Section 2 15 13	Copper Horizontal Cabling
J.	Section 2 15 43	Communications Faceplates and Modules
K.	Section 2 16 19	Communications Patch Cords and Station Cords

PART 2 - PRODUCTS

1.1 SUBMITTALS

A. Provide submittal information for the following submittal sections as described below:

1. Product Data

2. Shop Drawings:

    a. Cable Routing and Grouping Plan: Provide only if cable routing and grouping have not been shown on the Drawings, or if proposing a deviation.
3. Testing
    a. Provide a list of proposed test equipment for use in verifying the installation of the communications cabling system.
        I. Provide for each testing device:
        II. Manufacturer and product number.
        III. Manufacturer documentation showing date and outcome of last recalibration.
4. Testing device shall have been re-calibrated within the manufacturer's recommended recalibration period.
5. Manufacturer documentation showing software revision. Software revision shall be most current revision available for the device and shall be based upon the most current TIA/EIA testing guidelines.
6. Patch cords and other specialized components.
7. Provide proposed test result forms.
8. Provide the calculated optical fiber cable loss budget for each optical fiber cable in the system.

PART 2 - PRODUCTS

2.1 GENERAL

A. Communication cabling system components shall be sourced (manufactured) by formally partnered Manufacturers (collectively referred to as the "Manufacturer").
    1. Products shall not be intermixed between different manufacturers unless the Manufacturer of the chosen communications cabling system has listed (in writing) another manufacturer's component as an "Approved Alternative Product" and will warrant the "Approved Alternative Product" as part of the Manufacturer's extended Warranty.
B. Provide the same Manufacturer for this section as that for Division 27 Section271500 – Communications Horizontal Cabling unless otherwise noted.
C. For a given Manufacturer, all cabling products shall be part of a single product line –

components shall not be intermixed between a Manufacturer's product lines.

1. The product line shall be engineered "end-to-end" (i.e. the system and all its components

shall be engineered to function together as a single, continuous transmission path).

2. Physically verify the following materials on site, prior to purchase and delivery of the materials:
    a. Lengths of conduit and/or pathway to be used for routing backbone cabling. Precut materials of insufficient length shall not be installed.
    b. Fill ratio and overall suitability of raceway for installation of inside plant cabling.
    c. Promptly notify the Engineer of potential overfill, potential for installation problems due to overfill, or raceway which may be otherwise deemed unsuitable for use and shall await the Engineer's direction prior to purchase and delivery of the materials.

2.2 PERFORMANCE

A. Protocols/Services:

At a minimum, the communications cabling system shall support data network protocols/services atrates up to 10 Gbps. It shall support 10 Mb, 100 Mb, 1 Gb, and 10 Gb Ethernet and other network protocols.

1. The communications cabling system shall additionally support RS-232 and other dedicated point-to-point protocols.
2. The communications cabling system shall support PBX telephone services.
    a. It shall support analog, digital, and ISDN services, and shall be compatible with direct trunk lines (POTS).

B. Category Rating (for copper components):

Copper components (cable, connectors, etc.) shall exceed the transmission requirements for connectinghardware as specified in the TIA standards for the Category for which they are rated.

a. PATCH PANELS Copper Patch Panels
    a. Multi-pair copper riser panels:
        I. Angled Flat rack mountable in 19" rack
        II. Terminate 4-pair, 22-26 AWG, 100-ohm unshielded twisted pair cables with a standard 110 punchdown tool
        III. Support a universal (T568A and T568B) wiring pattern
        IV. Exceed the transmission requirements for connecting hardware as specified in the TIA/EIA standards for the Category for which they are rated.
    b. Bar strain relief
    c. Complete with all incidental materials necessary for mounting
b. Analog phone gateway panels:
    a. 2 RU 48 port flat rack mountable in 19" rack
    b. (48) RJ45 ports
c. Manufacturer:
    a. Hubbell 48 port Nextspeed Punchdown Patch Panel HP648E
    b. Hubbell 48 port unloaded patch panel HPJ48

C. FIBER DISTRIBUTION CABLE

1. The Contractor shall install the appropriate plenum cable type for the given environment. For amixed environment, the contractor may install plenum cable entirely to simplify the installation.
2. Cable may be single mode/multimode hybrid cables where both fiber types are in a commonouter sheath.
3. Optical fiber cables shall meet or exceed all applicable national and local building fire code requirements. Fiber cables used in a return air plenum environment shall have an Underwriters Laboratories rating that meets or exceeds the requirements of NFPA 262-1985 and UL(r)-910. (OFCP) and (UL(r)) shall be printed every two (2) feet on the cable jacket. The optical fiber risercable shall have an Underwriters Laboratories rating that meets or exceeds the requirements ofUL(r)-1666 (OFCR) and (UL(r)) shall be printed every two (2) feet on the cable jacket. Riser cable exposed to return air plenum spaces in open cable tray shall be plenum rated.

4. Multi-mode, 50/125 micron OM4 grade, tight buffered, armored, OFCP rated.

5. 62.5/125 OM1 grade fiber may be utilized only in the case of legacy systems which cannot be supported over 50 micron fiber.
6. Single-mode, 8.3/125 micron OS2 grade, tight buffered, armored OFCP rated.
7. Multimode plenum:
    a. Hitachi 61897-24
    b. Hubbell HFCD15024P4
    c. or Corning equivalent
8. Single Mode plenum:
    a. Hitachi 61433-12
    b. Hubbell HFCD15024PS
    c. or Corning equivalent
9. Fiber optic cables utilizing below grade / outside pathways shall be Indoor/Outdoor Gel-free Stranded Loose Tube Cable construction.
10. Multimode plenum:
    a. Hitachi 61894-24
    b. Hubbell HFCD 14024P4
    c. or Corning equivalent
11. Single Mode plenum:
    a. Hitachi 61459-24
    b. Hubbell HFCD 14024PS
    c. or Corning equivalent
12. FIBER CASSETTES TERMINATING HARDWARE
    a. All terminations of fiber shall be fusion spliced into LC Fiber termination cassettes.
    b. LC Multi-mode (10G)
    c. HUBBELL OCSPLCS12M4
    d. SUMITOMO FTLC-FSP12TBOM4
13. LC Single-mode
    a. HUBBELL OCSPLCS12M4
b. SUMITOMO FTLC-FSP12TBOS2
13. FIBER RACK MOUNT PATCH PANELS
    a. 1U Unloaded adaptor Patch Panel: Hubbell FCR1U3SPL
    b. 2U Unloaded adaptor Patch Panel: Hubbell FCR2U6SPL
    c. Blank adapter panels for unloaded Patch Panel Hubbell FSPB

2.5 HORIZONTAL UTP CABLE

A. Data Cable – all voice and data backbone cable shall be:
    1. Part Number 4 pair:
       Hubbell HC6RPEB
       Hitachi 350 Blue, 38891 plenum rated
    2. Category: 6
    3. Cable type: Plenum rated.
    4. Color: Blue
    5. Wireless LAN Cable
        a. Category: 6
        b. Cable type: Plenum rated.
        c. Color: orange
    d. Part Number 4 pair:
       Hubbell HC6RPEOR
       Hitachi 350 Orange, 38891 plenum rated
    6. Cables Exposed to Moisture
        a. Any UTP cable installed in pathways below grade or exterior to the building shall be a filled or indoor/outdoor type cable, to prevent moisture intrusion. These cables shall have the same performance characteristics and rating of other project UTP cables

used for the same application, and must be submitted for approval prior to installation.

b. Part number:
   - Hubbell C6SOPBK
   - Hitachi 30180-8

1. Enclosures:
   A. Accept modules for the termination of multimode and/or single mode fiber backbone cables and shall be sized (port/fiber count and rack units) as shown on the Drawings.
   B. Rack mountable with sliding doors and strain relief
   C. Blank adapter panels for unused openings
   D. Complete with fiber connectors and receptacle adaptors (see "Connectors" below) and with incidental materials necessary for mounting.

2. Connectors:
   A. Factory prepolished with fusion splice mounted in fiber adapter panels inside fiber enclosure.
      1. Multimode: Duplex LC connectors for 50/125 µm mulitimode fiber
      2. Singlemode Duplex LC connectors for singlemode fiber

B. Manufacturers:
   1. Hubbell

3. Products: Fiber Optic Connector Housing

   b. Hubbell FCR series

4. Fiber Optic Connectors
   a. Corning Glass Fusion Splicing Pigtail
      i. Single - Hubbell FPLCS3SM
      ii. Bundled - Hubbell FPBKR12LC6S

2.3 COPPER TERMINATION FRAMES AND BLOCKS

A. 110-Style Blocks:
1. Exceed TIA-568-C Category 5e specifications for performance.
2. 100-pair (or as noted on drawings) connecting blocks, designation strips, and labels for each 25-pair strip.
3. Label colors per TIA standards.
4. UL listed blocks without legs as required for mounting on frames.
5. 66-style blocks are not acceptable.

B. Manufacturer:

1. P110 Blocks Rack Mount 100 pair with wire management
   a. Hubbell 110RM15

2.4 CABLE

Cables shall be manufactured by:

A. CAT6 Cable
   1. Hubbell or
   2. Hitachi

B. Fiber Optic OSP Cable
   1. Fiber glass shall be single mode manufactured by Hubbell

C. Fiber Optic Riser Cable
   1. Fiber glass shall be single mode manufactured by Hubbell

D. Coax
   1. to be determined on a per project basis.

E. OSP Coax, Flooded
   2. to be determined on a per project basis.

E. OSP Phone CAT3 Buried Service Wire (BSW)
   1. Hitachi Cable PE89 and /or PE22 as determined by "JASPER MIDDLE SCHOOL" or
   2. General Cable PE89 and /or PE22 as determined by "JASPER MIDDLE SCHOOL"

F. Riser Phone CAT3 - Copper riser shall be ARMM manufactured by:
   1. Hitachi or
   2. General

2.5 CABLE ASSEMBLIES (PATCH CORDS) AND CROSS-CONNECTS

A. Same as Copper Patch Cables: Provide per Division 27 Section 271500 – Communications Horizontal Cabling.

B. Fiber Patch Cables:
   1. Provide fiber patch cables for fiber cross-connects. Fiber patch cables shall be pre-manufactured (factory-terminated) with a UL rating of OFNR.
   2. Fiber patch cables shall be manufactured by the selected communications cabling Manufacturer.

C. Quantities and sizes: Provide 3-meter patch cables. Provide for 25% of all multimode ports.
   1. Color: Aqua

2.6 CABLE SUPPORTS

1. Provide per Division 27 Section 270529 –Hangers and Supports for Communication Systems.

2.7 CABLE STRAPS

1. Reusable Velcro hook-and-loop style straps to secure cable bundles. Plastic tie wraps are unacceptable.

2.8 TESTING

A. General

1. Testing of the systems shall be in accordance with the manufacturer's recommendations and with the Governing Requirements.
2. Test reports shall be complete and in accordance with the appropriate Governing Requirements.
3. Where testing discloses deficiencies in the work, rework, repair, or replace equipment and systems found deficient.
4. Continue remedial measures and retesting until satisfactory results are obtained. Remedial measures and retesting shall be at no additional cost to the Owner.
5. Testing of product or equipment prior to installation shall include performance testing to establish the applicability of equipment for its intended purpose.
6. Establish the required test procedures from required Governing Requirements and manufacturer's recommendations.
7. Provide necessary test equipment, power, and consumables to perform the test.
8. Notify the of test schedule(s) at least one week in advance

B. Perform test

1. Provide test result documentation to
2. Final testing and start-up of product, equipment, and systems shall include establishing proper capacity, operation, maintenance, and compliance with Governing Requirements.
3. Provide the services of manufacturer's representatives for systems to be tested and started up.
4. Establish the required test procedures from required Governing Requirements and manufacturer's recommendations.
5. Provide necessary test equipment, power, and consumables to perform the test.
6. Notify of test schedule(s) at least one week in advance
7. Test records for each cable within the system shall be printed directly from the tester and shall be submitted in paper form (in a binder) and on USB drive to the Owner and Consultant for review.
8. Handwritten test results will not be accepted.

C. For copper cables:

1. Testing device shall be an ANSI/TIA-568-C Level 4 testing instrument re-calibrated within the calibration period recommended by the manufacturer, with the most current software revision based upon the most current TIA/EIA testing guidelines.

D. For fiber cables:

1. Testing devices shall consist of a light source/power meter with a stabilized light source for end-to-end attenuation testing and an Optical Time Domain Reflectometer (OTDR) for testing on the reel, for continuity and quality testing, for accurately determining cable length, and for locating and correcting problems noted during attenuation testing.
2. Testing equipment shall be calibrated and traceable to the National Institute for Standards and Technologies (NIST), with an operating range of 850 ±30 nm or 1300 ±20 nm in accordance with TIA/EIA-526-14 for multimode testing, and an operating range of 1310 ±10nm or 1550 ±20 nm in accordance with TIA/EIA-526-7 for single mode testing.

3. To ensure quality connectorization/splicing, a microscope of not less the 200x magnification shall be used to visually inspect connectors and splices after installation.

PART 3 - EXECUTION

3.1 GENERAL

A. CONNECTORS

1. Fiber connectors and splices:
   a. Visually check fiber connectors/splices after splicing with a minimum 200x magnification microscope to ensure that no physical damage has occurred during the installation process.
   b. Fiber splices shall be fusion and shall be required for all fiber strands.
   c. Mechanical splices are not acceptable. Each fusion splice shall be protected in a splice tray or similar protective device that is designed to mount within the enclosure.
   d. Bare/stripped optical fiber strands shall be protected with a heat shrink or silicon adhesive to prevent exposure to moisture.

B. COPPER TERMINATION BLOCKS

1. Cable shall be routed horizontally along base of backboard until it reaches the termination block column on which it is to terminate and then shall route vertically to the termination block.

2. Termination block punch downs shall be as follows:

   a. Punch down cable sequentially across the termination strips.
   b. Punch down cable using only the selected communication cabling system
   c. Manufacturer approved impact tool.

3.2 CABLE

A. General (applicable to all cable types):

1. Cable shall be installed in strict compliance with the manufacturer's recommendations.
2. Maintain separation from other conductors (power, fire alarm, etc.) per NEC requirements and TIA/EIA standards.
3. The bending radius and pull strength requirements of all cable as detailed in the TIA/EIA standards and the manufacturer's installation recommendations shall be strictly observed during handling and installation.
4. Pull cables simultaneously where more than one cable is being installed in the same raceway
5. Use pulling compound or lubricant where necessary.
6. Use compounds that will not damage conductor or insulation (Polywater or approved equal).
7. Use pulling means; including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cable or raceway.
8. Cable jackets shall not be twisted during installation. Cables showing evidence of twisting shall be replaced at no additional cost to the Owner, regardless of the outcome of cable testing.
9. Cable shall be installed in a continuous (non-spliced) manner unless otherwise indicated.

B. Cable installed in conduit and/or ducts:

1. Fill ratios shall not exceed NEC requirements.
2. Cable shall not be pulled into conduit/ducts until the conduit/duct ends have been prepared for cable installation (i.e. reamed to eliminate sharp edges and insulated throat bushings installed). Cables pulled into conduit/ducts prior to conduit/duct end preparation shall be replaced at no additional cost to the Owner.
3. Reinstate pull-wires in conduits and ducts after use to facilitate future addition of cables.

C. Cable installed in cable tray:

1. Cable shall not be attached to the cable tray (i.e. cable shall be left "loose") with the exception of cable installed in cable tray (cable runway) within telecommunications rooms (see "Cable in telecommunications rooms" below).
2. Cable shall be laid in tray in such a way as to present a neat and professional appearance.
3. For cable tray serving both backbone (riser) and horizontal cabling, install cable in cable tray in such a manner that backbone cabling does not overlap with horizontal cabling – reserve approximately one-fourth of the space in the tray for backbone cabling and the remaining three-fourths for horizontal cabling.
4. Where cables in cable trays are required to maintain specific distances between each other, they shall be firmly secured to maintain this distance at fire rated penetrations.

D. Cable not installed in conduit/ducts or cable tray:

1. Cables shall be strapped or fastened with reusable Velcro hook and loop style cable straps/fasteners for support.
2. Staples and tie-wraps are not acceptable:
    i. Straps and fasteners shall not be over-tightened.
    ii. Cables showing evidence of over-tightening shall be replaced at no additional cost to the Owner, regardless of the outcome of cable testing.
3. Straps and fasteners installed in plenum spaces shall be plenum rated.
4. Cables shall be bundled by application (horizontal or backbone) and by cable type (Cat 3, Cat 5E, Cat 5, Cat 6, Cat 6A, MM Fiber, SM Fiber, etc.).
5. Cable applications and types shall not be intermixed within a bundle.
6. Cables in suspended cable runs shall be supported at varying intervals.
7. Cable spans shall be limited to 5 feet or less, and the length of spans shall vary along the cable path (i.e. a given span should not be the same length as the span preceding or following it – "exact" spans can degrade cable performance).
8. See Division 27 Section 270528 – Communications Raceways and Pathways for requirements.
9. Cable installed on exposed surfaces or structural members shall be installed parallel and perpendicular to the surfaces.
10. Surface contours shall be followed wherever possible. Cables shall be attached to surfaces at intervals not to exceed 3 feet.
11. Attaching cables to pipes, electrical conduit, mechanical items, existing cables, or the ceiling support system (grids, hanger wires, etc. – with the exception of ceiling support anchors) is not acceptable.

E. Cable in telecommunications rooms:

1. Cable straps: Install per Division 27 Section 271100 – Communications Rooms.

F. Cable on backboards:

1. Cable shall be routed as close as possible to the ceiling, floor, sides, or corners to ensure that adequate wall or backboard space is available for current and future equipment and for cable terminations.
2. Lay cables via the shortest route directly to the nearest edge of the backboard from mounted equipment or blocks. Secure all similarly routed and similar cables together and attach to D-rings vertically and/or horizontally, then route over a path that will offer minimum obstruction to future installations of equipment, backboards or other cables.
3. See "Part 3 – Execution: Copper Termination Blocks" herein for details on routing copper cabling to termination blocks.

G. Cable Slack:

1. Provide cable slack (service loops) at cable ends (both ends) to accommodate future cabling system changes.
2. Provide slack length as follows:
    a. For fiber: Provide a minimum of 25 feet.
    b. For copper and coaxial: Provide a minimum of 25 feet.

H. Copper Cable:

1. All pairs within a cable shall be terminated. Un-terminated cable pairs are not acceptable.
2. Provide strain relief at the patch panels to ensure durable connections.
3. For shielded/armored cable, bond both ends of the metallic shield (or metallic strength member) to the nearest TGB.

I. Fiber Cable:

1. All fiber strands within a fiber cable shall be spliced/connectorized. The installation of "dark fiber" is not acceptable.
2. Cable shall be tested on reel prior to installation.

J. Cable assemblies and patch cords

1. Provide cable assemblies to Owner.

3.3 TESTING

A. General

1. Test devices shall be in calibration throughout the testing period. Tests performed on equipment without up to date calibration shall be rejected and shall be repeated at no additional cost to the Owner.
2. Notify the Consultant and Owner seven (7) days in advance of each type of test to be conducted.

3. The Owner and/or Consultant may, at their discretion, witness all testing.
4. The Owner and Consultant shall be invited to attend and inspect the first instance of each type of test to be conducted.
5. Tests conducted prior to first inspection shall be at the sole risk of the Contractor, and as such are subject to rejection.
6. Such tests will be repeated at no additional cost to the Owner.

B. Systems Specific Testing: Communications Cabling System

1. All interior (inside plant) and exterior (outside plant) fiber cables shall be tested on the reel upon delivery to the job site prior to installation.
2. Test results shall be permanently affixed to the reel and a copy given to the Owner and Consultant for review prior to installation.
3. Testing shall demonstrate compliance with the factory test results as shipped with the reel.
4. Cables that fail to pass shall not be installed and replace the cable at no additional cost to the Owner.
5. Repair of damaged cable is not acceptable.
6. Test the communications cabling system for compliance to the Governing
7. Requirements and all applicable standards as follow:
    a. Visually inspect all labels at the station locations (faceplates/ports), patch panels/ports, and on each end of each cable to ensure that all cables and equipment are correctly identified.

C. Copper Cable:

1. For Backbone Distribution (inside and outside plant): Test each cable, all pairs, for length, shorts, opens, continuity, polarity reversals, transposition (wire map), and the presence of AC voltage.
2. Test entire channel, from termination block to termination block.
3. Test results shall demonstrate compliance with:
    a. The criteria specified in TIA/EIA-568-C for all Category of cables

D. Fiber Cable:

1. Prior to testing, calculate the cable loss budget for each optical fiber cable and shall be clearly shown on the test documentation.
2. Maximum loss shall be calculated by the following formula, assuming no splices:
3. For Backbone Distribution:
    a. Max Loss = (allowable loss/km) * (km of fiber) +(0.4 dB) * (# of connectors) + (0.3 dB) * (# of splices)
    b. A mated connector-to-connector interface is defined as a single connector for the purposes of the above formula.
4. A given fiber cable shall not exceed its calculated maximum loss (per the above formula).
5. Test all strands. Testing shall consist of a bi-directional end-to-end Optical Transmission Loss Test Instrument trace performed per ANSI/TIA-568-C, TIA/EIA-455-61 and/or a

bidirectional end-to-end power meter test performed per ANSI/TIA-568-C and TIA/EIA-455-53A.

6. Loss numbers shall be calculated by taking the sum of the two bi-directional measurements and dividing that sum by two.
7. All backbone fiber cables shall be tested with an OTDR in addition to attenuation testing performed with a power meter.
8. The number of samples (averages) for each OTDR test shall be such that the noise amplitude is significantly less than the smallest loss of any component under test.
9. Multimode fiber testing shall incorporate use of a mandrel wrap of fiber jumper to induce macro bends in the fiber.
10. Test measurements shall be provided as follows:
    a. For Multi-mode Cable: Test at both 850 and 1300 nm.
11. For Single mode Cable: Test at both 1300 and 1550nm.
12. Test results shall demonstrate compliance with:
    a. The criteria specified in TIA/EIA-568-C
    b. The calculated loss budget above.
    c. The criteria specified in IEEE 802.3z (1000Base-X Gigabit Ethernet) and IEEE 802.3ae (10GBase-X 10 Gigabit Ethernet)
13. In addition to the above, tests performed shall be both those recommended and mandated by the communications cabling system Manufacturer.

3.4 CABLES AND EQUIPMENT THAT DO NOT PASS

1. Cables and equipment that do not pass shall be identified to the Consultant.
2. The source of the non-compliance shall be determined, corrected or replaced, and re-tested at no additional cost to the Owner.
3. Provide new test results to the Consultant in the same manner as above.
4. If it is determined that a cable is at fault, remove the damaged cable and replace it with a new cable. Cable “repairs” are not acceptable.
5. The procedure for removing the cable shall be as follows:
    a. Prior to removal of the damaged cable and re-pull of the new cable:
    b. Any cables which are in the same conduit, duct or innerduct as the damaged cable shall be tested, regardless of whether or not they are new cables installed as part of this project or existing cables installed prior to this project.
6. If the damaged cable is a backbone or outside plant cable:
    a. The Owner and Consultant shall be informed of the schedule for the removal and re-pull.
    b. The new cable shall be tested on the reel prior to installation.
    c. All test results shall be provided to the Consultant for approval.
7. The damaged cable shall be removed, and the new cable shall be pulled in.
8. After the removal of the damaged cable and re-pull of the new cable:
    a. The new cable shall be tested.

b. Any cables which are in the same conduit, duct or innerduct as the damaged cableshall be tested, regardless of whether they are new cables installed as part of this project or existing cables installed prior to this project.
c. All test results shall be provided to the Consultant for approval.

9. Existing cables which are in the same conduit, duct or innerduct as the damaged cable, and which are damaged by the extraction and re-pull process, shall be removed and replaced at noadditional cost to the Owner.
10. Existing damaged cables that are replaced shall be subject to the testing procedures of thissection in its entirety.

SECTION 3 – DOOR ACCESS KEYPADS

Section 3 - Door Access Control							
Item #	Estimated Quantity	Hardware Required	Installation Required	Item Description	Manufacturer	Warranty	Notes
1	3	Yes	Yes	Access Control Interior Exterior Entry Way	Aiphone or Equivalent	3Years	Access Control in Front Office. Two way communication Exteriror and Interiror Entry way door.
2	6	Yes	Yes	Access Control Keypads	Continental Access	3Years	Keypads on Cafeteria, Int/Ext Front, Rear, 2 side doors

System Requirements

1. Hardware required for Aiphone Audio/Visual entry access to be installed on Front Entry Door and Office Entry Door in Vestibule.
2. Keypad Entry to be installed on Front Door, Office Entry Door in Vestibule.
3. Door release and communication base station to be installed at Secretaries desk.
4. Keypad entry to be installed on Front,Cafeteria delivery, Rear, 2 side doors.
5. All Keypads to have audit function.

Door Access Requirements

Preferred system will have a sequence of operations that will

1. Allow the Secretary and other designated person to have two way Audio and Visual communication with person and Front Door Entryway.
2. Allow the Secretary and other designated person to release the door lock to allow person entry into the vestibule.
3. Allow the Secretary and other designated person to release the door lock to allow person entry into the Office.

SECTION 4 – INTERCOM PAGING WITH DIGITAL CLOCKS

Section 4 – Intercom Paging with Digital Clocks							
	Estimated	Hardware	Installation				
Item #	Quantity	Required	Required	Item Description	Manufacturer	Warranty	Notes
					Telecor or equivalent		
	1	Yes	Yes	Paging System/Paging Speakers/Digital Clocks		5 years	See AreaA-E for locations and AreaA-E special instructions

CLASSROOM INTERCOM SPECIFICATIONS

1. General

This section and associated drawings define a communications system for an intercom, public address, and master clock system. The bidder shall provide infrastructure, cable, hardware, and equipment, as defined, to 1a complete and operational communications system.

Verify all items shown on plans, or specified, and be familiar with the working conditions, hazards, and local requirements involved; submission of bids shall be deemed evidence of such understanding. All Bids shall take these existing conditions into consideration before bidding.

All materials, unless otherwise specified, shall be new, free from any defects, and of the best quality of their respective kinds. All like materials shall be of the same manufacture, model, and quality, unless otherwise specified.

All manufactured articles, material, and equipment shall be applied, installed connected, erected, used, cleaned, adjusted, and conditioned as recommended by the manufacturers, or as indicated in their published literature, unless specifically herein specified to the contrary.

Contractor shall coordinate his work with the General contractor and other related trades, and new connections within existing systems.

All work shall be performed by Contractor and workmen with five years experience with Classroom Intercom Systems and specified products. Execute in a neat and workmanlike manner providing a thorough and complete installation. Work shall be properly protected during construction, including the shielding of soft or fragile materials. At completion, the installation shall be thoroughly cleaned and all tools, equipment, obstructions, or debris present as a result of this portion of work shall be removed from the premises.

Manufacturer's names are listed herein to establish a standard.

2. CODE COMPLIANCE

All work will conform to the National Electric Code and applicable local ordinances. Low Voltage contractor must pull all inspections permits as required.

3. Raceways and Cables

Electrical work will conform to the National Electric Code and applicable local ordinances.

All 125-volt electrical conductors shall be installed in galvanized electrical metallic tubing with compression type fittings and couplings, minimum 1/2" size conduit. Furnished and installed by Div 16 contractor.

All low-voltage wires and cables concealed in walls shall be run in EMT conduit from flush outlet boxes to above accessible ceilings. Provide conduit where cables penetrate firewalls above ceilings. Furnished and installed by Div 16 contractor.

All EMT entering boxes shall be served with insulating throat connectors and locknuts. Furnished and installed by Div 16 contractor.

No raceway shall be located in proximity of hot water lines or excessive heat.

Where raceways cannot be run concealed in walls, use Wiremold Series surface raceway complete with all fittings, box extension rings, and required accessories. Coordinate routing of surface raceways with the Owner. Furnished and installed by Div 16 contractor.

4. HANGERS AND SUPPORTS

Use owner provided Cable tray system or j-hooks system that shall be furnished and installed by division 16 contractor.

No perforated straps permitted for supporting raceways or cables.

Use caddy wire support bridle rings systems for the installation of wire drop to Ceiling Speakers, Call Buttons, Etc in Classrooms, Hallways, Offices, Etc. Tie-wraps for supporting low voltage cables run concealed above ceilings will not be permitted**.** Do not run cables loose on ceiling tiles. Support from structure above. Group cables in bundles as per NEC or Local Codes.

Use ceiling tie wires for seismic supporting system for all ceiling mounted speakers. Support from structure above.

Tie mounts, plates, and anchors shall be used.

5. GROUNDING

Ground all electrical apparatus in accordance with the National Electric Code.

6. Quality Assurance

Manufacturers must be regularly engaged in the manufacture of integrated communication systems, master clock systems, and ancillary equipment, of types and capacities required. Approved products shall have been in satisfactory use in similar service for not less than five years.

Contractor's Qualifications: Firms with at least five years of successful installation experience with projects utilizing integrated communications systems and equipment similar to that required for this project.

All items of equipment including wire and cable shall be designed by the manufacturer to function as a complete system and shall be accompanied by the manufacturer's complete service notes and drawings detailing all interconnections.

The Contractor shall be an established communications and electronics Contractor that has had and currently maintains a locally run and operated business for at least five years with Shelby County, TN. The Contractor shall be a duly authorized distributor of the equipment supplied with full manufacturer's warranty privileges prior to bidding the project. The bidding contractor shall be responsible for the installation and service of classroom Intercom System. NO SUBCONTRACTING OF INSTALLATION OR SERVICE OF SYSTEM PERMITTED.

The Contractor shall show satisfactory evidence, upon request, that he maintains a fully equipped service organization capable of furnishing adequate inspection and service to the system. The Contractor shall maintain at his facility the necessary spare parts in the proper proportion as recommended by the manufacturer to maintain and service the equipment being supplied.

Except where specifically noted otherwise, all equipment supplied shall be the standard product of a single manufacturer of known reputation and experience in the industry. The Contractor shall have attended the manufacturer's installation and service school and upon request must show proof of attending such a school.

Installing contractor must have a service office within 30 miles of the site and be expected of providing service within a 24-hour period of time.

7. SERVICE AND MAINTENANCE

The Contractor shall provide a one year warranty of the installed system against defects in material and workmanship. All labor and materials shall be provided at no expense to the Owner during normal hours. The warranty period shall begin on the date of acceptance by the Owner or the first uses of system which ever is first.

The Contractor shall, at the Owner's request, make available a service contract offering continuing factory authorized service of this system after the initial warranty period.

The system manufacturer shall maintain engineering and service departments Capable of rendering advice regarding installation and final adjustment of the system.

8. SOLE SOURCE RESPONSIBILITY

Except where specifically noted otherwise, all equipment supplied shall be the standard product of a single manufacturer of known reputation and experience in the industry. The Contractor shall have attended the manufacturer's installation and service school and upon request must show proof of attending such school.

9. IN SERVICE TRAINING

The Contractor shall provide a minimum of four hours of in service training with this system. These sessions shall be broken into segments which will facilitate the training of individuals in the operation of this system. Operators Manuals and Users Guides shall be provided at the time of this training.

10. Scope of Work

Furnish and install all materials, labor, equipment, permits, etc., to provide communications system as described herein and illustrated on the drawings for a complete operating system.

All manufactured articles, material, and equipment shall be applied, installed connected, erected, used, cleaned, adjusted, and conditioned as recommended by the manufacturers, or as indicated in their published literature, unless specifically herein specified to the contrary.

All work shall be performed by competent workmen and executed in a neat and workmanlike manner providing a thorough and complete installation. Work shall be properly protected during construction, including the shielding of soft or fragile materials. At completion, the installation shall be thoroughly cleaned and all tools, equipment, obstructions, or debris present as a result of this portion of work shall be removed from the premises.

Program the operational characteristics matching the operation described herein, adjusting for call routing, transfers, priorities, and volume levels.

The Contractor shall provide a minimum of four (4) hours of in-service training with this system. These sessions shall be broken into segments, which will facilitate the training of individuals in the operation of this system. Operator Manuals and User Guides shall be provided at the time of this training.

11. Submittals

Submit the shop drawings, product data, and quality control submittals specified below at the same time as a package.

Shop Drawings: Composite wiring and/or schematic diagrams of the complete system as proposed to be installed. Drawing shall include relative position of all major components, typical connections, field components, accessories, and cable types.

Product Data: Include catalog cut sheets, manufacturer's default specifications, Users operation guide, and bill of materials.

Quality control shall include the following:

1. Submit the Name, address, and telephone number of the nearest fully equipped service organization.

2. Submit a certificate of completion of installation and service training from the system manufacturer.

Program the operational characteristics matching the operation described herein, adjusting for call routing, transfers, priorities, and volume levels.

Remove all existing conduit, wire device, etc., being abandoned due to relocation.

12. Acceptable Manufacturers

The system shall be manufactured by Telecor, Inc. or equal

This Manufacturer name that is listed herein is to establish the standardization type of school intercom system Lakeland School district has made standard in there district. The products of other manufacturers will only be acceptable if approved by the specifying architect and the Owner 10-days prior to the bid. The substitute material must be of a quality as good or better than the material specified, and will serve with equal efficiency and dependability, the purpose for which the items specified were intended.

Final approval of these alternates shall be determined at the time of completion. Failure to provide the "functional equivalent" shall result in the removal of the alternate system and installation of the specified system at the contractor's cost.

The intent is to establish a standard of quality, function and features. It is the responsibility of the bidder to insure that the proposed product meets or exceeds the intent of these specifications.

The functions and features specified are vital to the operation of this facility and therefore inclusion in the list of acceptable manufacturers does not release the contractor from compliance with the requirements of this specification.

13. Product Overview

Furnish and install all equipment, accessories, and materials in accordance with the specifications and drawings to provide a complete and operating IP Based Communication system using TCP/IP protocol as outlined below. Provide Telecor IP based Dual Channel XL System

Following is an outline of the basic functions required, set as a minimum standard. These functions must be included in the bid. Any exceptions to these functions must be listed and submitted as part of the bid. If several manufacturers are required to provide these functions proof must be provided that they will function as one integrated system to the user prior to bid.

Intercom Features/Public Address Features:

1. Individual intercom circuit for every Classroom.
2. Urgent Call Placement.
3. Monitor Areas of the building during a crisis from the rescue team or on site security officer.
4. All Call announcements.
5. Emergency Announcements.
6. Automatic Page.
7. Urgent Call-In Page.
8. 32 Zones of Audio Program Distribution.
9. 32 Zones of Paging.
10. Monitor Areas of the building during a crisis from the rescue team or on site security.
11. Page areas of the building during a crisis from the rescue team or on site security officer.
12. Temporary Speaker Exclusion for Special Events.
13. Complete System Programming and diagnostics from LAN, WAN or Internet.

Time Control and Event Scheduler

1. 16 Schedules of Class Change Signals.
2. 32 Zones of Class Change Signals.
3. 1536 Class Change Signal Events.
4. Weekly System Event Scheduler.
5. Analog or Digital Clock Correction and synchronization.
6. Supports Electronic Message Displays for Timekeeping, Count Up-down.

timers and full alphanumeric messaging.
7. Automatic Daylight Savings Time Correction.

14. Intercom/PA Features and Product Description

Supply and install a complete IP Based Communication system using TCP/IP protocol microprocessor based Public Address, Intercom, and master clock system using 25-volt speakers and horns.

The system shall consist of the IP based using TCP/IP protocol Central Control Unit, Administrative Control Console(s), Integrated Master Clock and Rack Equipment. All other necessary devices that are required by this specification to create a complete and operational system such as Staff Phones, Call Buttons, Speakers, Horns, Amplifiers, Network Switches, Program Sources and Secondary Clocks must be supplied under this contract.

The system shall be capable of multiple open voice intercom paths used for intercom, paging, program distribution, or emergency paging. The system shall be initially equipped with minimum of one intercom speech path.

Provide a separate circuit for each classroom and administrative office so each room can be individually addressed.

Corridor speakers, classrooms and outside horns shall be combined into groups of owner's preference. There must be 32 independent software paging zones that each circuit may be a part of. Each individually point must also have the ability to be paged independent of the software zones.

The system shall provide VOIP technology in addition to the industry standard home-run wiring design. The VOIP technology will operate in the same manner as the conventional speakers. The system must be a hybrid system having the capability of using both traditional design and IP design. The VOIP technology must have the ability to incorporate a call switch and must be capable of operating on the independent LAN network or a dedicated IP network. The system shall support VOIP technology in the following ways.

1. The ability to utilize an IP speaker that is directly connected anywhere on the LAN.

2. The ability to utilize an IP Amplifier which is designed to receive audio Signals from the Telecor Communication System over an IP network.

   a. These amplifiers shall reside on a dedicated network or can be connected to available ports on a facilities LAN, if properly partitioned. This shall be used when transmitting audio signals to remote locations or where running a dedicated cable may be prohibitive or costly.

   b. Paging, Audio Programs and Time Tone Signals for class changes

originating in the Telecor system can be selectively transmitted to individual amplifiers.

c. The IP amplifier shall provide synchronization and correction of Telecor's Analog and Digital Clocks, as well as Telecor's Electronic Message Displays. The digital signaling that provides support for these devices originates in the Telecor Communication System and is broadcast over the LAN to the amplifiers

3. The ability to utilize an IP Termination Board Unit. This unit incorporates the features of the IP Amplifier plus allows the ability to allow 25 standard 25v intercom stations to be connected to the IP Unit. This will allow further flexibility in the wiring scheme while allowing two-way intercom over the LAN.

All VOIP station devices installed as part of this system shall operate on a dedicated IP network to enhance security and simplify management of this emergency call system.

The system must support a Visual Console software application that allows for the operation of the Intercom/Paging System from a Windows based PC. This software package shall utilize an easy-to-use graphical user interface (GUI), allow routine call processing from classrooms, quick graphical access to paging, and program distribution. The software application shall also allow easy activation of class change schedules. Emergency operations shall be simplified through this software application by allowing stored audio files, alphanumeric messages to message displays to be activated from the GUI. The GUI shall allow common operations such as daily announcements to become automated with the use of the Visual Console, removing multi-step console set ups. While all operations are conducted from the PC screen, the Administrative Console or Telephone handset shall provide the means for originating voice communications to selected locations.

The software must allow the creation of a Custom Operating Screen based on the floor plans of the school facility. Icons representing Intercom Stations, and Paging, Monitoring and Audio Program Zones shall be incorporated onto the floor plans.

The Software GUI shall provide:

- Simple Routine Call Processing
- Emergency Functions
- Paging
- Program Distribution
- Enabling and Disabling of Schedules
- Customizable Page Elements
- Customizable Operating Screen
- Element Library for Emergency Event Icons

CLASSROOM INTERCOM SPECIFICATIONS

The Visual Console must provide an efficient and reliable method of notifying the occupants of a facility of critical situations. A variety of emergency tone signals that reside within the Intercom/Paging System shall be activated by clicking on pre-programmed buttons on the PC GUI screen, initiating the transmission of tone signals to speakers, alphanumeric messages to Electronic Message Displays.

The system specified is based on the Telecor XL system providing at least the following features and functions. It shall be installed and programmed by an authorized and certified Telecor dealer.

The central control unit shall have the capacity for expanding the system to 300 stations and 4 Administrative Consoles with the addition of plug in modules, as required.

It shall be complete with circuitry for accomplishing all functions for signaling and communications to all stations, page zones, and administrative control consoles. The unit shall contain all required electronics on modular, plug-in type boards for ease of service and future expansion.

All programmable functions shall be stored in a non-volatile EEPROM memory and shall not be lost in event of a power failure.

Programming functions shall be accomplished through the use of a standard Internet web-browser interface. Any PC connected to the schools network and provided with the proper authorization shall have multi-level access to system programming. Any off-site PC shall have multi-level access to the system through the use of the public internet, provided they have been granted proper authorization by the school.

The intercom system shall be connected to a (dedicated IP network) Ethernet network port using the TCP/IP protocol for PC programming, performing diagnostics, or logging transactions either on or off-site.

The system shall support remote programming and support through a wide area network connection.

The programming interface shall support configurations for multiple sites and allow the user, after logon, to select which site to program from a list of all sites.

The user interface shall support user names and passwords. There shall be multiple levels of access allowed. Some users may only have view privileges only while others may only edit their site.

The program shall also serve as part of the documentation process. Page Zones and bell schedules shall support user-definable names and display as pick lists when editing the configuration.

Diagnostic functions shall be accomplished through any PC connected to the school network and provided with the proper authorization and diagnostic software. Any off-site PC shall have access to the system for diagnostics through the use of the public internet, provided that they have been granted proper authorization and have been provided diagnostic software.

Although the Intercom PA system is programmed through a PC interface, the system shall not have to rely upon a personal computer for day to day operation. All programming information is loaded into the intercom system allowing independent operation of the system.

The final copy of the program and the configuration of data files shall be provided to the school in electronic format

The audio channel(s) shall be priority driven allowing for the highest priority signal type access to a voice channel. The system shall be user programmable to allocate, upon demand, either of the channel(s) to facilitate simultaneous intercom conversations, pages, program distributions, or combination thereof.

Call switches shall be provided and shall be programmable and capable of routing incoming calls from classrooms to a specific control console or specific group of consoles. Every point shall be individually programmed. Up to 16 different console groups can be assigned.

Calls may be answered from any annunciating control console, administrative telephone, attendant console, and Caller ID enabled single-line telephones. When calls are routed to multiple consoles or console display units simultaneously, once answered, the call shall be automatically cancelled from all other consoles or displays.

The system shall support both "normal calls" and "emergency calls" from a single call switch. Merely depressing the call switch repetitively 3 times or flashing the hook-switch of the room telephone 3 times shall initiate emergency calls. Call switches may also be programmed to initial an emergency call by pressing and holding the button for three seconds.

If an emergency call is not answered within a user programmable time, the call will automatically call all other Administrative Control Consoles in the system.

The system shall be capable of monitoring supervised call-in lines. Any supervised line shall alert the control console if the line is cut. The system can be checked daily from the control console for damaged lines.

All call switches shall be associated with a speaker assembly.

Every call switch point shall support an independent programmable priority level.

CLASSROOM INTERCOM SPECIFICATIONS

Pre-announce tones will alert the classroom of incoming calls with distinct tones for each priority level.

To prevent unauthorized monitoring, the tone will sound whenever the classroom is being monitored, and will repeat at regular intervals. Facilities shall also be provided to defeat the tone repeat function from the administrative console if it is not desired.

Provide automatic gain control on intercom speech to assure constant speech level.

System shall have the capabilities of interfacing with a local Gym or Auditorium Sound System, providing automatic bridging of the local system, whenever it is accessed from the console. The system shall automatically track the local system, controlling the audio program as programmed from the control console.

System will provide emergency and All Call paging and a minimum of 32 zones of group paging. The paging zones shall be independent of the time tone and audio program distribution zones. Systems sharing zones for both paging and time tone shall not be acceptable.

32 different sections of the building can be monitored either on or off the premises from a control console or telephone.

System shall support up to 5 low-impedance microphones, which can be individually programmed to announce in any individual room or assigned to any of the 32 paging zones. The microphone(s) shall be software programmable for control and distribution thus eliminating the need to go to the central electronics for set-up.

Distribution of paging announcements can be made from any administrative control console, telephone, or dedicated microphone set-up.

Emergency announcements shall have the highest priority over any other system function.

System shall support general announcements made from a conventional microphone to facilitate reading a script and the participation of multiple announcers.

Keying the microphone shall automatically mute all other audio programs at a lower priority in the system and transmit the microphone audio to All Rooms or specific speaker zones, as programmed into the system software.

The system must have the capability of distributing audio program sources from any administrative control console, telephone system phone or intercom system DTMF phone. Program distribution shall be accomplished on an all rooms basis, selected rooms basis or an individual room.

Classroom phones, if required, must have the ability to add or remove themselves from an ongoing program from their room phone.

CLASSROOM INTERCOM SPECIFICATIONS

Inputs shall be provided from at least 3 different line level sources and 5 different low impedance sources. Available inputs include microphones, tuners, tape players, or auxiliary sources.

The program source(s) can be located remotely from the central electronics so that the customer does not have to go to the communications closet to select the program.

The control console shall be able to selectively monitor program sources being distributed.

Any area of the building shall be software programmable into 32 zones for easy selection of receiving audio programs. These zones shall be independent from the page and time tone zones. Individual rooms shall also be included or excluded independently from receiving audio programs.

Systems whose only method of distributing an audio program is by the use of mechanical switch banks shall not be accepted.

Systems, which cannot support the distribution of program material by at least two separate methods, will not be acceptable.

The Central Control Unit shall provide a 0 dB signal for connections to an external amplifier for distribution of program audio, time signals and paging announcements.

The system shall provide capability for multiple open voice intercom paths used for intercom, paging, program distribution, or emergency paging (Minimum of two).These paths shall be global, non-blocking circuitry. Systems offering multiple-speech paths, which are restricted to a single speech path per group of room stations or circuit card, due to hardware constraints, will not be accepted. The intercom channels shall be universal allocating channels on demand.

The system shall support the automatic distribution of user programmable, class change time signals (Bell Schedule) to all selected areas:

The system shall support a minimum of 1536 events and 16 schedules.

Building time zones shall be used to select which areas receive the tone. They must be totally independent from page zones and program zones.

Ability to produce 8 different tone signals for classroom time changes or emergency signals selected from a combination of over 1500 tones.

All time signal programming shall be accomplished from a control console or a PC utilizing a standard web browser program.

Facilities for displaying console clock in 24-hour or 12-hour format, selectable at the control console.

The duration of the tone, as well as frequency, burst length and output level shall be software programmable from the console or a web browser.

The system shall support running all time schedules concurrently.

All system tones shall be user programmable for the following durations in seconds: 2, 3.5, 5, 6, 8, 10, 12.

The system shall provide the ability to have music on class change allowing any source to be distributed to specific program zones.

The intercom channel(s) must be equipped with an auto call back function allowing callers to simply request call back in the event that a channel is busy alleviating the need to repeatedly call the system.

15. Telephone Features and Product Description

The system shall integrate to the facility phone system to allow any authorized telephone system extension to:

1. Place intercom calls to any classroom or work area

2. Make paging announcements to any of the 32 zones

3. Initiate system tones to any area of the facility

4. Distribute programs to any zones and zone monitor any area of the building

The system shall allow the facility phone system to answer any calls from call switches or intercom handsets. When the phone system is equipped with standard Caller-ID support, all information about the caller such as room number and call priority will be available on the display of the telephone.

The integration to the phone system will utilize unused CO ports from the KSU/PBX or VOIP Hybrid System. This system is described in another section of the project

documents. Coordinate with the phone system vendor to ensure the availability of these ports. Up to 2 ports may be required.

16. Master Clock Features and Product Description

The system shall provide for automatic clock correction for Daylight Savings Time, Spring Ahead/Fall Back. Daylight savings shall not require the use of any user input at the time of daylight savings.

The master clock system shall support a minimum of 16 schedules and 1536 events as outlined in the Intercom/PA Features section.

17. Administrative Telephones

The intercom /paging system control console shall be microcomputer based, desk top console, occupying no more than 75 sq. inches of desk space and weighing 2 lbs. It shall be manufactured of high impact, molded plastic with a standard 12 button keypad. It shall be Model MCC-300.

The console shall provide selected, two-way voice communications and signaling between the console and room stations as well as between other control consoles in the system. The console shall be equipped with a telephone handset with a retractable cord to allow private conversations. A built-in microphone and speaker shall provide for push-to-talk intercom conversations.

Incoming calls shall be annunciated on a two line 20-character LCD backlit digital display by room number and priority level. The display shall be angle adjustable to ensure the clearest viewing of console information.

All incoming calls shall be held in memory and displayed sorted by priority and order received. Each of the six levels of priority shall be displayed by a unique priority prefix and call-in tone. The console shall also have facilities for reviewing all incoming calls stored in memory

The distribution of program material shall be controlled from the administrative control console, room selector switch or DTMF intercom handset. System shall support distribution to any of 31 distribution zones, individual rooms or combination thereof.

Paging announcements shall be distributed from the control console on an Emergency All Call, All Call, All-Call multiple zone, or individual basis to classroom speakers.

Any control console in the system shall have the ability to be designated as the "current console" and have the incoming calls from room stations, enunciate at that specific console. This function shall be programmed from the control console and shall allow for simple transfer of the "current console" assignment to any other console in the system.

The console shall also provide the ability for the operator to place on hold, or clear any incoming calls registered in the system from the console keypad.

Facilities for activating and controlling remote devices from the control console keypad. The system shall control the operation of external bells, utilizing the internal time clock within the system.

Capabilities for user programming of alphanumeric architectural room numbers from the control console. The system shall be capable of using 2, 3, 4 digit number, or a letter (A = I) and a 3 digit number. The number for both the classroom speaker and the telephone shall be the same.

The console shall retain the last room number dialed until another room number is dialed or previous call is cancelled.

Ability to manually distribute tone signals on an all-call basis from the keypad of the Administrative Control Console cabinet.

The console shall have the ability to program or change all of the operational characteristics of the Intercom/PA system.

18. Program Sources

Provide an AM/FM CD player, Front-loading media slots (CD, USB, SD/ SDHC) deliver intuitive playback of today's ubiquitous mass-storage mediums. With support for CD-DA, MP3, WAV, and AAC file. Provide Denon DN-300Z with antenna

1. The AM section shall be tuned over a range of 520 kHz – 1710 kHz. The FM section shall be tuned over a range of 87.5 to 107.90 MHz.

2. The CD player shall provide utilize a sampling frequency of 44.1 KHz. The unit shall provide controls for play, stop, fast forward, rewind, track forward, track reverse, pause and eject. The unit shall allow for random track play mode by the push of a single button.

19. Amplifiers

The power amplifiers shall be manufactured by Telecor. The system shall be sized at ½ watt per classroom, 1 watt per corridor speaker, and 3.5 watts per horn. The amplifier load shall not exceed 80% capacity.

The amplifiers shall be capable of producing an audio output of 250 watts RMS at less than 1% distortion with a balanced output.

They shall be designed to operate on a line voltage of 115 AC. One amplifier shall be provided for each audio channel. Provide Telecor SI-250 as needed

20. Equipment Racking

The central electronics equipment located in (MDF) shall be contained in an upright free standing rack, The rack must be sized by the contractor to house all

components required by this specification plus 20% spare expansion room for additions.

The EIA / TIA / RoHS compliant, gang able rack shall overall measurements of 83.125"H x 32"D x 23.06"W with panel space of 44 rack units. Load capacity shall be 3,150 lbs. The rack shall include a recessed rear door with vents and key lock; top panel with 10U opening and compound knockouts; open base with grounding stud; two pairs adjustable mounting rails with printed RU increments; knockout panels with combination knockouts above/below rear door; blank project panel below rear door; and provisions to mount an optional surface-mount front door (ordered separately). The rack shall be manufactured in the U.S.A. with certified U.S. steel and have a black wrinkle powder epoxy finish. It shall be listed to UL 2416. Provide Lowell Model No. LGR-4432 or Equal by Middle Atlantic.

The rack must be supplied with the additional items as required, Side Panels Lowell model SDP-4432,vented locking front door Lowell model LFD-44FV, Leg levelers for raising rack Lowell model LL, Provide for all unused rack spaces, blank panels or vented rack panels per manufacturer recommendations or Equal for all by Middle Atlantic.

The Telecor central electronics equipment shall be mounted in free standing equipment rack where indicated on the plans. The intercom card cage and power supply shall be supplied with the necessary mounting hardware to accommodate rack mounting. Mounting Hardware shall be Telecor model XL-RMK

The remote electronics equipment located in (IDF's) locations shall be contained in wall mounted rack, The rack must be sized by the contractor to house all components required by this specification plus 20% spare expansion room for additions.

The E.I.A. compliant, UL2416 listed, welded sectional wall rack shall consist of a back box and mounting section made in the U.S.A. from 16 gauge certified U.S. steel. Overall measurements shall be 23.05"D x 23.06"W. The mounting section

shall be 17.06"D with triple formed side-to bottom, side-to-top wrapped construction to achieve strength equivalent to 3/16" thick steel. It shall include side vents, one pair adjustable mounting rails tapped 10-32 (with mounting hardware), four knockouts for antennas (top and bottom), and integral rails on E.I.A. spacing (top and bottom). The mounting section shall attach to the back box on the inside with two heavy duty, spring-loaded L-pins (self seating, positive locking), which can be attached on either side to alter swing orientation. The back box shall be 5.80"D with keyhole mounting slots on 16" centers, 10" x 10" rear opening, embossed dimples and lacing points on the back plane, knockout panels with combination knockouts (.75-.5", 1.5-1") on top and bottom, and two keyed side locks. The rack shall have a black wrinkle powder epoxy finish. Provide Lowell model LWR-series or Equal by Middle Atlantic.

Each wall rack location must be supplied with the additional items as required, vented locking front door Lowell model LFD-XXFV, provide additional rear mounting rails for each rack as required Lowell model RRD-XX, Provide for all unused rack

spaces, blank panels or vented rack panels per manufacturer recommendations or Equal for all by Middle Atlantic.

For the MDF & IDF locations provide rack mounted uninterruptible power supply (UPS) for each location. For the Main (MDF) location provide Middle Atlantic model number UPS-22008IP, 8 outlet 2150VA/1650w, individual outlets with web enabled, provide additional Middle Atlantic UPS-EBPRD extend run time battery pack. (Only)

For (IDF) locations provide rack mounted uninterruptible power supply (UPS) for each rack location. Provide Middle Atlantic model number UPS-1000R-8IP, 8 outlet 1000VA/750w, individual outlets with web enabled. (Only)

21. Call Switches

The Call Switch shall be a Telecor model CS-1pt or approved equal. Furnish and install where indicated on the plans.

1. The switch shall be a momentary action, push-button switch mounted on a 1-gang brushed stainless steel plate suitable for flush or surface mounting on a standard single gang back box with 3 - 9/32" mounting centers.

2. The stainless steel plate shall be inscribed "Push to Call".

22. Ceiling Mounted Speakers

The Ceiling mounted speaker system for suspended tile ceilings shall be a 2'x2' layin speaker system, it shall directly replace a 2'x2' ceiling tile. Each speaker system shall include a factory-mounted driver mounted to a sub-plate with a fine perforation steel grille finished in white powder epoxy. The driver shall be 8" dual cone with a power rating of 15W. It shall have a magnet weight of 10 ozs., frequency response of 54Hz-11.6kHz (+6dB); 50Hz-20kHz (+6.6dB) and sensitivity

of 97.9dB avg. measured 1W/1M. The system shall include a steel backbox (.147 cu.ft.) with leads exiting through a metal clamp. The dual voltage transformer (70/25V) shall feature primary taps at 0.25, 0.5, 1, 2 and 5W. speaker shall include four restraint tabs for code compliance. Provide Lowell Model LT2-810-72-BB qty as shown on drawings or equal by Atlas-Soundolier.

22.A Wall Mounted Speakers

The baffle for indoor surface-mount applications shall be Lowell Model DSQ-8 or DSL-8 Series with 8" 25 volt speaker with muilti tap transformer, The back box shall feature wiremold knockouts on top/bottom, and universal mounting hole pattern in rear. The steel grille shall feature a circular perforation pattern. Both pieces shall have a white powder epoxy finish. Coordinate with Architect which model should be installed for each location. or equal by Atlas.

23. Horn Loudspeakers

The horn style loudspeaker shall be Double re-entrant metal horn with high efficiency 15W compression driver for clear voice paging and tone signaling in indoor or outdoor applications is ideal for use where a weather-resistant horn is specified for public address/signaling applications that require high intelligibility

It operates within a frequency range of 537Hz-4.5kHz (+6dB) with a sensitivity of 112.2dB log average (1W/1M) 124.0dB maximum SPL (calculated based on power rating and measured sensitivity). Horn includes a high quality transformer for use in 25V,70V or 100V distributed applications; taps are selected with a screwdriver.

Tap selector and screw terminal connections are located on rear, in a recessed area with integral strain relief and protective plastic cover. Horn mounts with universal swivel bracket for efficient installation and positioning. Mounting bracket base measures 2.875" dia. with 3 equally spaced holes (.28" dia.). Horn assembly measures 8.94" dia. x 9.38”D and features all-metal construction with durable beige epoxy finish for long service life.

Dispersion shall be 50 degrees conical (2kHz Octave Band). Impedance shall be 5000, 2500, 1300, 670, 330, 90, 45 ohms. Horn shall include a 25/70/100V transformer with screwdriver selectable taps. Taps for 25V use shall be: .13, .25, .48, .93, 1.9, 6.9, and 13.9W. Taps for 70V use shall be: 1, 2, 3.8, 7.5, and 15W. Taps for 100V use shall be: 2, 4, 7.7 and 15W. Provide Lowell Model LH-15TA or equal by Atlas-Soundolier where shown on drawings.

24. General wiring requirements

Wiring for Classrooms, Hallway Speakers and Call Buttons stations shall be West Penn 25357 or 357, West Penn 25291 or West Penn 452 provided Plenum rated cable in all locations per local code, project requirements or as per system manufacturers requirements.

Each classroom room should have homeruns back to Bix's or 66 punch blocks in IDF terminal closets or MDF main equipment rack.

All master station wiring shall be Westpenn 4245 or 254245 as recommended by manufacture wire type, or equal by Belden.

For Fiber Optic cable plant (IC Lan) provide 62.5 multimode cable, provide 6 strand cable from each IDF to MDF location.

Provide Westpenn M9x045T or equal by Belden, Gepco or Mohawk. Provide and Terminate at each end of fiber optic cable to new fiber patch bays with LC or SC connections.

All wiring shall meet all local, State, and National codes.

25. Network /Lan

Provide new Independent (Lan) network for School intercom system. The Intercom Lan (IC LAN) should include all network switches as required for MDF and each IDF locations. Provide 24 port 10/100/1000 1g switches with SFP ports and transceivers. Provide switches by HP, Cisco or Netgear.

Fiber Optic Rack mount enclosures for (MDF) location provide 4 Ru rack mount patch panel that will accommodate 12 adpater strips plates as required. provide Westpenn cable PP-W4U1 or equal by Hubble.

Fiber Optic Rack mount enclosures for (IDF) locations provide 2 Ru rack mount patch panel that will accommodate 6 adpater strips plates as required. provide Westpenn cable PP-W2U1 or equal by Hubble.

For Fiber connector panels for each fiber enclosure use Westpenn SC simplex Mulitimode 6 port model AS-WCO6M, SC duplex Multimode 12 port model AS-WC12M or for LC duplex mulitimode 12 port model AS-WL12M, for LC Quad mulitimode 24 port model AS-WL24M. Provide as needed for each IDF or MDF location.

Provide necessary Standard 62.5micron fiber optic glass type Multi-Mode patch cables for patch bays. Test and verify each fiber conductor from patch bays in MDF to IDF locations.

END OF BIDDING SECTION

Section 5 – A/V Systems for Gym & Auditorium

Section 5 – A/V Systems for Gym and Auditorium							
	Estimated	Hardware	Installation				
Item #	Quantity	Required	Required	Item Description	Manufacturer	Warranty	Notes
					Not specified		
	1	Yes	Yes	A/V Systems for Gym and Auditorium		5 years	See AreaD-E for locations and AreaD-E special instructions

A/V Systems for Gym and Auditorium submittal

The school is looking for Design and Build proposals for sound system for the auditorium sound system and Gym sound system.
Speakers, amplifiers, wired and wireless microphones, digital console, and simple user interface(s) for power sequencing and basic operation. Assistive listening system option for hearing impaired.

SECTION 275116

THEATER SOUND SYSTEM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

This Section includes the following:

1. This Section includes equipment for amplifying, distributing, and reproducing sound signals.
2. The following specifications detail the minimum performance and related criteria for a complete sound reinforcement system proposed for this project.
3. Provide and install a complete theater sound reinforcement system as directed on the electrical plans and herein specified.
4. The Contractor shall provide all labor, materials, equipment, and services with the exception of the wiring raceway system for sound cable and required electrical circuits which are to be installed by the project electrical contractor. The Contractor shall install a complete and working system according to the performance specifications and turn over to the owner at the final acceptance of this facility. Any item required to achieve this shall be provided whether or not they are specifically mentioned herein. It is the Contractor's responsibility to review and point out to the architect any information or conditions that could affect the final installation of the system.

Related Sections include the following:

1. Division 26 Section "Low-Voltage Electrical Power Conductors and Cables" for commonly used installation requirements.
2. Division 26 Section "Grounding and Bonding for Electrical Systems" for commonly used grounding methods and installation requirements.
3. Division 26 Section "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.
4. Division 26 Section "Raceways and Boxes for Electrical Systems" for commonly used electrical raceways and installation requirements.
5. Division 26 Section "Vibration and Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.
6. Division 26 Section "Wiring Devices" for device and face plate color and material.
7. Division 07 Section "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

Related Documents:

1. Drawings and general provisions of the contract, including general and supplemental conditions, General Requirements and specifications apply to the work specified in the section.
2. Electrical General Requirements section applies to this section.

1.3 DEFINITIONS

A. Channels: Separate parallel signal paths, from sources to loudspeakers or loudspeaker zones, with separate amplification and switching that permit selection between paths for speaker alternative program signals.

B. Zone: Separate group of loudspeakers and associated supply wiring that may be arranged for selective switching between different channels.

C. V: Volume control unit. (Volume Attenuators)

1.4 SUBMITTALS

Product Data:

1. Digital Mixer.
2. Digital I/O Box
3. Power Amplifiers.
4. Wireless and Wired Microphones and Accessories.
5. Equipment Rack, Panels, and accessories.
6. Loudspeakers.
7. Digital Signal Processor.
8. Volume Attenuators.
9. Transformers.
10. Floor Pockets and Wall Plates.
11. Power Sequencing Unit and Modules.
12. Assistive Listening System.
13. Media Players.
14. Cabling.

Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, fire alarm devices, security devices, special ceiling patterns and special moldings.
2. Field quality-control test reports.
3. Operation and maintenance data.

1.5 QUALITY ASSURANCE

Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

Comply with NFPA 70.

Comply with UL 50.

1.6 COORDINATION

Coordinate layout and installation of system components and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Listed manufacturers are to establish a level of quality and performance. Any substitutions will need to meet specifications and approved by Marion County Dept of Education. Contact Mike Ogden via email mogden@mctns.net.

2.2 COMPONENTS

A. Theater Speakers

1. Main Seating Loudspeakers – JBL AM7215/64 for Left and Right main speakers, weight approximately 60 lbs. (Provide two)
2. Main Seating Loudspeakers – JBL AM7215/95 for Center main speaker, weight approximately 60 lbs. (Provide one)
3. Delay Speakers – JBL Control 29AV-1with MTC-29UB U-Bracket, weight approximately 27 lbs. (provide a total of four) run at 110 watts on 70v. tap. Combine two per amplifier channel.
4. Note: All loudspeakers specified above to be provided with proper rigging and/or brackets for safe mounting to structure. Speakers will be aimed and adjusted for best sound results during “Testing and Equalization.”

B. Powered Monitor Speakers – Electro-voice ZLX-12BT, 12” Two Way Powered Monitor Speaker, (provide four with 25-foot microphone cable for input)

C. Auxiliary Ceiling Loudspeakers – Lowell RPAK810-72 consisting of 8” Loudspeakers with 5-watt, 70-volt line transformers, white speaker baffle, enclosure with acoustic pad, and LBS8-R1 Round Hole T-Bar Bridge. One Speaker is for the Green Room and one for the Dressing Room. Each room volume level shall be controlled by a wall mount Atlas AT-10 Volume Control.

D. 48 Channel Digital Mixer – Allen & Heath SQ-7 with dust cover (provide one)

E. 48 Input, 16 Output Digital I/O Box – Allen & Heath GX4816 (provide one)

F. Digital Signal Processor – Atlas TSD-BB44 (provide one)

G. Floor Boxes – Mystery Electronics FCMA-3000 (provide four with accessories below)

1. BB3000 Back Box, (provide four total)
2. MPR Insert Panel, (provide four total)
3. MPK Insert Panel, (provide eight total)
4. MP8 Insert Panel, (provide four) total
5. Neutrik NC3FDL-L-BAG-1, Panel Mount Female XLR Connector, (provide sixteen total)
6. Neutrik NC3MDL-L-BAG-1, Panel Mount Male XLR Connector, (provide four total)
7. Mystery Electronics HFPN Blanking Plate, (provide twelve total)

H. System Amplifiers –

1. Crown DCi 2|1250 for Left and Right main speakers, (provide one)
2. Crown DCi 2|1250 for Center Speaker and Green Room & Dressing Room speakers, (provide one)
3. Crown DCi 2|300 for Delay speakers, (provide one)

I. Storage Drawer – Middle Atlantic D3 (provide two)

J. Wired and Wireless Microphones and Accessories –

1. Sennheiser EW-DX 835-SET (R1-9). Rechargeable Dual Handheld Wireless System with BA 70 rechargeable battery, (provide one)
2. Sennheiser EW-DX EM 2 (R1-9) Two Channel Digital Receiver, (provide seven)
3. Sennheiser EW-DX SK (R1-9) Bodypack Transmitter, (provide fourteen)
4. Sennheiser BA 70 Rechargeable Battery Pack for EW-D, (provide fourteen)
5. Countryman E6OW6L1SR Earset Microphone for Sennheiser Bodypack, (provide fourteen)
6. Sennheiser EW-D ASA Splitter (Q-R-S) Antenna Distribution, (provide two)
7. Sennheiser ADP, UHF Passive Directional Paddle Antenna, (provide two)
8. Sennheiser CHG 70N + PSU Kit, 2-Bay Network Enabled Charger, (provide two)
9. Sennheiser CHG 70N, 2-Bay Networked Enabled Charger, (provide six)
10. Sennheiser WM1, Wall Mount Bracket, (provide two)
11. Shure A26X, Three Inch Mic Mount Extension, (provide two)
12. Shure UA825, 25 Ft. RG-8X Low Loss Cable, (provide two)
13. Sennheiser e835-S, Wired Dynamic Cardioid Microphone with on-off switch, (provide four)
14. Atlas MS10-CE, Straight Microphone Stand, (provide four)
15. Rapco Horizon RBM1-25, 25 Foot Microphone Cable, (provide four)

16. Shure MX202B/C Black Overhead Microphones, (provide six)
17. Proco WP1004 Single Gang Stainless Steel Wall Plate with Single XLR Mic Jack for Overhead Microphones, (provide six)

K. Power

1. Power Sequencing Unit – Middle Atlantic USC-6R with USC SWL remote switch with LED Status.
2. Rack Power - Middle Atlantic MPR-6A Raceway with (one) M-20A Module, (one) MPR-BL4A Blank, (four) RLM-20A Remote Modules, and (one) MPR-BL8A Blank. Connect circuits to power sequencing unit. Supply all necessary tails and jumpers required for a fully functional system.
3. Sound Booth Power – Middle Atlantic RLM-20-1CA Remote Power Module connected to power sequencing unit for proper sequence order, (provide one).

L. Assistive Listening System – Williams FM557 PRO with (4) PPAR37N Receivers, Batteries, EAR022 Surround Earphones and remote coaxial antenna , (provide one).

M. Sound Booth Media Player – Tascam CD-400U Media Player with Bluetooth connected to mixing console , (provide one).

N. Main Sound Equipment Rack – Lowell LER-3522, 35 RU, with LFD-35 Solid Front Door, (provide one)

O. Work Light for Rear of Equipment Rack – Middle Atlantic LT-CABUTL-DUAL, Dual LED Work Light, (provide one)

P. Brush Plate Organizer – Atlas BP-1 for cable pass through from I/O Stage Box, (provide one)

Q. Vent Plates – Middle Atlantic VT-2, (provide two)

R. Blank Plates for Equipment Rack – Provide blank plates as required for enclosed and finished appearance.

S. Wiring:

1. Main Loudspeakers – West Penn #227. One home run to each loudspeaker
2. Delay Loudspeakers – West Penn #226
3. Microphone and Line Level Circuits – West Penn #291
4. Remote Modules and Sequencer – West Penn #4245FBL Shielded CAT5e Cable
5. Digital Mixer and I/O Box - Rapco Horizon DURASHIELD-150NBNB-R, 150 Ft. Shielded CAT6 Cable with Ethercon Connectors.

PART 3 - EXECUTION

3.1 SCOPE OF WORK

A. The system shall consist of a center cluster mono sound reinforcement system with digital mixer and I/O box

B. The mixing equipment and media player shall be located in the sound booth.

C. System dynamics such as equalization, compression, and limiting will be handled by a DSP and programmed as required. Pull and terminate one Shielded CAT6 cable between the DSP network input and the Sound booth for programming purposes.

D. System Power Sequencing, System Amplification, Wireless Microphones, DSP, Assistive Listening System, and Digital I/O Box shall be located in an equipment rack on the stage.

E. Four Floor Pockets will be loaded with listed connectors on the stage.

F. Remote sound system activation shall be provided in the sound booth.

3.2 INSTALLATION

A. Wiring Method: Install wiring in raceways except within consoles, cabinets, or accessible ceiling spaces. Use plenum cable in environmental air spaces including plenum ceilings. Conceal cables and raceways except in unfinished spaces.

B. No exposed cables.

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess. Use lacing bars in cabinets.

D. Control-Circuit Wiring: Install number and size of conductors as recommended by system manufacturer for control functions indicated.

E. 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 (300 mm) for speaker microphones and adjacent parallel power and telephone wiring. Separate other intercommunication equipment conductors as recommended by equipment manufacturer.

F. Splices, Taps, and Terminations: Arrange on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

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

H. 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.

I. Wall-Mounting Outlets: Flush mounted.

J. No Floor-Mounting Outlets.

K. Speaker-Line Matching Transformer Connections: Make initial connections using tap settings indicated on Drawings.

L. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

M. The Contractor shall furnish and install a complete sound reinforcement system. Any material and/or equipment necessary for the proper operation not specified or described herein but necessary for the total operation of the system shall be deemed part of this specification.

N. All electrical power to the sound reinforcement system shall be on dedicated circuits with isolated grounds and be derived from the same electrical phase. One (1) 120 volt @ 20-amp circuit shall be provided at the sound control/PA booth counter and three (3) 120 volt @ 20 amp circuits hard wired to the main equipment rack.

3.3 WARRANTY

A. The Contractor shall warrant the equipment to be new and be free from defects in material and workmanship and will within one year of acceptance repair or replace all or any parts of the equipment found to be defective. Warranty maintenance shall be provided by the Contractor on a 24 hour per day, 7 days per week basis at no additional cost to the owner during the warranty period. The Contractor shall be the factory authorized distributor and service center for the mixing, equalization, amplification, and loudspeaker equipment specified.

B. The equipment listed is to establish a standard of quality and performance. The base bid on the system shall be the system as specified. Equipment installed and maintained by “Contactor” shall be deemed to meet this specification. Alternate equipment of equal quality may be bid as an add-to or deduct-from the base bid provided prior approval is obtained from the project electrical engineer ten (10) days prior to the bid date. Conditions shall also apply as outlined in Paragraph A above.

3.4 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.

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

B. Install grounding electrodes as specified in Division 26 Section "Grounding and Bonding for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Electro acoustic equalization of the completed system shall be performed after the following is complete:

1. Verification of the numbering of all system lines with like numbered Brady tags at the termination of each end of the lines. Numbers shall be transferred to the one-line functional drawing of the system as part of the owner’s operation and maintenance package of materials.

2. All loudspeaker devices to be swept tested within their specified range and power rating for proper performance and freedom from mounting device buzzes and rattles.

3. Verification of all mounting devices to have a safety factor of times five shall be accomplished prior to testing.

The following test equipment shall be considered minimum for this purpose: sound level meter, real time audio spectrum analyzer, sine/square wave generator, impedance bridge, audio oscilloscope, distortion analyzer, calibrated microphone, random noise generator and program computer.

Using the real time spectrum analyzer and random noise generator, prepare a raw curve. Feedback tune the system for the announce microphone until permanent feedback modes have been minimized and the feedback reducer circuit is engaged in DSP. Optimize the equalization for the full range response as certified by the playback of MP3's and other prerecorded material. Observe the high pass requirements of the loudspeakers when optimizing for low frequency response.

The owner shall be notified at the completion of the preliminary testing that the system is ready for final testing and operational instructions. At that time, the owner shall be presented with a bound and indexed set of equipment operational manuals on all system electronics, a one-line functional diagram of the system, and a certificate of completion in accordance with the specifications outlined herein. The Contractor shall train owner's representatives on the startup and operation of the sound system. The Contractor shall have present the lead technician on the project at the first major beneficial use of the system to make adjustments under actual conditions with patrons and participants present. The Contractor shall give a second training session to the owner's representatives within the warranty period.

Retesting: Correct deficiencies, revising tap settings of speaker-line matching transformers where necessary to optimize volume and uniformity of sound levels, and retest. Prepare a written record of tests.

Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Prepare a list of final tap settings of paging speaker-line matching transformers.

3.6 ADJUSTING AND CLEANING

A. On-Site Assistance: Engage a factory-authorized service representative to provide on-site assistance in adjusting sound levels, resetting transformer taps, aiming speakers and adjusting controls to meet occupancy conditions.

B. Adjust for proper operation.

C. Remove and replace warped, bowed, or otherwise damaged.

D. One year adjustment prior to second season of use.

1. Contractor is responsible for initiating and scheduling test at the convenience of the owner.
2. On-Site Assistance: Engage a factory-authorized service representative to provide on-site assistance in adjusting sound levels, resetting transformer taps, aiming speakers, and adjusting controls to meet occupancy conditions.

END OF SECTION 275116

SECTION 275220

GYMNASIUM SOUND SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

This Section includes the following:

1. This Section includes equipment for amplifying, distributing, and reproducing sound signals.
2. The following specifications detail the minimum performance and related criteria for a complete sound reinforcement system proposed for this project.
3. Provide and install a complete gymnasium sound reinforcement system as directed on the electrical plans and herein specified.
4. The Contractor shall provide all labor, materials, equipment, and services with the exception of the wiring raceway system for sound cable and required electrical circuits which are to be installed by the project electrical contractor. The Contractor shall install a complete and working system according to the performance specifications and turn over to the owner at the final acceptance of this facility. Any item required to achieve this shall be provided whether or not they are specifically mentioned herein. It is the Contractor’s responsibility to review and point out to the architect any information or conditions that could affect the final installation of the system.

Related Sections include the following:

1. Division 26 Section "Low-Voltage Electrical Power Conductors and Cables" for commonly used installation requirements.
2. Division 26 Section "Grounding and Bonding for Electrical Systems" for commonly used grounding methods and installation requirements.
3. Division 26 Section "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.
4. Division 26 Section "Raceways and Boxes for Electrical Systems" for commonly used electrical raceways and installation requirements.
5. Division 26 Section "Vibration and Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.
6. Division 26 Section "Wiring Devices" for device and face plate color and material.
7. Division 07 Section "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating

items.

Related Documents:

1. Drawings and general provisions of the contract, including general and supplemental conditions, General Requirements and specifications apply to the work specified in the section.
2. Electrical General Requirements section applies to this section.

1.3 DEFINITIONS

A. Channels: Separate parallel signal paths, from sources to loudspeakers or loudspeaker zones, with separate amplification and switching that permit selection between paths for speaker alternative program signals.

B. Zone: Separate group of loudspeakers and associated supply wiring that may be arranged for selective switching between different channels.

C. V: Volume control unit. (Volume Attenuators)

1.4 SUBMITTALS

Product Data:
1. Analog Rack Mount Mixer.
2. Portable Rack
3. Power amplifiers.
4. Wireless and Wired Microphones and Accessories.
5. Equipment rack, panels, and accessories.
6. Loudspeakers.
7. Digital signal processor.
8. Floor Pockets and Wall Plates.
9. Power sequencing unit and modules.
10. Media Players.
11. Cabling.

Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, fire alarm devices, security devices, special ceiling patterns and special moldings.

Field quality-control test reports.

Operation and maintenance data.

1.5 QUALITY ASSURANCE

Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article

100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

Comply with NFPA 70.

Comply with UL 50.

1.6 COORDINATION

Coordinate layout and installation of system components and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Listed manufacturers are to establish a level of quality and performance. Any substitutions will need to be approved Marion County Dept of Education. Contact Mike Ogden via email mogden@mctns.net.

2.2 COMPONENTS

A. Gym Speakers

1. Community V2-3594W, White 3-Way Passive speakers with VB-VY35 White U-Bracket (Provide eight)

2. Note: All loudspeakers specified above to be provided with proper rigging and/or brackets for safe mounting to structure. Speakers will be aimed and adjusted for best sound results during “Testing and Equalization”.

B. 16 Channel Analog Mixer – Mackie 1604VLZ4 with RP1604-VLZ Roto pod Bracket Kit (provide one)

C. Digital Signal Processor – Atlas TSD-BB22 (provide one)

D. System Amplifiers – Crown DCi 2|1250, (provide two)

E. Bluetooth Receiver for Main Equipment Rack – Denon DN-300BR Rackmount Bluetooth Receiver, (provide one)

F. Storage Drawer – Middle Atlantic D2 (provide one)

G. Sennheiser e835-S, Wired Dynamic Cardioid Microphone with on-off switch, (provide one)

H. Rapco Horizon RBM1-10, 10 Foot Microphone Cable, (provide one)

I. Single Gang Stainless Steel Wall Plate with Single XLR Mic Jack for Wired Microphones, (provide two)

J. Power - Furman M-8S Power Sequencer, (provide one)

K. Portable Rack – Gator G-PROR-8U, 8 Space Rack with retractable handle, (provide one)

1. Shure SCM268, Four Channel Mixer, (provide one)

2. Storage Drawer – Middle Atlantic D2 (provide one)

3. Media Player – Tascam CD-400U Media Player with Bluetooth, (provide one)

4. Power – Furman M-8X2 Power Conditioner, (provide one)

5. Wired and Wireless Microphones and Accessories –

a. Sennheiser EW-DX 835-SET (R1-9). Rechargeable Dual Handheld Wireless System with BA 70 rechargeable battery, (provide one)

b. Sennheiser CHG 70N + PSU Kit, 2-Bay Network Enabled Charger, (provide one)

6. Blank Panel – Middle Atlantic EB-1, (provide one)

7. Rapco Horizon RBM1-25, 25 Foot Microphone Cable, (provide one to connect mixer output in portable rack to microphone connector in floor plate)

L. Desktop Stand for Announcer – Atlas DS-7E, (provide one)

M. Microphone Stands – On Stage MS7701B Tripod stands, (provide two)

N. Main Sound Equipment Rack – Lowell LER-2422, 24 RU, with LFD-24 Solid Front Door, (provide one)

O. Blank Plates for Equipment Rack – Provide blank plates as required for enclosed and finished appearance.

P. Wiring:

1. Gym Loudspeakers – West Penn #227. One home run to each loudspeaker

2. Microphone and Line Level Circuits – West Penn #291

PART 3 - EXECUTION

3.1 SCOPE OF WORK

A. The system shall consist of an eight-speaker mono sound reinforcement system with portable rack mounted mixer feeding the main mixer located in the main equipment rack.

B. The portable rack shall consist of a four channel mixer, media player, wireless microphones, two space storage drawer and power conditioner.

C. The main equipment rack shall consist of the main mixer, a Bluetooth receiver, system amplifiers, DSP, storage drawer and blank panels.

D. System dynamics such as equalization, compression, and limiting will be handled by a DSP and programmed as required.

3.2 INSTALLATION

A. Wiring Method: Install wiring in raceways except within consoles, cabinets, or accessible ceiling spaces. Use plenum cable in environmental air spaces including plenum ceilings. Conceal cables and raceways except in unfinished spaces.

B. No exposed cables.

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess. Use lacing bars in cabinets.

D. Control-Circuit Wiring: Install number and size of conductors as recommended by system manufacturer for control functions indicated.

E. 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 for speaker microphones and adjacent parallel power and telephone wiring. Separate other intercommunication equipment conductors as recommended by equipment manufacturer.

F. Splices, Taps, and Terminations: Arrange on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

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

H. 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.

I. Wall-Mounting Outlets: Flush mounted.

J. No Floor-Mounting Outlets.

K. Speaker-Line Matching Transformer Connections: Make initial connections using tap settings indicated on Drawings.

L. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

M. The Contractor shall furnish and install a complete sound reinforcement system. Any material and/or equipment necessary for the proper operation not specified or described herein but necessary for the total operation of the system shall be deemed part of this specification.

N. All electrical power to the sound reinforcement system shall be on dedicated circuits with isolated

grounds and be derived from the same electrical phase. One (1) 120 volt @ 20-amp circuit shall be provided at the main equipment rack.

3.3 WARRANTY

A. The Contractor shall warrant the equipment to be new and be free from defects in material and workmanship and will within one year of acceptance repair or replace all or any parts of the equipment found to be defective. Warranty maintenance shall be provided by the Contractor on a 24 hour per day, 7 days per week basis at no additional cost to the owner during the warranty period. The Contractor shall be the factory authorized distributor and service center for the mixing, equalization, amplification, and loudspeaker equipment specified and provide documents of proof along with submittals for verification.

B. The equipment listed is to establish a standard of quality and performance. The base bid on the system shall be the system as specified. Equipment installed and maintained by "Contractor" shall be deemed to meet this specification. Alternate equipment of equal quality may be bid as an add-to or deduct-from the base bid provided prior approval is obtained from the project electrical engineer ten (10) days prior to the bid date. Conditions shall also apply as outlined in Paragraph A above.

3.4 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.

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

B. Install grounding electrodes as specified in Division 26 Section "Grounding and Bonding for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Electro acoustic equalization of the completed system shall be performed after the following is complete:

1. Verification of the numbering of all system lines with like numbered Brady tags at the termination of each end of the lines. Numbers shall be transferred to the one-line functional drawing of the system as part of the owner's operation and maintenance package of materials.

2. All loudspeaker devices to be swept tested within their specified range and power rating for proper performance and freedom from mounting device buzzes and rattles.

3. Verification of all mounting devices to have a safety factor of times five shall be accomplished prior to testing.

The following test equipment shall be considered minimum for this purpose: sound level meter, real time audio spectrum analyzer, sine/square wave generator, impedance bridge, audio oscilloscope, distortion analyzer, calibrated microphone, random noise generator and program computer. The Contractor shall

submit along with equipment specifications a certified listing of the above equipment along with model and serial numbers.

Using the real time spectrum analyzer and random noise generator, prepare a raw curve. Feedback tune the system for the announce microphone until permanent feedback modes have been minimized and the feedback reducer circuit is engaged in DSP. Optimize the equalization for the full range response as certified by the playback of MP3's and other prerecorded material. Observe the high pass requirements of the loudspeakers when optimizing for low frequency response.

The owner shall be notified at the completion of the preliminary testing that the system is ready for final testing and operational instructions. At that time, the owner shall be presented with a bound and indexed set of equipment operational manuals on all system electronics, a one-line functional diagram of the system, and a certificate of completion in accordance with the specifications outlined herein. The Contractor shall train owner's representatives on the startup and operation of the sound system. The Contractor shall have present the lead technician on the project at the first major beneficial use of the system to make adjustments under actual conditions with patrons and participants present. The Contractor shall give a second training session to the owner's representatives within the warranty period.

Retesting: Correct deficiencies, revising tap settings of speaker-line matching transformers where necessary to optimize volume and uniformity of sound levels, and retest. Prepare a written record of tests.

Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Prepare a list of final tap settings of paging speaker-line matching transformers.

3.6 ADJUSTING AND CLEANING

A. On-Site Assistance: Engage a factory-authorized service representative to provide on-site assistance in adjusting sound levels, resetting transformer taps, aiming speakers, and adjusting controls to meet occupancy conditions.

B. Adjust for proper operation.

C. Remove and replace warped, bowed, or otherwise damaged.

D. One year adjustment prior to second season of use.

1. Manufacturer is responsible for initiating and scheduling test at the convenience of the athletic department.

2. On-Site Assistance: Engage a factory-authorized service representative to provide on-site assistance in adjusting sound levels, resetting transformer taps, aiming speakers, and adjusting controls to meet occupancy conditions.

END OF SECTION 275220

Secition 6 – Security Cameras

Section 6 – Security Cameras							
	Estimated	Hardware	Installation				
Item #	Quantity	Required	Required	Item Description	Manufacturer	Warranty	Notes
					Honeywell or equivalent		
	60	Yes	Yes	Security NVR and Cameras		5 years	Vendor to provide location Area Map

Security Cameras Submittal

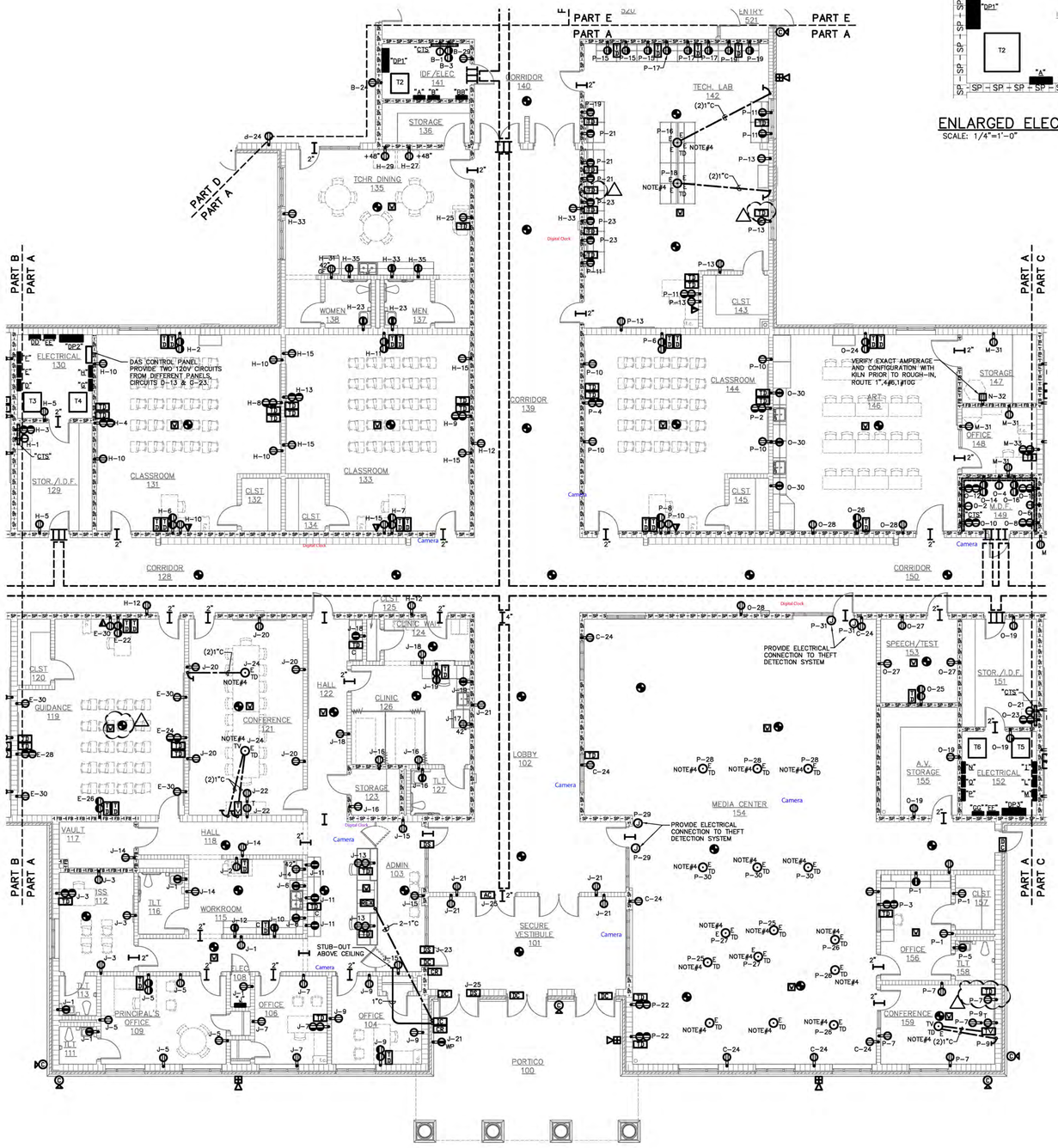
1. List the hardware and software required to implement this project.

2. Provide a detailed map and building diagram of the proposed surveillance system for Jasper Middle School, including camera placement and network equipment.

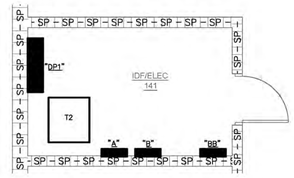
3. The primary goal of the surveillance system is to address security concerns and to protect against potential threats.

4. System's data storage capabilities including local server and cloud storage options must be able to save for 10 days before overwriting.

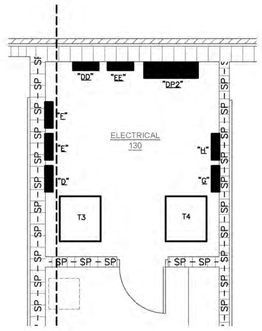
5. Camera System will be placed on network separate from the school if IP based.



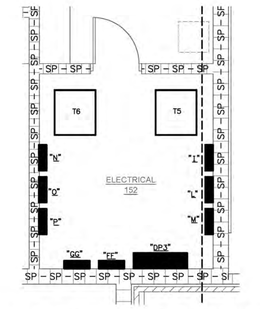
FLOOR PLAN – PART "A" – POWER & COMMUNICATIONS
SCALE: 1/8"=1'-0"



ENLARGED ELECTRIC ROOM 141
SCALE: 1/4"=1'-0"



ENLARGED ELECTRIC ROOM 130
SCALE: 1/4"=1'-0"



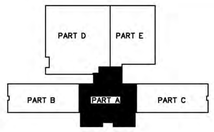
ENLARGED ELECTRIC ROOM 152
SCALE: 1/4"=1'-0"

NOTES

1. PRIOR TO LOCATING ANY AND ALL DEVICES AT CASEWORK, COUNTERTOPS ETC., THE CONTRACTOR SHALL REFER TO FINAL ARCHITECTURAL CASEWORK ELEVATIONS AND SHOP DRAWINGS TO VERIFY MOUNTING HEIGHTS AND LOCATIONS. ALL DEVICE LOCATIONS SHALL BE COORDINATED WITH THESE DRAWINGS AND/OR THE ARCHITECT PRIOR TO ROUGH-IN.
2. ALL 120V, 20 AMP CIRCUITS WITH HOMERUNS GREATER THAN 70 FEET SHALL HAVE CIRCUIT AND GROUNDING CONDUCTORS OF #10AWG AS MINIMUM. ANY 120V, 20 AMP CIRCUIT WITH OUTLETS GREATER THAN 100 FEET OF BRANCH CIRCUIT LENGTH SHALL HAVE CIRCUIT AND GROUNDING CONDUCTORS OF #10AWG MINIMUM TO ALL OUTLETS AND HOMERUN. ANY 120V, 20 AMP CIRCUIT WITH HOMERUN GREATER THAN 140 FEET SHALL HAVE BRANCH CIRCUIT AND GROUNDING CONDUCTORS OF #8AWG MINIMUM. PROVIDE ADEQUATE BOX TO SPLICE #12AWG FOR TERMINATION TO DEVICE. LARGER CONDUCTORS MAY REQUIRE THE UTILIZATION OF LARGER CONDUIT SIZES – REFER TO NEC TABLES.
3. CONTRACTOR SHALL PROVIDE ALL REQUIRED BRANCH CIRCUIT RACEWAY AND CONDUCTORS FOR CONNECTION OF DEVICES INDICATED. WIRING MAY BE ROUTED BELOW CONCRETE SLAB OR OVERHEAD, AT THE CONTRACTORS OPTION. ALL ABOVE-SLAB RACEWAY SHALL BE CONCEALED FROM VIEW IN WALLS OR ABOVE CEILINGS EXCEPT WHERE SPECIFICALLY NOTED TO BE SURFACE MOUNTED. PROVIDE A DEDICATED NEUTRAL CONDUCTOR FOR ALL 120V CIRCUITS.
4. VERIFY EXACT LOCATION OF FLOOR BOXES WITH ARCHITECT PRIOR TO ROUGH-IN.

WALL LEGEND

- BRICK & C.M.U. WALL (EXTERIOR WALL)
- C.M.U. WALL SMOKE PARTITION
  NOTE: CONTRACTOR SHALL SEAL ALL NEW DUCT AND PIPE PENETRATIONS AT ALL SMOKE PARTITIONS.
- C.M.U. WALL 1 HR. FIRE BARRIER



KEY PLAN
N.T.S.

ENGINEERING SERVICES GROUP, INC.
CONSULTING ENGINEERS
900 East Hill Ave. Suite 350
Knoxville, Tennessee 37915
(865) 522-0393
PROJECT NO. 19539

NEW
JASPER MIDDLE
JASPER, TENNESSEE

KAATZ, BINKLEY, JONES & MORRIS ARCHITECTS, INC.
NASHVILLE
1008 CHARLIE DANIELS PKY., MT. JULIET, TN 37122
P.O. BOX 713, MT. JULIET, TN 37122
PHONE: (615) 754-5393 FAX: (615) 754-5340

REVISIONS	
NO.	DATE
FM1	1-21-2022
	10/6/2022
DWN.	MWE
CHK'D.	ECH
APP'D.	ECH

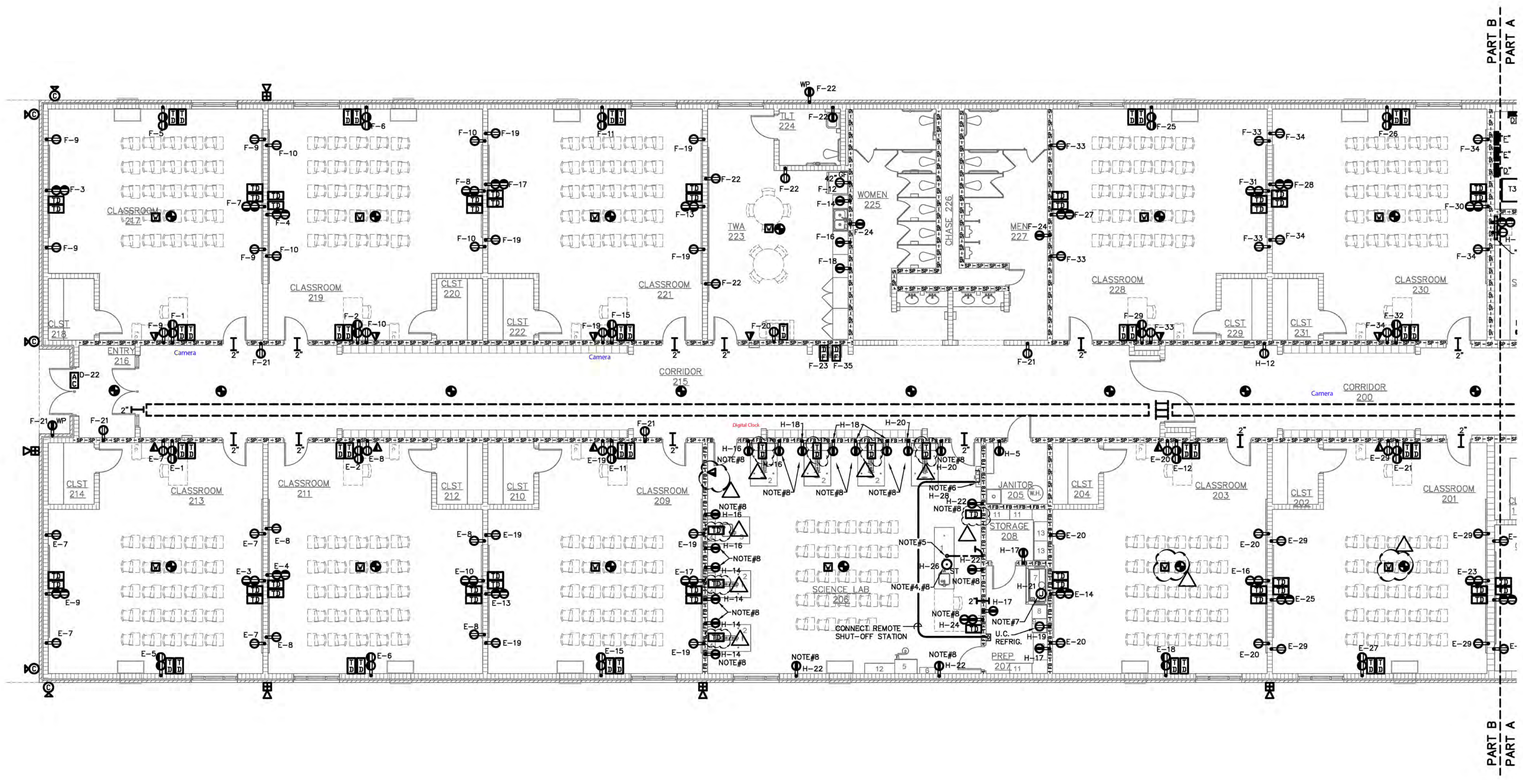
EDWARD C. HENDERSON
REGISTERED ENGINEER
No. 119545
STATE OF TENNESSEE

FLOOR PLAN - PART A - POWER & COMMUNICATIONS

PROJ. NO. 2697-14
DATE 11/23/2021
DWG. NO.
E1.06

NEW
JASPER MIDDLE

Outside Bull Horn /Intercom Speaker



FLOOR PLAN – PART "B" – POWER & COMMUNICATIONS

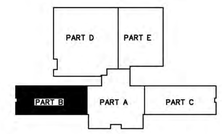
SCALE: 1/8"=1'-0"

NOTES

1. PRIOR TO LOCATING ANY AND ALL DEVICES AT CASEWORK, COUNTERTOPS ETC., THE CONTRACTOR SHALL REFER TO FINAL ARCHITECTURAL CASEWORK ELEVATIONS AND SHOP DRAWINGS TO VERIFY MOUNTING HEIGHTS AND LOCATIONS. ALL DEVICE LOCATIONS SHALL BE COORDINATED WITH THESE DRAWINGS AND/OR THE ARCHITECT PRIOR TO ROUGH-IN.
2. ALL 120V, 20 AMP CIRCUITS WITH HOMERUNS GREATER THAN 70 FEET SHALL HAVE CIRCUIT AND GROUNDING CONDUCTORS OF #10AWG AS MINIMUM. ANY 120V, 20 AMP CIRCUIT WITH OUTLETS GREATER THAN 100 FEET OF BRANCH CIRCUIT LENGTH SHALL HAVE CIRCUIT AND GROUNDING CONDUCTORS OF #10AWG MINIMUM TO ALL OUTLETS AND HOMERUN. ANY 120V, 20 AMP CIRCUIT WITH HOMERUN GREATER THAN 140 FEET SHALL HAVE BRANCH CIRCUIT AND GROUNDING CONDUCTORS OF #8AWG MINIMUM. PROVIDE ADEQUATE BOX TO SPLICE #12AWG FOR TERMINATION TO DEVICE. LARGER CONDUCTORS MAY REQUIRE THE UTILIZATION OF LARGER CONDUIT SIZES – REFER TO NEC TABLES.
3. CONTRACTOR SHALL PROVIDE ALL REQUIRED BRANCH CIRCUIT RACEWAY AND CONDUCTORS FOR CONNECTION OF DEVICES INDICATED. WIRING MAY BE ROUTED BELOW CONCRETE SLAB OR OVERHEAD, AT THE CONTRACTORS OPTION. ALL ABOVE-SLAB RACEWAY SHALL BE CONCEALED FROM VIEW IN WALLS OR ABOVE CEILINGS EXCEPT WHERE SPECIFICALLY NOTED TO BE SURFACE MOUNTED. PROVIDE A DEDICATED NEUTRAL CONDUCTOR FOR ALL 120V CIRCUITS.
4. TURN CONDUIT UP UNDER INSTRUCTOR LAB TABLE IN THE SERVICE CHASE AREA, REFER TO DETAIL SHEET E2.2. CONTRACTOR SHALL CONNECT ALL RECEPTACLES FURNISHED WITH TABLES, REFER TO TABLE MANUFACTURERS INSTALLATION INSTRUCTIONS. VERIFY EXACT LOCATION OF CONDUIT STUB UP WITH ARCHITECT AND EQUIPMENT SUPPLIER PRIOR TO ROUGH-IN. PROVIDE PULL-STRING.
5. TURN 2-1" CONDUIT UP UNDER INSTUCTOR'S TABLE IN THE SERVICE CHASE AREA FOR USE BY OWNER'S VENDOR TO INSTALL COMMUNICATIONS CABLING. STUB UP 6" AFF SIMILAR TO POWER. EXTEND TO WALL AND STUB OUT ABOVE ACCESSIBLE CEILING. VERIFY EXACT LOCATION OF CONDUIT STUB-UP WITH ARCHITECT AND EQUIPMENT SUPPLIER PRIOR TO ROUGH-IN. PROVIDE PULL-STRING.
6. PROVIDE CONNECTION FOR UTILITY CONTROL PANEL FOR EMERGENCY SHUT-OFF OF GAS AND ELECTRIC RECEPTACLES, 120VOLT, REFER TO PLUMBING DRAWINGS FOR EXACT LOCATION. INSTALL REMOTE PANIC BUTTON FURNISHED WITH PANEL. PROVIDE ALL NECESSARY RACEWAY, BOXES, WIRING ETC FOR A COMPLETE INSTALLATION IN ACCORDANCE WITH EQUIPMENT MANUFACTURER SPECIFICATIONS.
7. PROVIDE 120VOLT CONNECTION FOR FUME HOOD FURNISHED BY OTHERS. VERIFY ALL REQUIREMENTS WITH EQUIPMENT SUPPLIER PRIOR TO ROUGH-IN. PROVIDE CONTROLS WIRING TO FUME HOOD FAN AS REQUIRED.
8. RECEPTACLES NOTED SHALL BE CONTROLLED BY GAS CONTROL PANEL FURNISHED BY OTHERS. ELECTRICAL CONTRACTOR SHALL ROUTE CIRCUITRY AS NOTED THROUGH CONTACTORS FURNISHED WITH GAS CONTROL PANEL. COORDINATE REQUIREMENTS WITH GAS CONTROL PANEL SUPPLIER. ELECTRICAL CONTRACTOR SHALL INSTALL CONTACTOR ENCLOSURE ABOVE ACCESSIBLE CEILING IN ROOM SERVED.

WALL LEGEND

- BRICK & C.M.U. WALL (EXTERIOR WALL)
- C.M.U. WALL SMOKE PARTITION
  NOTE: CONTRACTOR SHALL SEAL ALL NEW DUCT AND PIPE PENETRATIONS AT ALL SMOKE PARTITIONS.
- C.M.U. WALL 1 HR. FIRE BARRIER



KEY PLAN
N.T.S.

ENGINEERING SERVICES GROUP, INC.
CONSULTING ENGINEERS
900 EAST HILL AVE, SUITE 350
KNOXVILLE, TENNESSEE 37915
(865) 522-0393
PROJECT NO. 19539

NEW
JASPER MIDDLE
JASPER, TENNESSEE

KAATZ, BINKLEY, JONES & MORRIS ARCHITECTS, INC.
NASHVILLE
1008 CHARLIE DANIELS PKY., MT. JULIET, TN 37122
P.O. BOX 713, MT. JULIET, TN 37122
PHONE: (615) 754-5393 FAX: (615) 754-5340

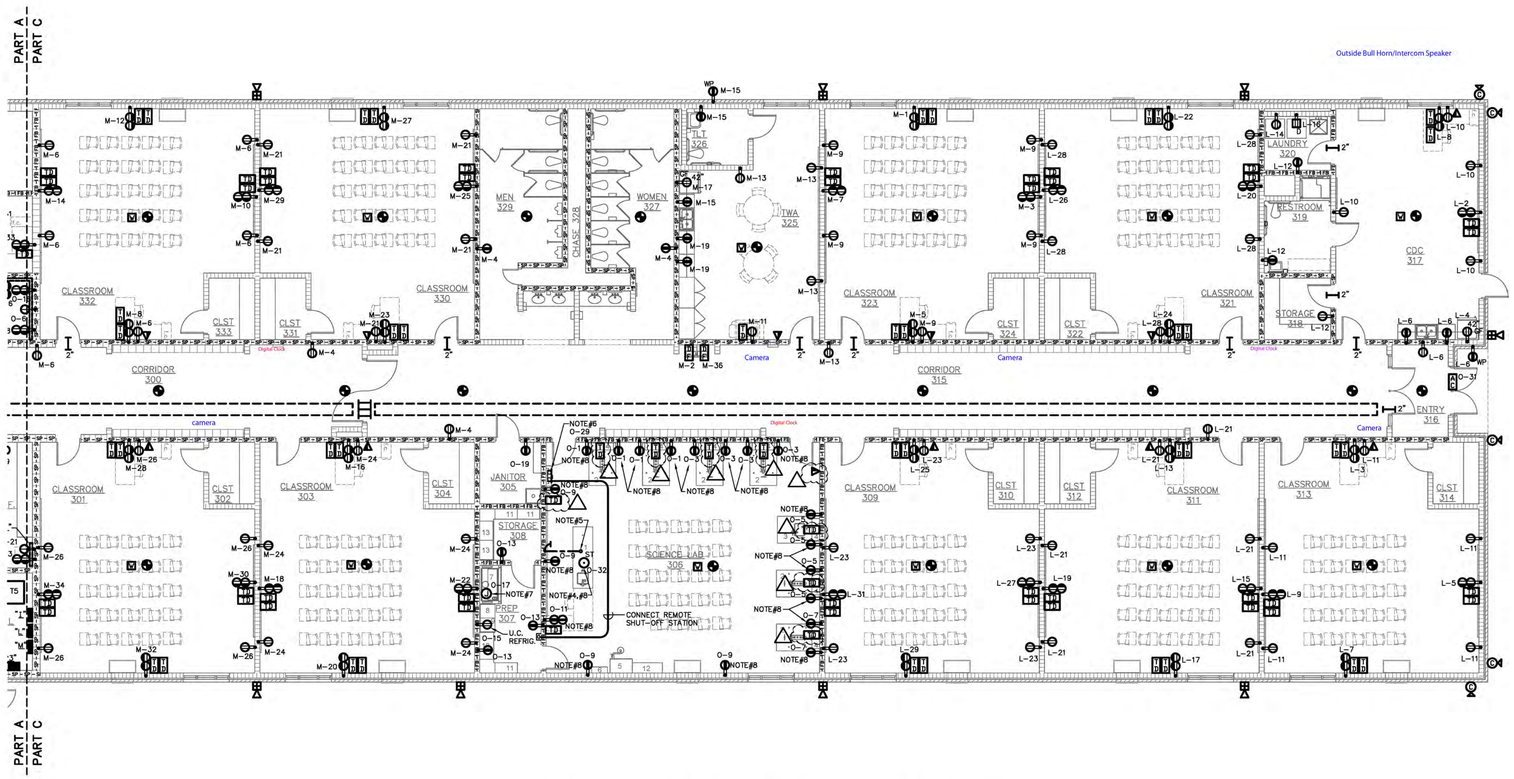
REVISIONS	
NO.	DATE
FM1	1-21-2022
FM2	3/3/2022
	10/6/2022
DWN.	MWE
CHK'D.	ECH
APP'D.	ECH

EDWARD C. HENDERSON JR. REGISTERED ENGINEER AGRICULTURE COMMERCE No. 118245 STATE OF TENNESSEE

FLOOR PLAN - PART B - POWER & COMMUNICATIONS

PROJ. NO. 2697-14
DATE 11/23/2021
DWG. NO.
E1.07

NEW
JASPER MIDDLE



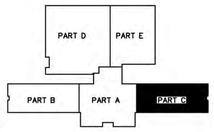
FLOOR PLAN – PART "C" – POWER & COMMUNICATIONS
SCALE: 1/8"=1'-0"

NOTES

1. PRIOR TO LOCATING ANY AND ALL DEVICES AT CASEWORK, COUNTERTOPS ETC., THE CONTRACTOR SHALL REFER TO FINAL ARCHITECTURAL CASEWORK ELEVATIONS AND SHOP DRAWINGS TO VERIFY MOUNTING HEIGHTS AND LOCATIONS. ALL DEVICE LOCATIONS SHALL BE COORDINATED WITH THESE DRAWINGS AND/OR THE ARCHITECT PRIOR TO ROUGH-IN.
2. ALL 120V, 20 AMP CIRCUITS WITH HOMERUNS GREATER THAN 70 FEET SHALL HAVE CIRCUIT AND GROUNDING CONDUCTORS OF #10AWG AS MINIMUM. ANY 120V, 20 AMP CIRCUIT WITH OUTLETS GREATER THAN 100 FEET OF BRANCH CIRCUIT LENGTH SHALL HAVE CIRCUIT AND GROUNDING CONDUCTORS OF #10AWG MINIMUM TO ALL OUTLETS AND HOMERUN. ANY 120V, 20 AMP CIRCUIT WITH HOMERUN GREATER THAN 140 FEET SHALL HAVE BRANCH CIRCUIT AND GROUNDING CONDUCTORS OF #8AWG MINIMUM. PROVIDE ADEQUATE BOX TO SPLICE #12AWG FOR TERMINATION TO DEVICE. LARGER CONDUCTORS MAY REQUIRE THE UTILIZATION OF LARGER CONDUIT SIZES – REFER TO NEC TABLES.
3. CONTRACTOR SHALL PROVIDE ALL REQUIRED BRANCH CIRCUIT RACEWAY AND CONDUCTORS FOR CONNECTION OF DEVICES INDICATED. WIRING MAY BE ROUTED BELOW CONCRETE SLAB OR OVERHEAD, AT THE CONTRACTORS OPTION. ALL ABOVE-SLAB RACEWAY SHALL BE CONCEALED FROM VIEW IN WALLS OR ABOVE CEILINGS EXCEPT WHERE SPECIFICALLY NOTED TO BE SURFACE MOUNTED. PROVIDE A DEDICATED NEUTRAL CONDUCTOR FOR ALL 120V CIRCUITS.
4. TURN CONDUIT UP UNDER INSTRUCTOR LAB TABLE IN THE SERVICE CHASE AREA, REFER TO DETAIL SHEET E . CONTRACTOR SHALL CONNECT ALL RECEPTACLES FURNISHED WITH TABLES, REFER TO TABLE MANUFACTURERS INSTALLATION INSTRUCTIONS. VERIFY EXACT LOCATION OF CONDUIT STUB UP WITH ARCHITECT AND EQUIPMENT SUPPLIER PRIOR TO ROUGH-IN. EXTEND CONDUIT OVER TO NEAREST WALL FROM STUB UP AND ROUTE BRANCH CIRCUITRY ABOVE CEILING TO PANEL.
5. TURN 2-1" CONDUIT UP UNDER INSTUCTOR'S TABLE IN THE SERVICE CHASE AREA FOR USE BY OWNER'S VENDOR TO INSTALL COMMUNICATIONS CABLING. STUB UP 6" AFF SIMILAR TO POWER. EXTEND TO WALL AND STUB OUT ABOVE ACCESSIBLE CEILING. VERIFY EXACT LOCATION OF CONDUIT STUB-UP WITH ARCHITECT AND EQUIPMENT SUPPLIER PRIOR TO ROUGH-IN. PROVIDE PULL-STRING.
6. PROVIDE CONNECTION FOR UTILITY CONTROL PANEL FOR EMERGENCY SHUT-OFF OF GAS AND ELECTRIC RECEPTACLES, 120VOLT, REFER TO PLUMBING DRAWINGS FOR EXACT LOCATION. INSTALL REMOTE PANIC BUTTON FURNISHED WITH PANEL. PROVIDE ALL NECESSARY RACEWAY, BOXES, WIRING ETC FOR A COMPLETE INSTALLATION IN ACCORDANCE WITH EQUIPMENT MANUFACTURER SPECIFICATIONS.
7. PROVIDE 120VOLT CONNECTION FOR FUME HOOD FURNISHED BY OTHERS. VERIFY ALL REQUIREMENTS WITH EQUIPMENT SUPPLIER PRIOR TO ROUGH-IN. PROVIDE CONTROLS WIRING TO FUME HOOD FAN AS REQUIRED.
8. RECEPTACLES NOTED SHALL BE CONTROLLED BY GAS CONTROL PANEL FURNISHED BY OTHERS. ELECTRICAL CONTRACTOR SHALL ROUTE CIRCUITRY AS NOTED THROUGH CONTACTORS FURNISHED WITH GAS CONTROL PANEL. COORDINATE REQUIREMENTS WITH GAS CONTROL PANEL SUPPLIER. ELECTRICAL CONTRACTOR SHALL INSTALL CONTACTOR ENCLOSURE ABOVE ACCESSIBLE CEILING IN ROOM SERVED.

WALL LEGEND

- BRICK & C.M.U. WALL (EXTERIOR WALL)
- C.M.U. WALL SMOKE PARTITION
  NOTE: CONTRACTOR SHALL SEAL ALL NEW DUCT AND PIPE PENETRATIONS AT ALL SMOKE PARTITIONS.
- C.M.U. WALL 1 HR. FIRE BARRIER



KEY PLAN
N.T.S.

ENGINEERING SERVICES GROUP, INC.
CONSULTING ENGINEERS
900 East Hill Ave. Suite 350
Knoxville, Tennessee 37915
(865) 522-0393
PROJECT NO. 19539

NEW
JASPER MIDDLE
JASPER, TENNESSEE

KAATZ, BINKLEY, JONES & MORRIS ARCHITECTS, INC.
NASHVILLE
1008 CHARLIE DANIELS PKY. MT. JULIET, TN 37122
P.O. BOX 713, MT. JULIET, TN 37122
PHONE: (615) 754-5393 FAX: (615) 754-5340

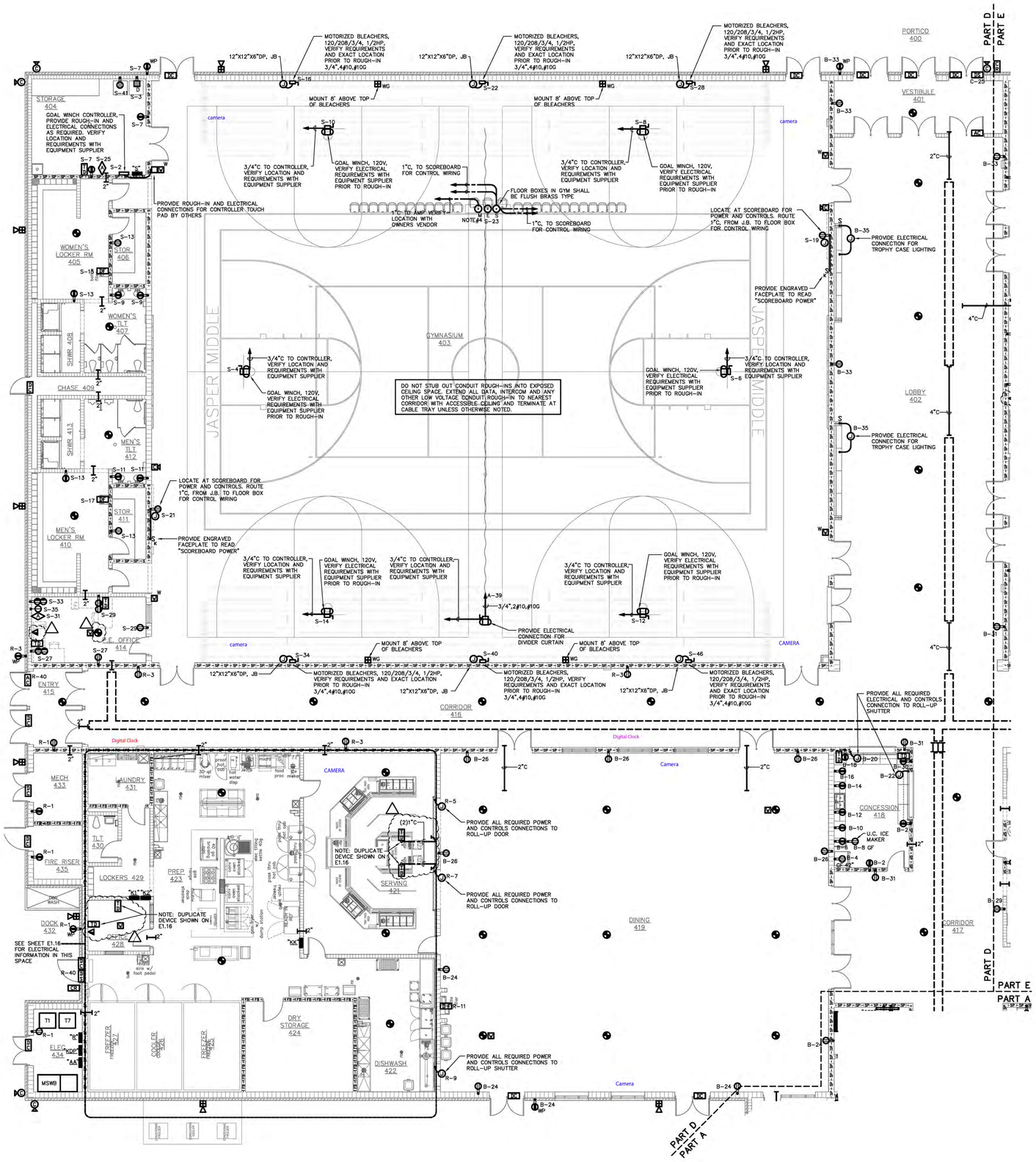
REVISIONS	
NO.	DATE
FM2	3/3/2022
	10/6/2022
DWN.	MWE
CHK'D.	ECH
APP'D.	ECH

EDWARD C. HENDERSON
REGISTERED ENGINEER
No. 119249
STATE OF TENNESSEE
11/23/21

FLOOR PLAN - PART C - POWER & COMMUNICATIONS

PROJ. NO. 2697-14
DATE 11/23/2021
DWG. NO.
E1.08

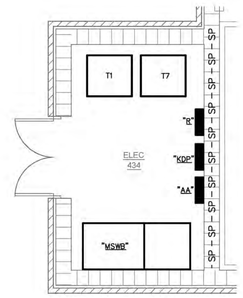
NEW
JASPER MIDDLE



FLOOR PLAN – PART "D" – POWER & COMMUNICATIONS
SCALE: 1/8"=1'-0"

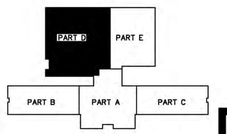
NOTES

1. PRIOR TO LOCATING ANY AND ALL DEVICES AT CASEWORK, COUNTERTOPS ETC., THE CONTRACTOR SHALL REFER TO FINAL ARCHITECTURAL CASEWORK ELEVATIONS AND SHOP DRAWINGS TO VERIFY MOUNTING HEIGHTS AND LOCATIONS. ALL DEVICE LOCATIONS SHALL BE COORDINATED WITH THESE DRAWINGS AND/OR THE ARCHITECT PRIOR TO ROUGH-IN.
2. ALL 120V, 20 AMP CIRCUITS WITH HOMERUNS GREATER THAN 70 FEET SHALL HAVE CIRCUIT AND GROUNDING CONDUCTORS OF #10AWG AS MINIMUM. ANY 120V, 20 AMP CIRCUIT WITH OUTLETS GREATER THAN 100 FEET OF BRANCH CIRCUIT LENGTH SHALL HAVE CIRCUIT AND GROUNDING CONDUCTORS OF #10AWG MINIMUM TO ALL OUTLETS AND HOMERUN. ANY 120V, 20 AMP CIRCUIT WITH HOMERUN GREATER THAN 140 FEET SHALL HAVE BRANCH CIRCUIT AND GROUNDING CONDUCTORS OF #8AWG MINIMUM. PROVIDE ADEQUATE BOX TO SPLICE #12AWG FOR TERMINATION TO DEVICE. LARGER CONDUCTORS MAY REQUIRE THE UTILIZATION OF LARGER CONDUIT SIZES – REFER TO NEC TABLES.
3. CONTRACTOR SHALL PROVIDE ALL REQUIRED BRANCH CIRCUIT RACEWAY AND CONDUCTORS FOR CONNECTION OF DEVICES INDICATED. WIRING MAY BE ROUTED BELOW CONCRETE SLAB OR OVERHEAD, AT THE CONTRACTORS OPTION. ALL ABOVE-SLAB RACEWAY SHALL BE CONCEALED FROM VIEW IN WALLS OR ABOVE CEILINGS EXCEPT WHERE SPECIFICALLY NOTED TO BE SURFACE MOUNTED. PROVIDE A DEDICATED NEUTRAL CONDUCTOR FOR ALL 120V CIRCUITS.
4. VERIFY EXACT LOCATION OF FLOOR BOXES WITH ARCHITECT PRIOR TO ROUGH-IN.



ENLARGED ELECTRIC ROOM 434
SCALE: 1/4"=1'-0"

WALL LEGEND
- BRICK & C.M.U. WALL (EXTERIOR WALL)
- C.M.U. WALL SMOKE PARTITION
  NOTE: CONTRACTOR SHALL SEAL ALL NEW DUCT AND PIPE PENETRATIONS AT ALL SMOKE PARTITIONS.
- C.M.U. WALL 1 HR. FIRE BARRIER



KEY PLAN
N.T.S.

ENGINEERING SERVICES GROUP, INC.
CONSULTING ENGINEERS
900 EAST HILL AVE, SUITE 350
KNOXVILLE, TENNESSEE 37915
(865) 522-0393
PROJECT NO. 19539

NEW
JASPER MIDDLE
JASPER, TENNESSEE

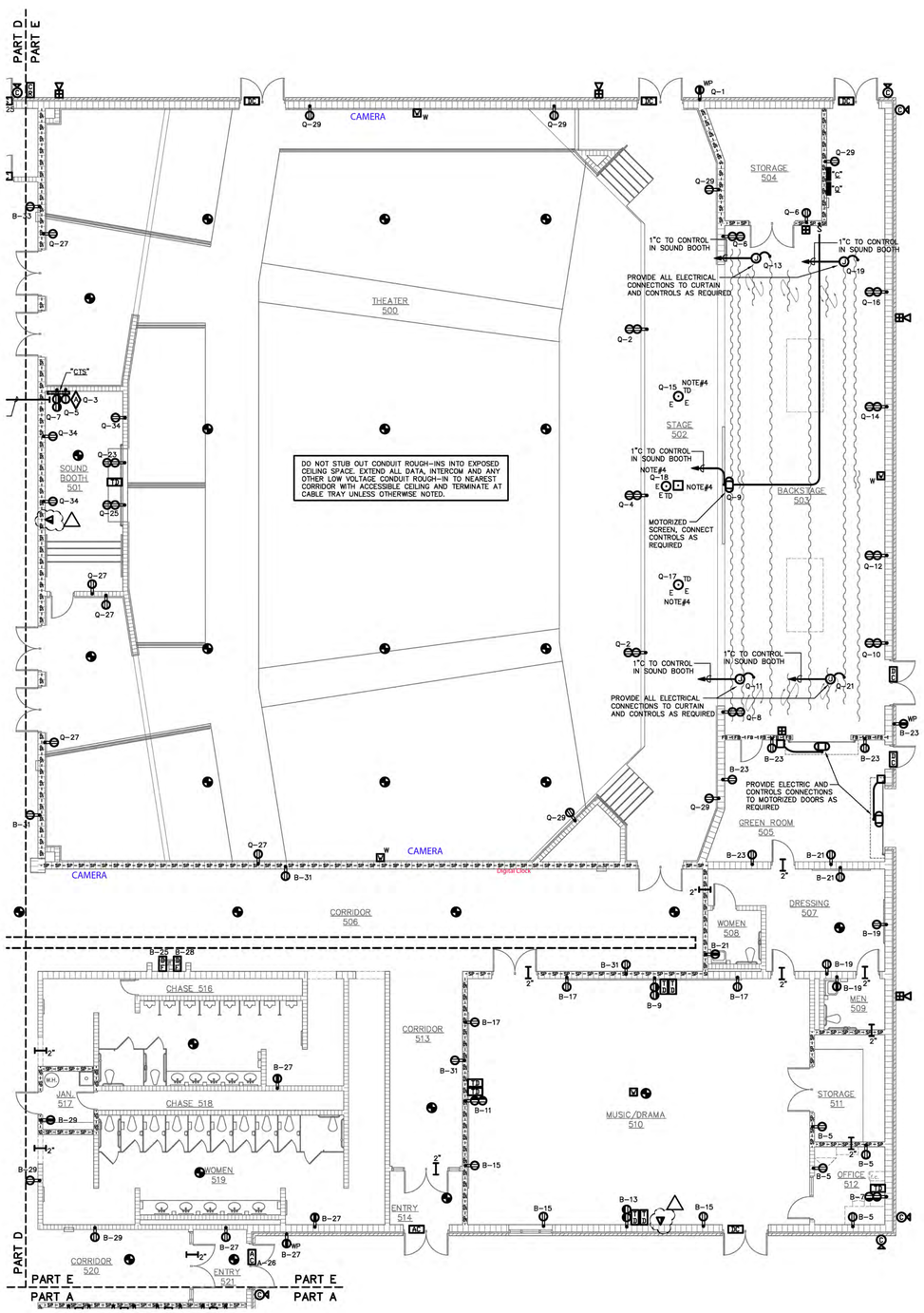
KAATZ, BINKLEY, JONES & MORRIS ARCHITECTS, INC.
NASHVILLE
1008 CHARLIE DANIELS PKY., MT. JULIET, TN 37122
P.O. BOX 713, MT. JULIET, TN 37122
PHONE: (615) 754-5393 FAX: (615) 754-5340

REVISIONS	
NO.	DATE
FM1	1-21-2022
	10-6-2022
DWN.	MWE
CHK'D.	ECH
APP'D.	ECH

FLOOR PLAN - PART D - POWER & COMMUNICATIONS

PROJ. NO. 2697-14
DATE 11/23/2021
DWG. NO.
E1.09

NEW
JASPER MIDDLE

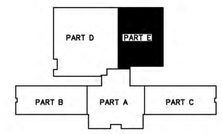


FLOOR PLAN – PART "E" – POWER & COMMUNICATIONS
SCALE: 1/8"=1'-0"

NOTES

1. PRIOR TO LOCATING ANY AND ALL DEVICES AT CASEWORK, COUNTERTOPS ETC., THE CONTRACTOR SHALL REFER TO FINAL ARCHITECTURAL CASEWORK ELEVATIONS AND SHOP DRAWINGS TO VERIFY MOUNTING HEIGHTS AND LOCATIONS. ALL DEVICE LOCATIONS SHALL BE COORDINATED WITH THESE DRAWINGS AND/OR THE ARCHITECT PRIOR TO ROUGH-IN.
2. ALL 120V, 20 AMP CIRCUITS WITH HOMERUNS GREATER THAN 70 FEET SHALL HAVE CIRCUIT AND GROUNDING CONDUCTORS OF #10AWG AS MINIMUM. ANY 120V, 20 AMP CIRCUIT WITH OUTLETS GREATER THAN 100 FEET OF BRANCH CIRCUIT LENGTH SHALL HAVE CIRCUIT AND GROUNDING CONDUCTORS OF #10AWG MINIMUM TO ALL OUTLETS AND HOMERUN. ANY 120V, 20 AMP CIRCUIT WITH HOMERUN GREATER THAN 140 FEET SHALL HAVE BRANCH CIRCUIT AND GROUNDING CONDUCTORS OF #8AWG MINIMUM. PROVIDE ADEQUATE BOX TO SPLICE #12AWG FOR TERMINATION TO DEVICE. LARGER CONDUCTORS MAY REQUIRE THE UTILIZATION OF LARGER CONDUIT SIZES – REFER TO NEC TABLES.
3. CONTRACTOR SHALL PROVIDE ALL REQUIRED BRANCH CIRCUIT RACEWAY AND CONDUCTORS FOR CONNECTION OF DEVICES INDICATED. WIRING MAY BE ROUTED BELOW CONCRETE SLAB OR OVERHEAD, AT THE CONTRACTORS OPTION. ALL ABOVE-SLAB RACEWAY SHALL BE CONCEALED FROM VIEW IN WALLS OR ABOVE CEILINGS EXCEPT WHERE SPECIFICALLY NOTED TO BE SURFACE MOUNTED. PROVIDE A DEDICATED NEUTRAL CONDUCTOR FOR ALL 120V CIRCUITS.
4. VERIFY LOCATION OF FLOOR BOXES WITH ARCHITECT PRIOR TO ROUGH-IN.

WALL LEGEND
- BRICK & C.M.U. WALL (EXTERIOR WALL)
- C.M.U. WALL SMOKE PARTITION
  NOTE: CONTRACTOR SHALL SEAL ALL NEW DUCT AND PIPE PENETRATIONS AT ALL SMOKE PARTITIONS.
- C.M.U. WALL 1 HR. FIRE BARRIER



KEY PLAN
N.T.S.

ESGA
ENGINEERING SERVICES GROUP, INC.
CONSULTING ENGINEERS
900 EAST HILL AVE, SUITE 350
KNOXVILLE, TENNESSEE 37915
(865) 522-0393
PROJECT NO. 19539

NEW
JASPER MIDDLE
JASPER, TENNESSEE

KAATZ, BINKLEY, JONES & MORRIS ARCHITECTS, INC.
NASHVILLE
1008 CHARLIE DANIELS PKY., MT. JULIET, TN 37122
P.O. BOX 713, MT. JULIET, TN 37122
PHONE: (615) 754-5393 FAX: (615) 754-5340

REVISIONS	
NO.	DATE
FM1	1-21-2022
	10-6-2022
DWN.	MWE
CHK'D.	ECH
APP'D.	ECH

EDWARD C. HENDERSON
REGISTERED ENGINEER
No. 119743
STATE OF TENNESSEE
11/23/21

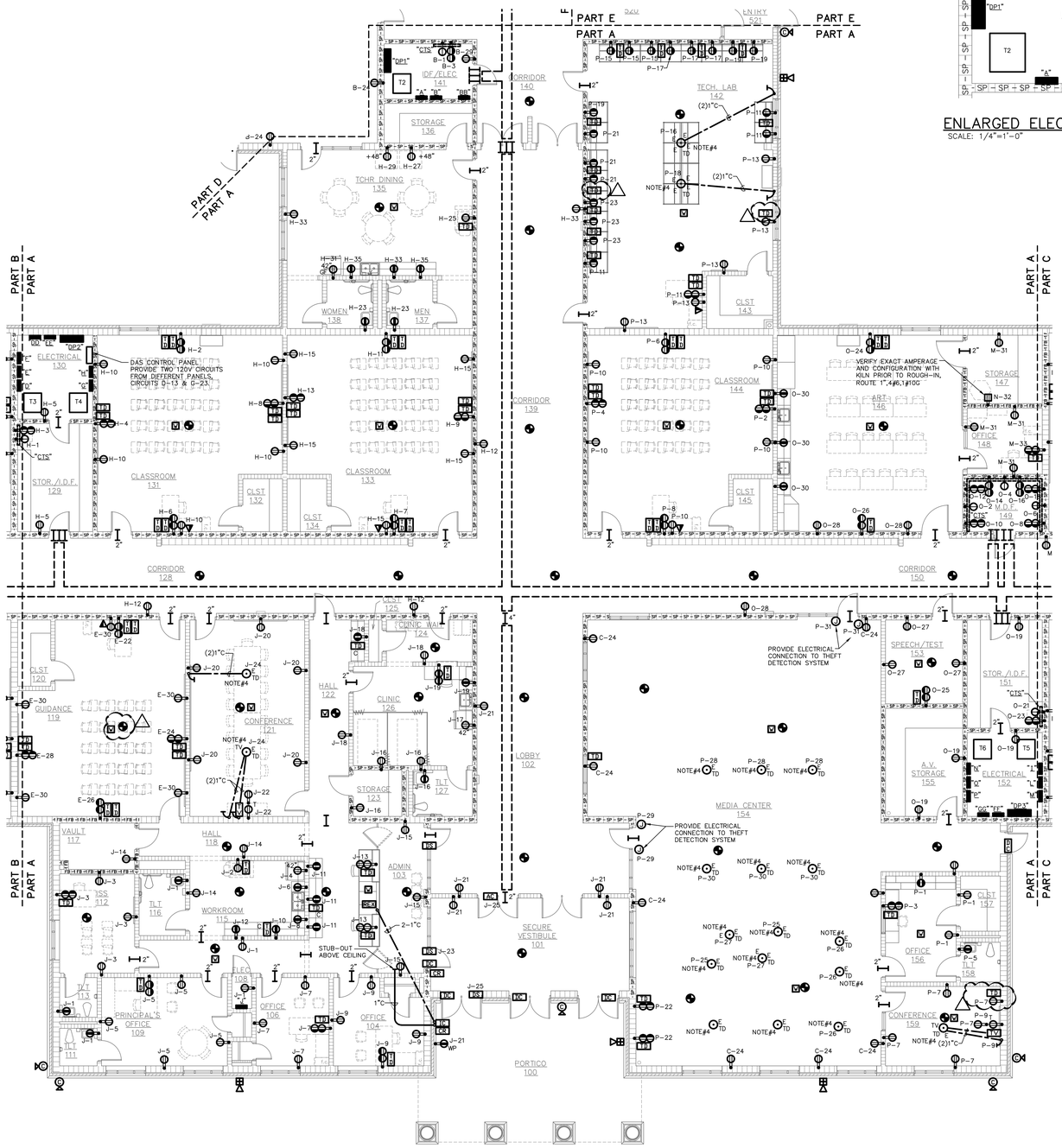
FLOOR PLAN - PART E - POWER & COMMUNICATIONS

PROJ. NO. 2697-14
DATE 11/23/2021
DWG. NO.
E1.10

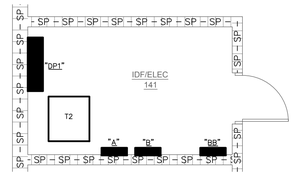
NEW
JASPER MIDDLE

NOTES

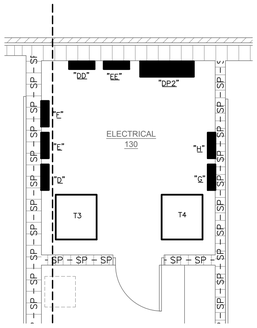
1. PRIOR TO LOCATING ANY AND ALL DEVICES AT CASEWORK, COUNTERTOPS ETC., THE CONTRACTOR SHALL REFER TO FINAL ARCHITECTURAL CASEWORK ELEVATIONS AND SHOP DRAWINGS TO VERIFY MOUNTING HEIGHTS AND LOCATIONS. ALL DEVICE LOCATIONS SHALL BE COORDINATED WITH THESE DRAWINGS AND/OR THE ARCHITECT PRIOR TO ROUGH-IN.
2. ALL 120V, 20 AMP CIRCUITS WITH HOMERUNS GREATER THAN 70 FEET SHALL HAVE CIRCUIT AND GROUNDING CONDUCTORS OF #10AWG AS MINIMUM. ANY 120V, 20 AMP CIRCUIT WITH OUTLETS GREATER THAN 100 FEET OF BRANCH CIRCUIT LENGTH SHALL HAVE CIRCUIT AND GROUNDING CONDUCTORS OF #10AWG MINIMUM TO ALL OUTLETS AND HOMERUN. ANY 120V, 20 AMP CIRCUIT WITH HOMERUN GREATER THAN 140 FEET SHALL HAVE BRANCH CIRCUIT AND GROUNDING CONDUCTORS OF #8AWG MINIMUM. PROVIDE ADEQUATE BOX TO SPLICE #12AWG FOR TERMINATION TO DEVICE. LARGER CONDUCTORS MAY REQUIRE THE UTILIZATION OF LARGER CONDUIT SIZES – REFER TO NEC TABLES.
3. CONTRACTOR SHALL PROVIDE ALL REQUIRED BRANCH CIRCUIT RACEWAY AND CONDUCTORS FOR CONNECTION OF DEVICES INDICATED. WIRING MAY BE ROUTED BELOW CONCRETE SLAB OR OVERHEAD, AT THE CONTRACTORS OPTION. ALL ABOVE-SLAB RACEWAY SHALL BE CONCEALED FROM VIEW IN WALLS OR ABOVE CEILINGS EXCEPT WHERE SPECIFICALLY NOTED TO BE SURFACE MOUNTED. PROVIDE A DEDICATED NEUTRAL CONDUCTOR FOR ALL 120V CIRCUITS.
4. VERIFY EXACT LOCATION OF FLOOR BOXES WITH ARCHITECT PRIOR TO ROUGH-IN.



FLOOR PLAN – PART "A" – POWER & COMMUNICATIONS
SCALE: 1/8"=1'-0"



ENLARGED ELECTRIC ROOM 141
SCALE: 1/4"=1'-0"



ENLARGED ELECTRIC ROOM 130
SCALE: 1/4"=1'-0"

ENLARGED ELECTRIC ROOM 152
SCALE: 1/4"=1'-0"

WALL LEGEND

- BRICK & C.M.U. WALL (EXTERIOR WALL)
- C.M.U. WALL SMOKE PARTITION
  NOTE: CONTRACTOR SHALL SEAL ALL NEW DUCT AND PIPE PENETRATIONS AT ALL SMOKE PARTITIONS.
- C.M.U. WALL 1 HR. FIRE BARRIER

KEY PLAN
N.T.S.

THIS INDIVIDUAL SHEET COMPRISES ONE OF MANY SHEETS ISSUED AS BIDDING AND CONTRACT DOCUMENTS. INFORMATION CONTAINED HEREIN MAY NOT BE ALL INCLUSIVE OF INFORMATION NEEDED FOR BIDDING AND/OR CONSTRUCTION. REFER TO ENTIRE BIDDING AND CONTRACT DOCUMENTS FOR ASSOCIATED INFORMATION.

ENGINEERING SERVICES GROUP, INC.
CONSULTING ENGINEERS
900 EAST HILL AVE. SUITE 350
KNOXVILLE, TENNESSEE 37915
(865) 522-0393
PROJECT NO. 19539

NEW
JASPER MIDDLE
JASPER, TENNESSEE

KAATZ, BINKLEY, JONES & MORRIS ARCHITECTS, INC.
NASHVILLE
1008 CHARLIE DANIELS PKY., MT. JULIET, TN 37122
P.O. BOX 713, MT. JULIET, TN 37122
PHONE: (615) 754-5393 FAX: (615) 754-5340

REVISIONS	
NO.	DATE
FM1	1-21-2022
	10/6/2022
DWN.	MWE
CHK'D.	ECH
APP'D.	ECH

EDWARD C. HENDERSON
REGISTERED ENGINEER
No. 113245
STATE OF TENNESSEE
11/23/21

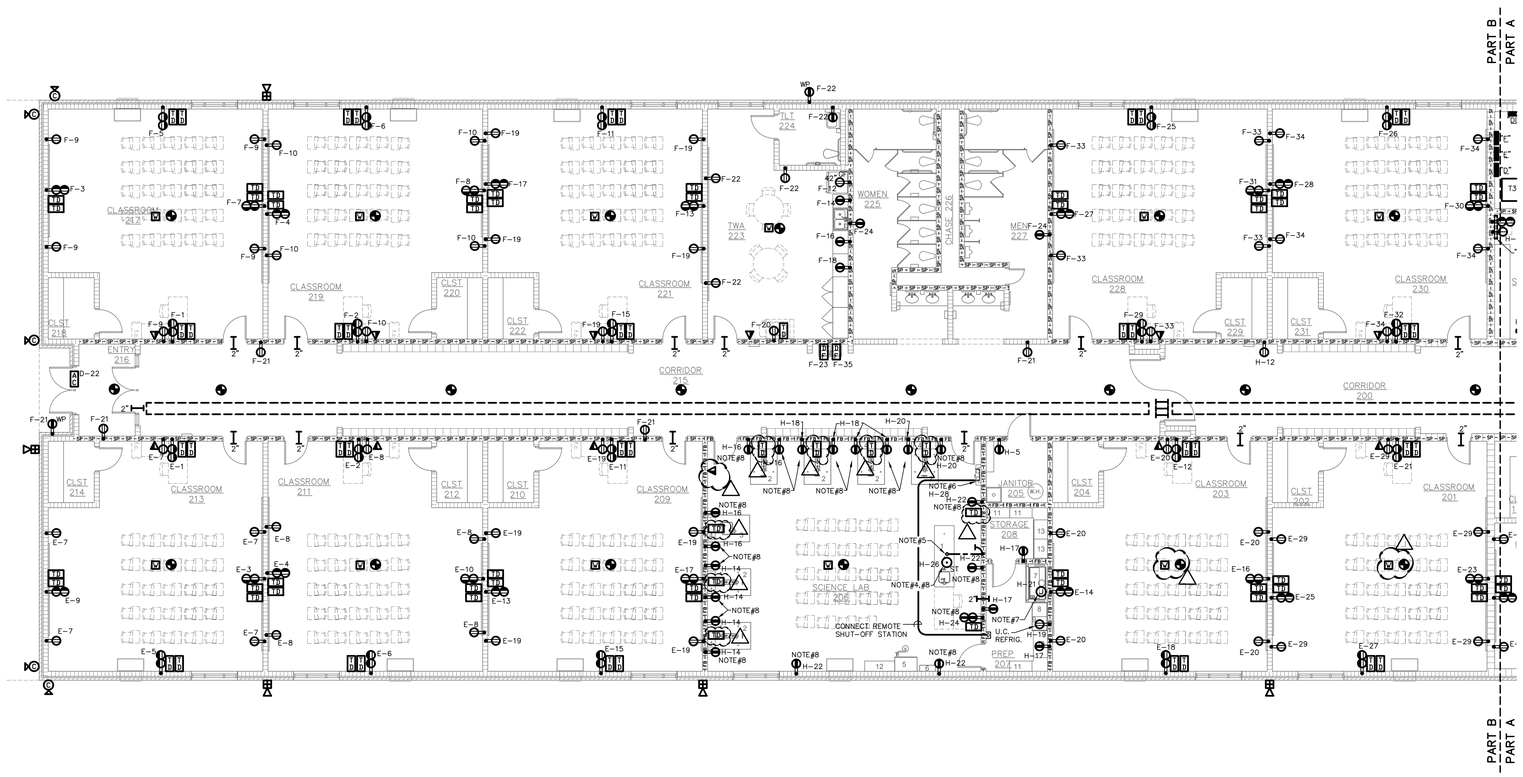
FLOOR PLAN - PART A - POWER & COMMUNICATIONS

PROJ. NO. 2697-14
DATE 11/23/2021
DWG. NO.
E1.06

NEW
JASPER MIDDLE

NOTES

1. PRIOR TO LOCATING ANY AND ALL DEVICES AT CASEWORK, COUNTERTOPS ETC., THE CONTRACTOR SHALL REFER TO FINAL ARCHITECTURAL CASEWORK ELEVATIONS AND SHOP DRAWINGS TO VERIFY MOUNTING HEIGHTS AND LOCATIONS. ALL DEVICE LOCATIONS SHALL BE COORDINATED WITH THESE DRAWINGS AND/OR THE ARCHITECT PRIOR TO ROUGH-IN.
2. ALL 120V, 20 AMP CIRCUITS WITH HOMERUNS GREATER THAN 70 FEET SHALL HAVE CIRCUIT AND GROUNDING CONDUCTORS OF #10AWG AS MINIMUM. ANY 120V, 20 AMP CIRCUIT WITH OUTLETS GREATER THAN 100 FEET OF BRANCH CIRCUIT LENGTH SHALL HAVE CIRCUIT AND GROUNDING CONDUCTORS OF #10AWG MINIMUM TO ALL OUTLETS AND HOMERUN. ANY 120V, 20 AMP CIRCUIT WITH HOMERUN GREATER THAN 140 FEET SHALL HAVE BRANCH CIRCUIT AND GROUNDING CONDUCTORS OF #8AWG MINIMUM. PROVIDE ADEQUATE BOX TO SPLICE #12AWG FOR TERMINATION TO DEVICE. LARGER CONDUCTORS MAY REQUIRE THE UTILIZATION OF LARGER CONDUIT SIZES – REFER TO NEC TABLES.
3. CONTRACTOR SHALL PROVIDE ALL REQUIRED BRANCH CIRCUIT RACEWAY AND CONDUCTORS FOR CONNECTION OF DEVICES INDICATED. WIRING MAY BE ROUTED BELOW CONCRETE SLAB OR OVERHEAD, AT THE CONTRACTORS OPTION. ALL ABOVE-SLAB RACEWAY SHALL BE CONCEALED FROM VIEW IN WALLS OR ABOVE CEILINGS EXCEPT WHERE SPECIFICALLY NOTED TO BE SURFACE MOUNTED. PROVIDE A DEDICATED NEUTRAL CONDUCTOR FOR ALL 120V CIRCUITS.
4. TURN CONDUIT UP UNDER INSTRUCTOR LAB TABLE IN THE SERVICE CHASE AREA, REFER TO DETAIL SHEET E2.2. CONTRACTOR SHALL CONNECT ALL RECEPTACLES FURNISHED WITH TABLES, REFER TO TABLE MANUFACTURERS INSTALLATION INSTRUCTIONS. VERIFY EXACT LOCATION OF CONDUIT STUB UP WITH ARCHITECT AND EQUIPMENT SUPPLIER PRIOR TO ROUGH-IN. EXTEND CONDUIT OVER TO NEAREST WALL FROM STUB UP AND ROUTE BRANCH CIRCUITRY ABOVE CEILING TO PANEL.
5. TURN 2-1" CONDUIT UP UNDER INSTUCTOR'S TABLE IN THE SERVICE CHASE AREA FOR USE BY OWNER'S VENDOR TO INSTALL COMMUNICATIONS CABLING. STUB UP 6" AFF SIMILAR TO POWER. EXTEND TO WALL AND STUB OUT ABOVE ACCESSIBLE CEILING. VERIFY EXACT LOCATION OF CONDUIT STUB-UP WITH ARCHITECT AND EQUIPMENT SUPPLIER PRIOR TO ROUGH-IN. PROVIDE PULL-STRING.
6. PROVIDE CONNECTION FOR UTILITY CONTROL PANEL FOR EMERGENCY SHUT-OFF OF GAS AND ELECTRIC RECEPTACLES, 120VOLT, REFER TO PLUMBING DRAWINGS FOR EXACT LOCATION. INSTALL REMOTE PANIC BUTTON FURNISHED WITH PANEL. PROVIDE ALL NECESSARY RACEWAY, BOXES, WIRING ETC FOR A COMPLETE INSTALLATION IN ACCORDANCE WITH EQUIPMENT MANUFACTURER SPECIFICATIONS.
7. PROVIDE 120VOLT CONNECTION FOR FUME HOOD FURNISHED BY OTHERS. VERIFY ALL REQUIREMENTS WITH EQUIPMENT SUPPLIER PRIOR TO ROUGH-IN. PROVIDE CONTROLS WIRING TO FUME HOOD FAN AS REQUIRED.
8. RECEPTACLES NOTED SHALL BE CONTROLLED BY GAS CONTROL PANEL FURNISHED BY OTHERS. ELECTRICAL CONTRACTOR SHALL ROUTE CIRCUITRY AS NOTED THROUGH CONTACTORS FURNISHED WITH GAS CONTROL PANEL. COORDINATE REQUIREMENTS WITH GAS CONTROL PANEL SUPPLIER. ELECTRICAL CONTRACTOR SHALL INSTALL CONTACTOR ENCLOSURE ABOVE ACCESSIBLE CEILING IN ROOM SERVED.

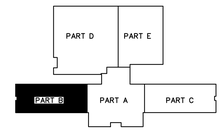


FLOOR PLAN – PART "B" – POWER & COMMUNICATIONS

SCALE: 1/8"=1'-0"

WALL LEGEND

- BRICK & C.M.U. WALL (EXTERIOR WALL)
- C.M.U. WALL SMOKE PARTITION
  NOTE: CONTRACTOR SHALL SEAL ALL NEW DUCT AND PIPE PENETRATIONS AT ALL SMOKE PARTITIONS.
- C.M.U. WALL 1 HR. FIRE BARRIER



KEY PLAN
N.T.S.

THIS INDIVIDUAL SHEET COMPRISES ONE OF MANY SHEETS ISSUED AS BIDDING AND CONTRACT DOCUMENTS. INFORMATION CONTAINED HEREIN MAY NOT BE ALL INCLUSIVE OF INFORMATION NEEDED FOR BIDDING AND/OR CONSTRUCTION. REFER TO ENTIRE BIDDING AND CONTRACT DOCUMENTS FOR ASSOCIATED INFORMATION.

ENGINEERING SERVICES GROUP, INC.
CONSULTING ENGINEERS
900 EAST HILL AVE. SUITE 350
KNOXVILLE, TENNESSEE 37915
(865) 522-0393
PROJECT NO. 19539

NEW
JASPER MIDDLE
JASPER, TENNESSEE

KAATZ, BINKLEY, JONES & MORRIS ARCHITECTS, INC.
NASHVILLE
1008 CHARLIE DANIELS PKY., MT. JULIET, TN 37122
P.O. BOX 713, MT. JULIET, TN 37122
PHONE: (615) 754-5393 FAX: (615) 754-5340

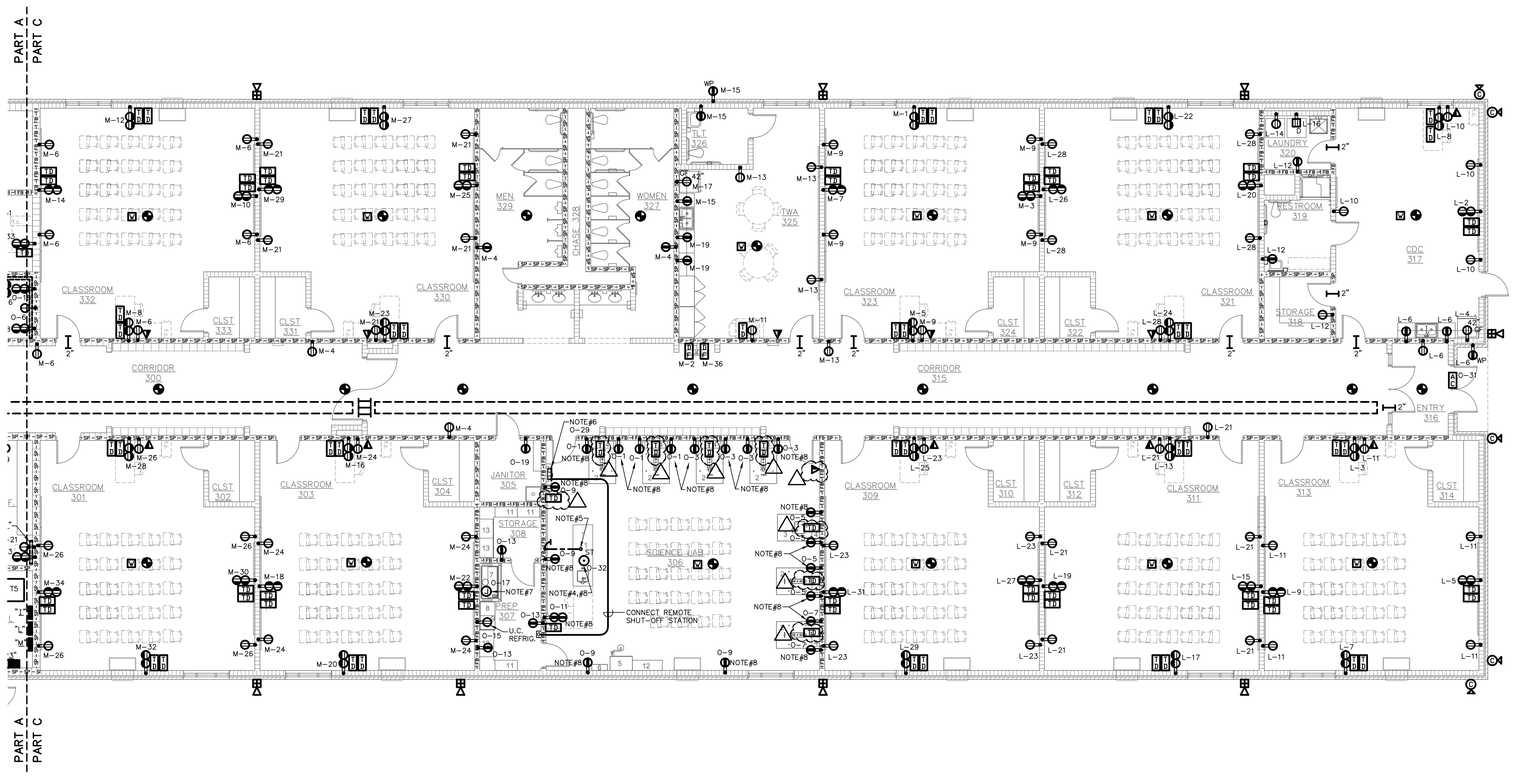
REVISIONS	
NO.	DATE
FM1	1-21-2022
FM2	3/3/2022
	10/6/2022
DWN.	MWE
CHK'D.	ECH
APP'D.	ECH

EDWARD C. HENDERSON
REGISTERED ENGINEER
STATE OF TENNESSEE
No. 118247

FLOOR PLAN - PART B - POWER & COMMUNICATIONS

PROJ. NO. 2697-14
DATE 11/23/2021
DWG. NO.
E1.07

NEW
JASPER MIDDLE



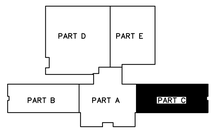
FLOOR PLAN – PART "C" – POWER & COMMUNICATIONS
SCALE: 1/8"=1'-0"

NOTES

1. PRIOR TO LOCATING ANY AND ALL DEVICES AT CASEWORK, COUNTERTOPS ETC., THE CONTRACTOR SHALL REFER TO FINAL ARCHITECTURAL CASEWORK ELEVATIONS AND SHOP DRAWINGS TO VERIFY MOUNTING HEIGHTS AND LOCATIONS. ALL DEVICE LOCATIONS SHALL BE COORDINATED WITH THESE DRAWINGS AND/OR THE ARCHITECT PRIOR TO ROUGH-IN.
2. ALL 120V, 20 AMP CIRCUITS WITH HOMERUNS GREATER THAN 70 FEET SHALL HAVE CIRCUIT AND GROUNDING CONDUCTORS OF #10AWG AS MINIMUM. ANY 120V, 20 AMP CIRCUIT WITH OUTLETS GREATER THAN 100 FEET OF BRANCH CIRCUIT LENGTH SHALL HAVE CIRCUIT AND GROUNDING CONDUCTORS OF #10AWG MINIMUM TO ALL OUTLETS AND HOMERUN. ANY 120V, 20 AMP CIRCUIT WITH HOMERUN GREATER THAN 140 FEET SHALL HAVE BRANCH CIRCUIT AND GROUNDING CONDUCTORS OF #8AWG MINIMUM. PROVIDE ADEQUATE BOX TO SPLICE #12AWG FOR TERMINATION TO DEVICE. LARGER CONDUCTORS MAY REQUIRE THE UTILIZATION OF LARGER CONDUIT SIZES – REFER TO NEC TABLES.
3. CONTRACTOR SHALL PROVIDE ALL REQUIRED BRANCH CIRCUIT RACEWAY AND CONDUCTORS FOR CONNECTION OF DEVICES INDICATED. WIRING MAY BE ROUTED BELOW CONCRETE SLAB OR OVERHEAD, AT THE CONTRACTORS OPTION. ALL ABOVE-SLAB RACEWAY SHALL BE CONCEALED FROM VIEW IN WALLS OR ABOVE CEILINGS EXCEPT WHERE SPECIFICALLY NOTED TO BE SURFACE MOUNTED. PROVIDE A DEDICATED NEUTRAL CONDUCTOR FOR ALL 120V CIRCUITS.
4. TURN CONDUIT UP UNDER INSTRUCTOR LAB TABLE IN THE SERVICE CHASE AREA, REFER TO DETAIL SHEET E CONTRACTOR SHALL CONNECT ALL RECEPTACLES FURNISHED WITH TABLES, REFER TO TABLE MANUFACTURERS INSTALLATION INSTRUCTIONS. VERIFY EXACT LOCATION OF CONDUIT STUB UP WITH ARCHITECT AND EQUIPMENT SUPPLIER PRIOR TO ROUGH-IN. EXTEND CONDUIT OVER TO NEAREST WALL FROM STUB UP AND ROUTE BRANCH CIRCUITRY ABOVE CEILING TO PANEL.
5. TURN 2-1" CONDUIT UP UNDER INSTUCTOR'S TABLE IN THE SERVICE CHASE AREA FOR USE BY OWNER'S VENDOR TO INSTALL COMMUNICATIONS CABLING. STUB UP 6" AFF SIMILAR TO POWER. EXTEND TO WALL AND STUB OUT ABOVE ACCESSIBLE CEILING. VERIFY EXACT LOCATION OF CONDUIT STUB-UP WITH ARCHITECT AND EQUIPMENT SUPPLIER PRIOR TO ROUGH-IN. PROVIDE PULL-STRING.
6. PROVIDE CONNECTION FOR UTILITY CONTROL PANEL FOR EMERGENCY SHUT-OFF OF GAS AND ELECTRIC RECEPTACLES, 120VOLT, REFER TO PLUMBING DRAWINGS FOR EXACT LOCATION. INSTALL REMOTE PANIC BUTTON FURNISHED WITH PANEL. PROVIDE ALL NECESSARY RACEWAY, BOXES, WIRING ETC FOR A COMPLETE INSTALLATION IN ACCORDANCE WITH EQUIPMENT MANUFACTURER SPECIFICATIONS.
7. PROVIDE 120VOLT CONNECTION FOR FUME HOOD FURNISHED BY OTHERS. VERIFY ALL REQUIREMENTS WITH EQUIPMENT SUPPLIER PRIOR TO ROUGH-IN. PROVIDE CONTROLS WIRING TO FUME HOOD FAN AS REQUIRED.
8. RECEPTACLES NOTED SHALL BE CONTROLLED BY GAS CONTROL PANEL FURNISHED BY OTHERS. ELECTRICAL CONTRACTOR SHALL ROUTE CIRCUITRY AS NOTED THROUGH CONTACTORS FURNISHED WITH GAS CONTROL PANEL. COORDINATE REQUIREMENTS WITH GAS CONTROL PANEL SUPPLIER. ELECTRICAL CONTRACTOR SHALL INSTALL CONTACTOR ENCLOSURE ABOVE ACCESSIBLE CEILING IN ROOM SERVED.

WALL LEGEND

- BRICK & C.M.U. WALL (EXTERIOR WALL)
- C.M.U. WALL SMOKE PARTITION
  NOTE: CONTRACTOR SHALL SEAL ALL NEW DUCT AND PIPE PENETRATIONS AT ALL SMOKE PARTITIONS.
- C.M.U. WALL 1 HR. FIRE BARRIER



KEY PLAN
N.T.S.

ENGINEERING SERVICES GROUP, INC.
CONSULTING ENGINEERS
900 EAST HILL AVE, SUITE 350
KNOXVILLE, TENNESSEE 37915
(865) 522-0393
PROJECT NO. 19539

NEW
JASPER MIDDLE
JASPER, TENNESSEE

KAATZ, BINKLEY, JONES & MORRIS ARCHITECTS, INC.
NASHVILLE
1008 CHARLIE DANIELS PKY., MT. JULIET, TN 37122
P.O. BOX 713, MT. JULIET, TN 37122
PHONE: (615) 754-5393 FAX: (615) 754-5340

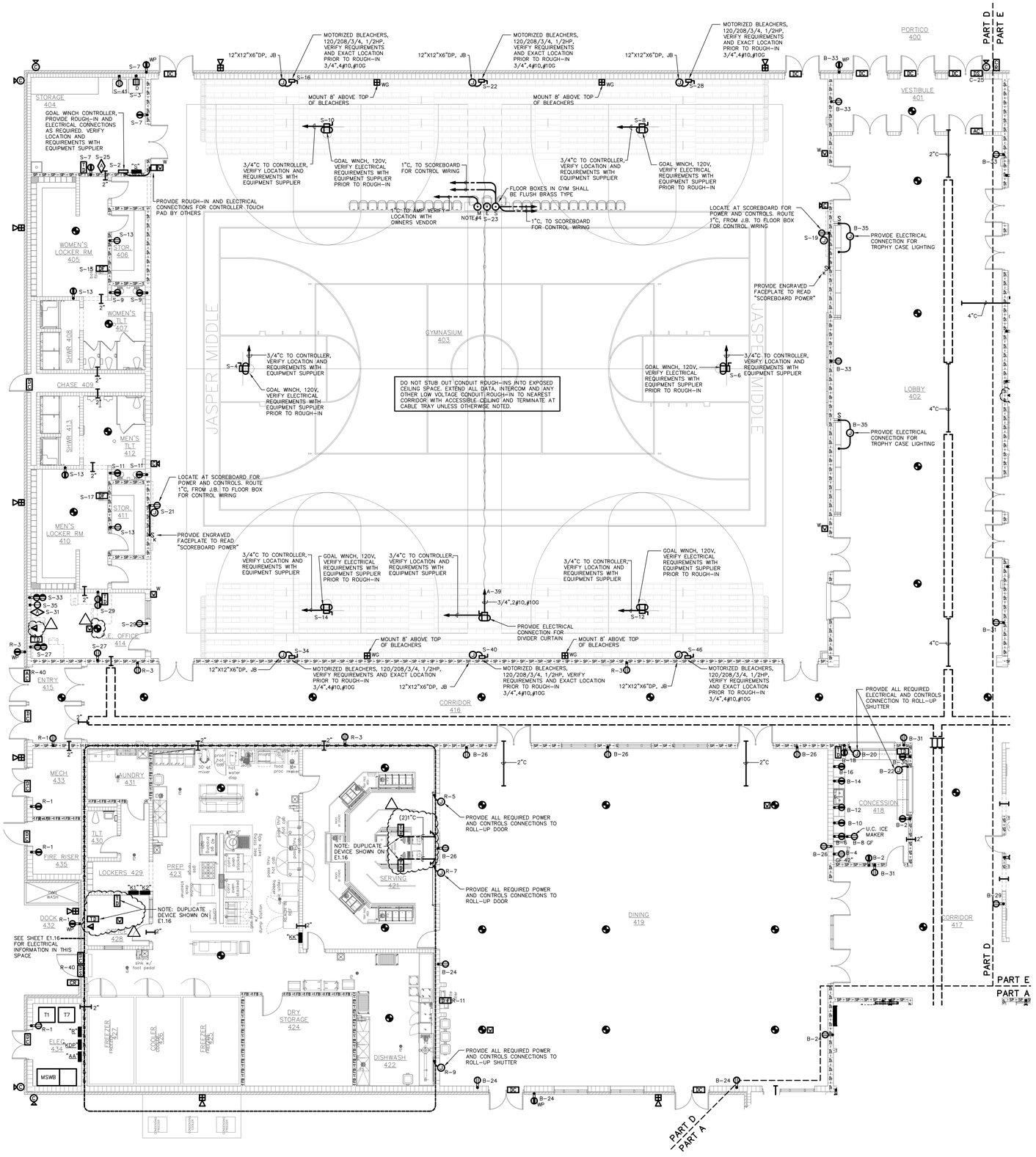
REVISIONS	
NO.	DATE
FM2	3/3/2022
	10/6/2022
DWN.	MWE
CHK'D.	ECH
APP'D.	ECH

EDWARD C. HENDERSON
REGISTERED ENGINEER
No. 118243
STATE OF TENNESSEE
11/23/21

FLOOR PLAN - PART C - POWER & COMMUNICATIONS

PROJ. NO. 2697-14
DATE 11/23/2021
DWG. NO.
E1.08

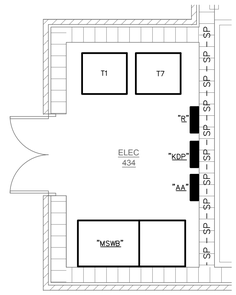
NEW
JASPER MIDDLE



FLOOR PLAN – PART "D" – POWER & COMMUNICATIONS
SCALE: 1/8"=1'-0"

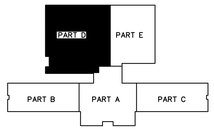
NOTES

1. PRIOR TO LOCATING ANY AND ALL DEVICES AT CASEWORK, COUNTERTOPS ETC., THE CONTRACTOR SHALL REFER TO FINAL ARCHITECTURAL CASEWORK ELEVATIONS AND SHOP DRAWINGS TO VERIFY MOUNTING HEIGHTS AND LOCATIONS. ALL DEVICE LOCATIONS SHALL BE COORDINATED WITH THESE DRAWINGS AND/OR THE ARCHITECT PRIOR TO ROUGH-IN.
2. ALL 120V, 20 AMP CIRCUITS WITH HOMERUNS GREATER THAN 70 FEET SHALL HAVE CIRCUIT AND GROUNDING CONDUCTORS OF #10AWG AS MINIMUM. ANY 120V, 20 AMP CIRCUIT WITH OUTLETS GREATER THAN 100 FEET OF BRANCH CIRCUIT LENGTH SHALL HAVE CIRCUIT AND GROUNDING CONDUCTORS OF #10AWG MINIMUM TO ALL OUTLETS AND HOMERUN. ANY 120V, 20 AMP CIRCUIT WITH HOMERUN GREATER THAN 140 FEET SHALL HAVE BRANCH CIRCUIT AND GROUNDING CONDUCTORS OF #8AWG MINIMUM. PROVIDE ADEQUATE BOX TO SPLICE #12AWG FOR TERMINATION TO DEVICE. LARGER CONDUCTORS MAY REQUIRE THE UTILIZATION OF LARGER CONDUIT SIZES – REFER TO NEC TABLES.
3. CONTRACTOR SHALL PROVIDE ALL REQUIRED BRANCH CIRCUIT RACEWAY AND CONDUCTORS FOR CONNECTION OF DEVICES INDICATED. WIRING MAY BE ROUTED BELOW CONCRETE SLAB OR OVERHEAD, AT THE CONTRACTORS OPTION. ALL ABOVE-SLAB RACEWAY SHALL BE CONCEALED FROM VIEW IN WALLS OR ABOVE CEILINGS EXCEPT WHERE SPECIFICALLY NOTED TO BE SURFACE MOUNTED. PROVIDE A DEDICATED NEUTRAL CONDUCTOR FOR ALL 120V CIRCUITS.
4. VERIFY EXACT LOCATION OF FLOOR BOXES WITH ARCHITECT PRIOR TO ROUGH-IN.



ENLARGED ELECTRIC ROOM 434
SCALE: 1/4"=1'-0"

WALL LEGEND
- BRICK & C.M.U. WALL (EXTERIOR WALL)
- C.M.U. WALL SMOKE PARTITION
  NOTE: CONTRACTOR SHALL SEAL ALL NEW DUCT AND PIPE PENETRATIONS AT ALL SMOKE PARTITIONS.
- C.M.U. WALL 1 HR. FIRE BARRIER



KEY PLAN
N.T.S.

THIS INDIVIDUAL SHEET COMPRISES ONE OF MANY SHEETS ISSUED AS BIDDING AND CONTRACT DOCUMENTS. INFORMATION CONTAINED HEREIN MAY NOT BE ALL INCLUSIVE OF INFORMATION NEEDED FOR BIDDING AND/OR CONSTRUCTION. REFER TO ENTIRE BIDDING AND CONTRACT DOCUMENTS FOR ASSOCIATED INFORMATION.

ENGINEERING SERVICES GROUP, INC.
CONSULTING ENGINEERS
900 EAST HILL AVE. SUITE 350
KNOXVILLE, TENNESSEE 37915
(865) 522-0393
PROJECT NO. 19539

NEW
JASPER MIDDLE
JASPER, TENNESSEE

KAATZ, BINKLEY, JONES & MORRIS ARCHITECTS, INC.
NASHVILLE
1008 CHARLIE DANIELS PKY., MT. JULIET, TN 37122
P.O. BOX 713, MT. JULIET, TN 37122
PHONE: (615) 754-5393 FAX: (615) 754-5340

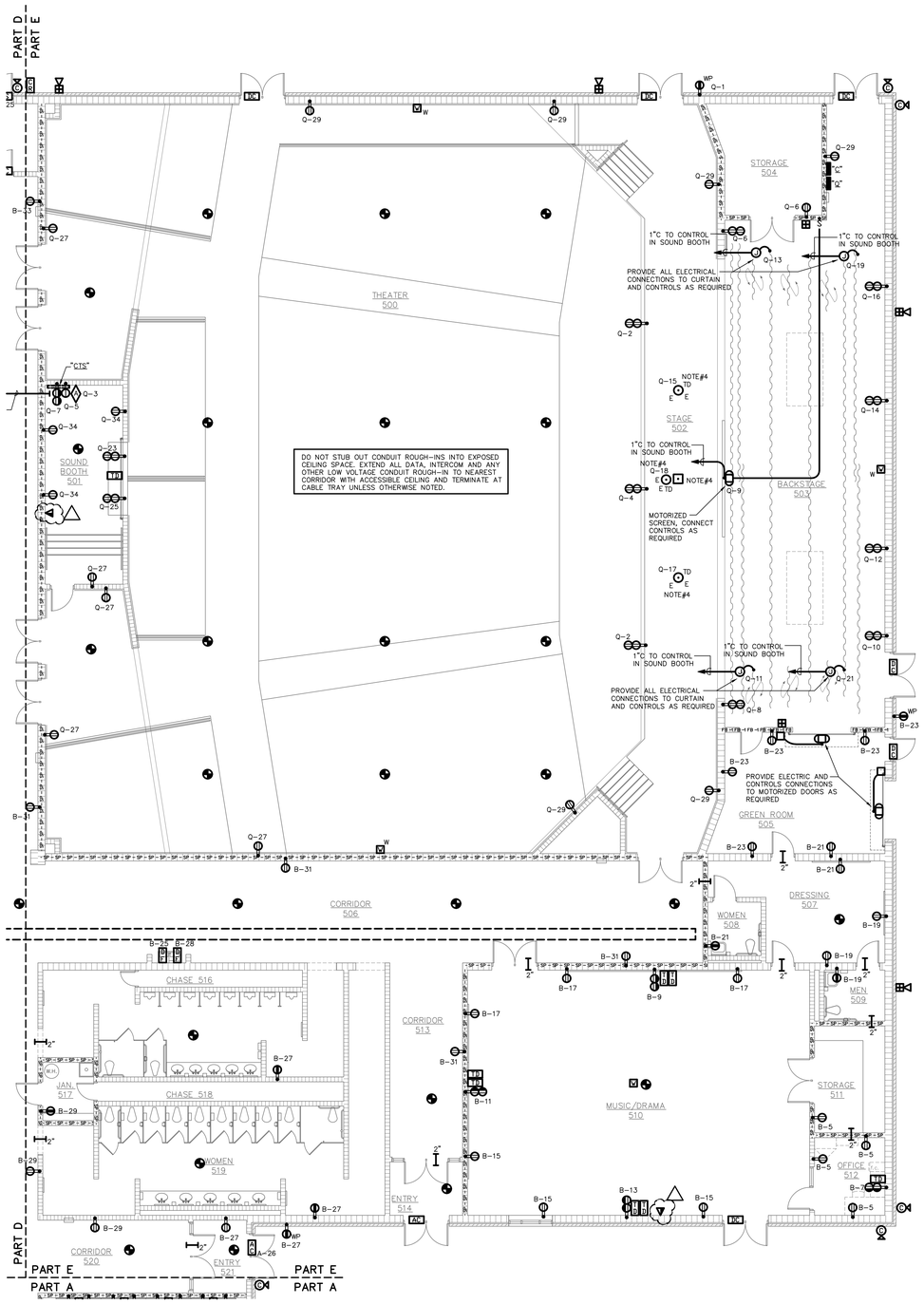
REVISIONS	
NO.	DATE
FM1	1-21-2022
	10-6-2022
DWN.	MWE
CHK'D.	ECH
APP'D.	ECH

EDWARD C. HENDERSON JR. REGISTERED ENGINEER No. 119245 STATE OF TENNESSEE 11/23/21

FLOOR PLAN - PART D - POWER & COMMUNICATIONS

PROJ. NO. 2697-14
DATE 11/23/2021
DWG. NO.
E1.09

NEW
JASPER MIDDLE



FLOOR PLAN – PART "E" – POWER & COMMUNICATIONS

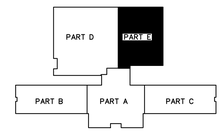
SCALE: 1/8"=1'-0"

NOTES

1. PRIOR TO LOCATING ANY AND ALL DEVICES AT CASEWORK, COUNTERTOPS ETC., THE CONTRACTOR SHALL REFER TO FINAL ARCHITECTURAL CASEWORK ELEVATIONS AND SHOP DRAWINGS TO VERIFY MOUNTING HEIGHTS AND LOCATIONS. ALL DEVICE LOCATIONS SHALL BE COORDINATED WITH THESE DRAWINGS AND/OR THE ARCHITECT PRIOR TO ROUGH-IN.
2. ALL 120V, 20 AMP CIRCUITS WITH HOMERUNS GREATER THAN 70 FEET SHALL HAVE CIRCUIT AND GROUNDING CONDUCTORS OF #10AWG AS MINIMUM. ANY 120V, 20 AMP CIRCUIT WITH OUTLETS GREATER THAN 100 FEET OF BRANCH CIRCUIT LENGTH SHALL HAVE CIRCUIT AND GROUNDING CONDUCTORS OF #10AWG MINIMUM TO ALL OUTLETS AND HOMERUN. ANY 120V, 20 AMP CIRCUIT WITH HOMERUN GREATER THAN 140 FEET SHALL HAVE BRANCH CIRCUIT AND GROUNDING CONDUCTORS OF #8AWG MINIMUM. PROVIDE ADEQUATE BOX TO SPLICE #12AWG FOR TERMINATION TO DEVICE. LARGER CONDUCTORS MAY REQUIRE THE UTILIZATION OF LARGER CONDUIT SIZES – REFER TO NEC TABLES.
3. CONTRACTOR SHALL PROVIDE ALL REQUIRED BRANCH CIRCUIT RACEWAY AND CONDUCTORS FOR CONNECTION OF DEVICES INDICATED. WIRING MAY BE ROUTED BELOW CONCRETE SLAB OR OVERHEAD, AT THE CONTRACTORS OPTION. ALL ABOVE-SLAB RACEWAY SHALL BE CONCEALED FROM VIEW IN WALLS OR ABOVE CEILINGS EXCEPT WHERE SPECIFICALLY NOTED TO BE SURFACE MOUNTED. PROVIDE A DEDICATED NEUTRAL CONDUCTOR FOR ALL 120V CIRCUITS.
4. VERIFY LOCATION OF FLOOR BOXES WITH ARCHITECT PRIOR TO ROUGH-IN.

WALL LEGEND

- BRICK & C.M.U. WALL (EXTERIOR WALL)
- C.M.U. WALL SMOKE PARTITION
  NOTE: CONTRACTOR SHALL SEAL ALL NEW DUCT AND PIPE PENETRATIONS AT ALL SMOKE PARTITIONS.
- C.M.U. WALL 1 HR. FIRE BARRIER



KEY PLAN
N.T.S.

ENGINEERING SERVICES GROUP, INC.
CONSULTING ENGINEERS
900 EAST HILL AVE, SUITE 350
KNOXVILLE, TENNESSEE 37915
(865) 522-0393
PROJECT NO. 19539

NEW
JASPER MIDDLE
JASPER, TENNESSEE

KAATZ, BINKLEY, JONES & MORRIS ARCHITECTS, INC.
NASHVILLE
1008 CHARLIE DANIELS PKY., MT. JULIET, TN 37122
P.O. BOX 713, MT. JULIET, TN 37122
PHONE: (615) 754-5393 FAX: (615) 754-5340

REVISIONS	
NO.	DATE
FM1	1-21-2022
	10-6-2022
DWN.	MWE
CHK'D.	ECH
APP'D.	ECH

EDWARD C. HENDERSON
REGISTERED ENGINEER
203
STATE OF TENNESSEE
ALONE
ARCHITECTURE
No. 118243
STATE OF TENNESSEE
11/23/21

FLOOR PLAN - PART E - POWER & COMMUNICATIONS

PROJ. NO. 2697-14
DATE 11/23/2021
DWG. NO.
E1.10

NEW
JASPER MIDDLE

INTERCOM/PAGING

- Intercom Handset to be installed on the Media Center Circulation Desk and in Office 156.
- Main Intercom Handset to be installed on Admin 103, Front Desk.
- Digital Clocks installed in Hallways

DATA WIRING

- TD in Offices 103, 104, 106, 109, 112, 115 will have two data jacks installed per TD.
- TD in classrooms will have one data jack per TD.
- Faceplates to cover unused data rough in.
- Data to be pulled to W – Wifi.

SECURITY CAMERAS

- Vendor to suggest placement of inside cameras
- IP Cameras to be installed on separate network with Vendor Web interface to access cameras outside school network.

INTERCOM/PAGING

- Digital Clocks installed in Hallway.

DATA WIRING

- TD is Science Lab 206 and TWA 223 to have two data drops per TD.
- Data to be pulled to W – Wifi.

SECURITY CAMERAS

- Vendor to suggest placement of inside cameras
- IP Cameras to be installed on separate network with Vendor Web interface to access cameras outside school network.

INTERCOM/PAGING

- Digital Clocks installed in Hallway.

DATA WIRING

- TD in Science Lab 306 and TWA 325 install two data jacks per TD.
- Data to be pulled to W – Wifi.

SECURITY CAMERAS

- Vendor to suggest placement of inside cameras
- IP Cameras to be installed on separate network with Vendor Web interface to access cameras outside school network

INTERCOM/PAGING

- Digital Clocks installed in Hallway.

DATA WIRING

- TD with two data on Serving Line 421
- TD with two data in Office 428
- Data to be pulled to W – Wifi.

SECURITY CAMERAS

- Vendor to suggest placement of inside cameras
- IP Cameras to be installed on separate network with Vendor Web interface to access cameras outside school network

INTERCOM/PAGING

- Digital Clocks installed in Hallway.

DATA WIRING

- Data to be pulled to TD Q-17 and Q-15
- Data to be pulled to W – Wifi.

SECURITY CAMERAS

- Vendor to suggest placement of inside cameras
- IP Cameras to be installed on separate network with Vendor Web interface to access cameras outside school network

ELECTRICAL SYMBOL LEGEND

L.E.D. LIGHTING FIXTURE:
"A" REFERS TO DESIGNATION IN THE LIGHTING FIXTURE SCHEDULE
"3" REFERS TO CIRCUIT NUMBER
"b" REFERS TO SWITCH CONTROL

L.E.D. EMERGENCY LIGHTING FIXTURE:
EQUIPPED WITH BUILT-IN EMERGENCY POWER BATTERY UNITS AND HOT MONITOR LINE TO ALLOW SWITCHING CONTROL. BATTERY SHALL PROVIDE 1400 LUMENS MINIMUM LIGHT OUTPUT IN EMERGENCY MODE. "NL" INDICATES UNSWITCHED FOR USE AS NIGHT LIGHT

L.E.D. EMERGENCY LIGHTING FIXTURE:
STANDARD FIXTURE, CONNECTED TO CENTRAL EMERGENCY LIGHTING INVERTER. PROVIDE EACH LIGHTING FIXTURE WITH AN EMERGENCY LIGHTING CONTROL RELAY HUBBELL #UL924BRUNV FOR SWITCH CONTROL

L.E.D. LIGHTING FIXTURE:
"C" REFERS TO DESIGNATION IN THE LIGHTING FIXTURE SCHEDULE
"b" REFERS TO SWITCH CONTROL
"3" REFERS TO CIRCUIT NUMBER
"EM" INDICATES FIXTURE EQUIPPED WITH EMERGENCY BATTERY UNIT.

LIGHT SWITCH:
WALL MOUNTED 48" AFF, SINGLE POLE UNLESS NOTED. PROVIDE WHITE TAPE LABEL WITH 1/4" HIGH TYPED BLACK LETTERING ON COVERPLATE INDICATING PANELBOARD AND CIRCUIT NUMBER. PROVIDE A NEUTRAL CONDUCTOR TO ALL SWITCH BOXES FOR USE BY WALL OCCUPANCY SENSORS. WIRE-NUT CONDUCTOR IF NOT USED.
"b" REFERS TO FIXTURES CONTROLLED BY SWITCH
"OS" WALL STATION OCCUPANCY SENSOR: AUTO-ON SETTING
"VS" WALL STATION VACANCY SENSOR: MANUAL-ON SETTING
BOTH "OS" AND "VS" SENSORS SHALL USE BOTH ULTRASONIC AND PASSIVE INFRARED TO DETECT AND SHALL BE FIELD CONFIGURABLE BETWEEN OCCUPANCY AND VACANCY MODES. PROVIDE NEUTRAL CONDUCTOR CONNECTION. SWITCH SHALL NOT GENERATE ANY CURRENT ON THE GROUND CONDUCTOR OR RACEWAY. WATTSTOPPER #DW-100
"3" 3-WAY
"4" 4-WAY
"k" AC BARREL KEY LOCKING SWITCH HUBBELL #HBL1221RKL SINGLE POLE, #HBL1223RKL 3-WAY
"PL" EQUIPPED WITH PILOT LIGHT TO INDICATE WHEN SWITCH IS ON

EXIT LIGHT FIXTURE:
WITH BUILT-IN EMERGENCY BATTERY UNIT, ALUMINUM HOUSING, RED LETTERING, LED LAMP SOURCE, DIRECTIONAL ARROWS AS INDICATED FURNISH WITH SELF-DIAGNOSTICS.
"X" CEILING MOUNTED SINGLE FACE
"X2" CEILING MOUNTED DOUBLE FACE
"XW" WALL MOUNTED SINGLE FACE

EMERGENCY LIGHTING UNIT:
WALL MOUNTED, TWIN HEAD UNIT WITH SELF-CONTAINED BATTERY. PROVIDE UNSWITCHED POWER TO EACH UNIT.

EXIT LIGHT FIXTURE WITH EMERGENCY LIGHT HEADS:
EXIT SIGN WITH BUILT-IN TWIN-HEAD EMERGENCY LIGHT AND SELF-CONTAINED EMERGENCY BATTERY UNIT, THERMOPLASTIC HOUSING, RED LETTERING, LED LAMP SOURCE FOR LETTERING, DIRECTIONAL ARROWS AS INDICATED, SELF-DIAGNOSTICS, SINGLE FACE.

LIGHTING DIMMER:
WALL MOUNTED 48" AFF, PRESET SERIES WITH SEPARATE ON/OFF CONTROL, RATED FOR 2000WATTS

0-10VOLT DIMMING WALL VACANCY SENSOR:
WALL MOUNTED 48" AFF, WALL STATION VACANCY SENSOR: SHALL USE BOTH ULTRASONIC AND PASSIVE INFRARED TO DETECT. PROVIDE NEUTRAL CONDUCTOR CONNECTION. SWITCH SHALL NOT GENERATE ANY CURRENT ON THE GROUND CONDUCTOR OR RACEWAY. WATTSTOPPER #DW-311 (FOR USE AS SINGLE AND 3-WAY SWITCH)

WIRELESS WALL SWITCH
WALL MOUNTED 48" AFF, LOW VOLTAGE CONTROLLER, TWO BUTTON WITH ON/OFF LUTRON PJ2-2B-GXX-L01

CEILING MOUNTED OCCUPANCY SENSOR:
FURNISH AND INSTALL LOW-VOLTAGE OCCUPANCY SENSOR. PROVIDE ALL REQUIRED LOW VOLTAGE WIRING BETWEEN SENSORS AND POWER PACKS. SENSOR SHALL USE DUAL-TECHNOLOGY (INFRARED AND ULTRASONIC) TO DETECT ON A 2000 SQUARE FOOT 360 DEGREE PATTERN. SENSORS SHALL BE LUTRON LOS-CDT-2000-WH

WALL MOUNTED OCCUPANCY SENSOR:
FURNISH AND INSTALL LOW-VOLTAGE OCCUPANCY SENSOR 8'AFF. PROVIDE ALL REQUIRED LOW VOLTAGE WIRING BETWEEN SENSORS AND POWER PACKS. SENSOR SHALL USE DUAL-TECHNOLOGY (INFRARED AND ULTRASONIC) TO DETECT ON A 1600 SQUARE FOOT 110 DEGREE PATTERN.. SENSORS SHALL BE LUTRON #LOS-WDT-WH

OCCUPANCY SENSOR POWER PACK:
FURNISH AND INSTALL LOW-VOLTAGE CONTROLLED POWER PACK. UNIT SHALL BE FULLY RATED TO SWITCH 20 AMP BALLAST LOAD. SHALL PROVIDE POWER TO LOW-VOLTAGE OCCUPANCY SENSORS. UNIT SHALL BE MOUNTED IN AN ACCESSIBLE LOCATION. POWER PACK SHALL BE LUTRON #PP-DV.

HIGH CEILING MOUNT OCCUPANCY SENSOR:
FURNISH AND INSTALL LOW-VOLTAGE OCCUPANCY SENSOR. PROVIDE ALL REQUIRED LOW VOLTAGE WIRING BETWEEN SENSORS AND POWER PACKS. SENSOR SHALL DETECT A 360 DEGREE PATTERN AND SHALL BE SUITABLE FOR HEIGHT UP TO 45'. SENSOR SHALL BE HUBBELL #WSP-SM-24V AND #WSP-L360-WH(LENS). THESE UNITS SHALL USE POWER PACK HUBBELL #UVPP.

WIRELESS LIGHTING DIMMER:
WALL MOUNTED 48" AFF, FOUR BUTTONS & RAISE AND LOWER BUTTONS CONTROLLING 1 ZONE OF LIGHTING, LUTRON PJ2-2BRL-GXX-L01, INSTALL IN RECESSED SINGLE GANG JUNCTION BOX. SEE TYPICAL CONTROLLER DETAIL THIS SHEET.

WIRELESS LIGHTING DIMMER:
WALL MOUNTED 48" AFF, FIVE BUTTONS & RAISE AND LOWER BUTTONS CONTROLLING 2 ZONE OF LIGHTING, LUTRON PJ2-3BRL-GXX-L01, INSTALL IN RECESSED SINGLE GANG JUNCTION BOX. SEE TYPICAL CONTROLLER DETAIL THIS SHEET.

WIRELESS DIMMING POWER PACK:
FURNISH AND INSTALL WIRELESS POWER PACK. UNIT SHALL BE RATED TO SWITCH 5 AMP BALLAST LOAD. UNIT SHALL BE MOUNTED IN AN ACCESSIBLE LOCATION. POWER PACK SHALL BE LUTRON #RMJ-5T-DV-B

WIRELESS CEILING MOUNTED OCCUPANCY SENSOR:
FURNISH AND INSTALL WIRELESS OCCUPANCY SENSOR. SENSOR SHALL USE DUAL-TECHNOLOGY (INFRARED AND ULTRASONIC) TO DETECT ON A 600 SQUARE FOOT 360 DEGREE PATTERN. LUTRON LRF2-OCR2B-P-WH

WIRELESS SWITCH POWER PACK:
FURNISH AND INSTALL WIRELESS POWER PACK. UNIT SHALL BE RATED TO SWITCH 16 AMP BALLAST LOAD AND HAVE AN ISOLATED RELAY TO CONTROL SHUT DOWN OF HVAC. UNIT SHALL BE MOUNTED IN AN ACCESSIBLE LOCATION. POWER PACK SHALL BE LUTRON #RMJS-16R-DV-B

HOUSE LIGHTING CONTROL STATION:
WALL MOUNTED 48" AFF, TWO BUTTON CONTROLLER LUTRON #QSWS2-2BI-WH

DIMMING SYSTEM I/O CONTROLLER:
INSTALL PER MANUFACTURER RECOMMENDATIONS, LUTRON #QSE-IO

0-10 VOLT POWER INTERFACE:
DIMMING SYSTEM 0-10 VOLT DIMMING CONTROLLER, MOUNT NEAR LIGHTING FIXTURE BEING CONTROLLED LUTRON #GRX-TVI

HOUSE LIGHTING MASTER CONTROL STATION:
WALL MOUNTED 48" AFF, LUTRON #QSGRJ-3P-WH

THEATRICAL LIGHTING DMX JACK:
ROUTE 1"C FROM SINGLE GANG BOX TO DMX SPLITTER, 18" AFF, UNLESS OTHERWISE NOTED

GROUND FAULT CIRCUIT INTERRUPTER DEVICE:
BLANK FACE 120V 20A GFCI DEVICE, MOUNT 48"AFF, HUBBELL #GFBFST20, PROVIDE PRINTED LABEL INDICATING WHAT EQUIPMENT DEVICES SERVES

"FACP" **FIRE ALARM CONTROL PANEL:**
MOUNT WITH TOP 6'-0" AFF. FURNISH WITH BATTERY BACK-UP AND DIGITAL COMMUNICATOR. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION. PROVIDE DEDICATED 20A 120V CIRCUIT. ASSOCIATED CIRCUIT BREAKER DEVICE SHALL BE RED, EQUIPPED WITH A LOCK-ON DEVICE TO PREVENT SHUT-OFF, AND LABELED "FIRE ALARM CIRCUIT." PROVIDE PERMANENT MARKING ON THE CONTROL PANEL INDICATING THE LOCATION AND CIRCUIT DESIGNATION OF THE FEEDER CIRCUIT.

"FAA" **FIRE ALARM REMOTE ANNUNCIATOR:**
MOUNT WITH TOP 6'-0" AFF. ROUTE 1" CONDUIT TO THE FIRE ALARM PANEL.

MANUAL PULL STATION:
FIRE ALARM SYSTEM MANUAL ACTIVATION DEVICE, MOUNT 48" AFF

VISUAL SIGNAL:
FIRE ALARM ACTIVATION SIGNAL DEVICE, ADA COMPLIANCE LISTED, MOUNT 80" AFF, MEASURED TO THE BOTTOM OF THE APPLIANCE. ANY DEVIATION FROM 80" MOUNTING HEIGHT SHALL BE COORDINATED WITH THE AUTHORITY HAVING JURISDICTION PRIOR TO ROUGH-IN. ALL DEVICES SHALL BE MOUNTED AT THE SAME HEIGHT UNLESS DIRECTED OTHERWISE. COORDINATE BOX HEIGHT WITH THE FIRE ALARM SUPPLIER PRIOR TO ROUGHING-IN. REFER TO FIRE ALARM SPECIFICATIONS FOR ALL OTHER INFORMATION IN REGARDS TO FIRE ALARM SYSTEM REQUIREMENTS.
"cd" INDICATES THE CANDELA RATING.
"WP" INDICATES WEATHERPROOF SUITABLE FOR OUTDOOR MOUNTING

AUDIBLE/VISUAL SIGNAL: SPEAKER/STROBE
FIRE ALARM SIGNAL ACTIVATION DEVICE, ADA COMPLIANCE LISTED, MOUNT 80" AFF, MEASURED TO THE BOTTOM OF THE APPLIANCE. ANY DEVIATION FROM 80" MOUNTING HEIGHT SHALL BE COORDINATED WITH THE AUTHORITY HAVING JURISDICTION PRIOR TO ROUGH-IN. ALL DEVICES SHALL BE MOUNTED AT THE SAME HEIGHT UNLESS DIRECTED OTHERWISE. COORDINATE BOX HEIGHT WITH THE FIRE ALARM SUPPLIER PRIOR TO ROUGHING-IN. REFER TO FIRE ALARM SPECIFICATIONS FOR ALL OTHER INFORMATION IN REGARDS TO FIRE ALARM SYSTEM REQUIREMENTS.
"cd" INDICATES THE CANDELA RATING.
"db" INDICATES THE DECIBEL RATING.
"WP" INDICATES WEATHERPROOF SUITABLE FOR OUTDOOR MOUNTING
"CLG" INDICATES A CEILING MOUNTED DEVICE
"WG" INDICATES DEVICE EQUIPPED WITH WIREGUARD

DUCT MOUNTED SMOKE DETECTOR:
LOCATION AND MOUNTING BY MECHANICAL CONTRACTOR, FIRE ALARM CONNECTION BY ELECTRIC CONTRACTOR. ELECTRICAL CONTRACTOR TO VERIFY EXACT NUMBER OF DETECTORS REQUIRED WITH MECHANICAL AND ELECTRICAL DRAWINGS. PROVIDE ALL FIRE ALARM CONTROL MODULES AS REQUIRED FOR HVAC UNIT SHUT-DOWN UPON ACTIVATION OF THE DUCT SMOKE DETECTOR.

PROVIDE FOR EACH DUCT DETECTOR A REMOTE TEST STATION WITH LED INDICATOR. TEST SWITCH SHALL BE LOCATED ON THE WALL 6" BELOW FINISHED CEILING OR 9'-0"AFF WHICHEVER IS LOWER. EACH TEST STATION SHALL BE LABELED SUCH AS "DUCT DETECTOR, SUPPLY, RTU-1". WHERE HVAC UNITS ARE LOCATED IN MECHANICAL ROOMS LOCATE TEST SWITCH IN THAT ROOM, WHERE UNITS ARE LOCATED ABOVE THE CEILING, ROOF MOUNTED, ETC.. LOCATE TEST SWITCH AS CLOSE AS POSSIBLE AT THE NEAREST WALL.

SMOKE DETECTOR:
CEILING MOUNTED ON 4" SQUARE BOX. DETECTORS SHALL NOT BE LOCATED IN THE DIRECT AIRFLOW OR CLOSER THAN 3'-0" TO ANY AIR SUPPLY DIFFUSER OR RETURN AIR OPENING.

HEAT DETECTOR:
CEILING MOUNTED ON 4" SQUARE BOX. HEAT DETECTOR SHALL BE RATE OF RISE TYPE DETECTOR.

TAMPER SWITCH:
FURNISHED AND INSTALLED BY SPRINKLER CONTRACTOR, CONNECTION TO FIRE ALARM SYSTEM BY ELECTRICAL CONTRACTOR. VERIFY EXACT NUMBER OF DEVICES WITH THE SPRINKLER CONTRACTOR.

POST INDICATOR VALVE:
FURNISHED AND INSTALLED BY SPRINKLER CONTRACTOR, CONNECTION TO FIRE ALARM SYSTEM BY ELECTRICAL CONTRACTOR

FIRE/SMOKE DAMPER:
PROVIDE 120V POWER TO DAMPER FURNISHED BY MECHANICAL. PROVIDE DUCT DETECTOR FOR INSTALLATION BY MECHANICAL. PROVIDE ALL CONTROL MODULES NECESSARY TO CONNECT TO FIRE ALARM SYSTEM. PROVIDE MEANS OF DISCONNECT PER NEC REQUIREMENTS.

DOOR RELEASE:
FURNISHED AND INSTALLED BY DOOR HARDWARE CONTRACTOR, CONNECTION TO FIRE ALARM SYSTEM BY ELECTRICAL CONTRACTOR

EQUIPMENT NUMBER:
REFER TO SCHEDULES AND EQUIPMENT SUPPLIERS DRAWINGS FOR SUPPORTING INFORMATION

"CTS" **COMMUNICATIONS TERMINAL SPACE:**
3/4" PLYWOOD BOLTED TO WALL, TOP 6'-0" AFF, WIDTH AS INDICATED ON THE DRAWINGS. INSTALL GROUND BAR AND 1#6CU GROUND WIRE TO BUILDING GROUND SYSTEM. PAINT WITH FIRE-RETARDANT PAINT.

TELEPHONE OUTLET ROUGH-IN:
4-11/16" SQUARE BY 2-1/8"DP BOX WITH SINGLE GANG DEVICE RING AND NO TRIM PLATE, 18" AFF ROUGH-IN. STUB 1" CONDUIT OUT TO ABOVE ACCESSIBLE CEILING SPACE.
"W" INDICATES WALL MOUNTED PHONE, 54" AFF ROUGH-IN
"C" SPECIAL MOUNTING HEIGHT IN OR AROUND CASEWORK, SEE ARCHITECTURAL DRAWINGS AND CASEWORK ELEVATIONS.
OUTLETS, CABLING AND TRIMPLATE FURNISHED AND INSTALLED BY OWNER'S VENDOR.

TELE/DATA OUTLET ROUGH-IN:
4-11/16" SQUARE BY 2-1/8"DP BOX WITH SINGLE GANG DEVICE RING AND NO TRIM PLATE, 18" AFF ROUGH-IN. STUB (2) 1" CONDUITS OUT TO ABOVE ACCESSIBLE CEILING SPACE. "C" SPECIAL MOUNTING HEIGHT IN OR AROUND CASEWORK, SEE ARCHITECTURAL DRAWINGS AND CASEWORK ELEVATIONS.
OUTLETS, CABLING AND TRIMPLATE FURNISHED AND INSTALLED BY OWNER'S VENDOR.

TELEVISION OUTLET ROUGH-IN:
4-11/16" SQUARE BY 2-1/8"DP BOX WITH SINGLE GANG DEVICE RING AND NO TRIMPLATE, VERIFY MOUNTING HEIGHT WITH ARCHITECT UNLESS OTHERWISE NOTED STUB 1" CONDUIT OUT TO ABOVE ACCESSIBLE CEILING SPACE.
OUTLET, CABLING AND TRIMPLATE FURNISHED BY OWNER'S VENDOR.

MOTORIZED DAMPER:
FURNISHED AND INSTALLED BY MECHANICAL CONTRACTOR, POWER CONNECTIONS BY ELECTRICAL CONTRACTOR

DISCONNECT SWITCH:
HORSEPOWER RATED, FUSED, HEAVY DUTY
"WP" WEATHERPROOF, NEMA 3R OUT OF DOORS

CONTROLLERS:
LOCKABLE MANUAL MOTOR STARTER FURNISHED AND INSTALLED BY THE ELECTRICAL CONTRACTOR.

MOTOR STARTER, FURNISHED BY MECHANICAL CONTRACTOR, INSTALLED BY ELECTRICAL CONTRACTOR.

ELECTRIC MOTOR CONNECTION:
USE FLEXIBLE CONDUIT WITH-IN 18" OF CONNECTION

POWER PANELBOARD:
FLUSH OR SURFACE MOUNTED, TOP 6'-0" AFF. SEE PANELBOARD SCHEDULE FOR SUPPORT INFORMATION.

DRINKING FOUNTAIN:
CONCEAL DUPLEX 120V 20A PLUG RECEPTACLE BEHIND UNIT, 33"+/- AFF. HOMERUN CIRCUIT BREAKER SHALL BE 5mA GFCI TYPE. COORDINATE ROUGH-IN LOCATION WITH DRINKING FOUNTAIN.

TAMPER RESISTANT DUPLEX PLUG RECEPTACLE:
18" AFF, 20A, 120V. PROVIDE WHITE TAPE LABEL WITH 1/4" HIGH TYPED BLACK LETTERING ON COVERPLATE OF RECEPTACLE INDICATING PANELBOARD AND CIRCUIT NUMBER. TAMPER RESISTANT
"T" INDICATES LOCATE ALONGSIDE TELEVISION OUTLET

COLORED SIDES, SPECIAL MOUNTING HEIGHT IN OR AROUND CASEWORK, SEE ARCHITECTURAL DRAWINGS AND CASEWORK ELEVATIONS, TAMPER RESISTANT

COLORED CENTER WITH BUILT-IN GROUND FAULT PROTECTION, 44" AFF AT CASEWORK, 18" WEATHER-RESISTANT OUT OF DOORS, TAMPER RESISTANT
"WP" WEATHERPROOF IN-USE 'EXTRA-DUTY' (UL 514D-2000) METAL COVER AND WEATHER-RESISTANT (UL 498SE) TYPE GFCI DEVICE.
"R" INDICATES MOUNTED ON THE ROOF PROVIDE DEDICATED NEUTRAL FOR EACH CIRCUIT SERVING AN OUTLET.

COLORED SIDE WITH BUILT-IN TRANSIENT VOLTAGE SURGE SUPPRESSION. UL 1449 3RD EDITION LISTED WITH LED STATUS INDICATOR LIGHTS. NON-ISOLATED GROUND. TAMPER RESISTANT

30A PLUG RECEPTACLE:
FLUSH MOUNT 8'-0" AFF. PROVIDE 30A, 120V, DEVICE. NEMA L5-30R. ROUTE 2#10,1#10G, BACK TO PANELBOARD.

TAMPER RESISTANT QUADPLEX PLUG RECEPTACLE:
PROVIDE TWO DUPLEX RECEPTACLES IN A DOUBLE GANG BOX WITH A DOUBLE GANG COVERPLATE. REFER TO RECEPTACLE DESCRIPTIONS ABOVE FOR RECEPTACLE TYPE REQUIRED.

FLOOR OUTLET:
FLUSH MOUNTED BOX WITH CONCEALED WIRING DEVICES FIRE RATED OR NON-FIRE RATED AS REQUIRED, RATED FOR ON GRADE WHERE REQUIRED.
"E" INDICATES 120V DUPLEX RECEPTACLE, POWER CONDUIT NOT SHOWN
"TD" INDICATES TELE/DATA ROUGH-IN
"M" INDICATES MICROPHONE OUTLET ROUGH-IN
"AV" INDICATES AUDIO VISUAL OUTLET ROUGH-IN
"S" INDICATES SCORBOARD OUTLET
ALL LOW VOLATGE CABLING, OUTLETS AND TRIMPLATES SHALL BE FURNISHED AND INSTALLED BY OWNER'S VENDOR.

MYSTERY BOX:
FLUSH MOUNTED BOX FOR STAGE AV DEVICES, NON-FIRE RATED. PROVIDE MYSTERY BOX # FMCA3300 SERIES WITH #BB3000 BACKBOX. FURNISH AND INSTALL ALL NECESSARY INSERTS FOR DEVICES INSTALLED BY OTHERS. STUB 2 - 1 1/4"C OUT ABOVE ACCESSIBLE CEILING.

FIRESTOP SLEEVE:
FIRESTOP SLEEVE FOR LOW VOLTAGE CABLING. LOCATE ABOVE ACCESSIBLE CEILING SPACE. PROVIDE NUMBER OF SLEEVES AS SHOWN, STANDARD SIZE IS 4" UNLESS OTHERWISE NOTED. SLEEVE SHALL BE AS MANUFACTURED BY HILTI CORPORATION - SPEED SLEEVE MODEL #CP653. INSTALL SLEEVE PER THE MANUFACTURER INSTRUCTIONS AND SPECIFICATIONS. WHERE MULTIPLE SLEEVES ARE SHOWN OR NOTED AT ONE LOCATION USE FIRESTOP GANGPLATE. FOR WALL THICKNESS GREATER THAN 11" USE CONDUIT SLEEVES WITH FIRESTOPPING PER DETAIL

CABLE TRAY:
WIRE MESH CABLE TRAY, 18" WIDE X 6" DEEP UNLESS NOTED OTHERWISE, REFER TO SPECIFICATION FOR DETAILS

INTERCOM LOUDSPEAKER LOCATION AND ROUGH-IN:
CEILING RECESSED COMPLETE WITH BACKBOX, BAFFLE AND MOUNTING SUPPORTS. SPEAKER, CABLING AND ALL ASSOCIATED MOUNTING FURNISHED AND INSTALLED BY OWNER'S VENDOR.

WALL FLUSH MOUNTED INTERIOR SPEAKER, 7'-6" AFF UNLESS NOTED OTHERWISE. PROVIDE FLUSH MOUNTED SPEAKER BACKBOX WITH 3/4"C STUBBED OUT TO ACCESSIBLE CEILING FOR USE BY OTHERS. BACKBOX FURNISHED AND INSTALLED BY ELECTRICAL CONTRACTOR. COORDINATE TYPE OF BACKBOX REQUIRED WITH OWNER'S VENDOR. SPEAKER, CABLING AND ALL ASSOCIATED MOUNTING FURNISHED AND INSTALLED BY OWNER'S VENDOR.

WALL FLUSH MOUNTED EXTERIOR SPEAKER, LOCATE AT A HEIGHT AS DIRECTED BY ARCHITECT. PROVIDE FLUSH MOUNTED SPEAKER BACKBOX WITH 3/4"C STUBBED OUT TO ACCESSIBLE CEILING FOR USE BY OTHERS. BACKBOX FURNISHED AND INSTALLED BY ELECTRICAL CONTRACTOR. COORDINATE TYPE OF BACKBOX REQUIRED WITH OWNER'S VENDOR. SPEAKER, CABLING AND ALL ASSOCIATED MOUNTING FURNISHED AND INSTALLED BY OWNER'S VENDOR.

PROJECTOR SPEAKER LOUDSPEAKER LOCATION:
CEILING RECESSED COMPLETE WITH BACKBOX, BAFFLE AND MOUNTING SUPPORTS. SPEAKER, CABLING AND ALL ASSOCIATED MOUNTING FURNISHED AND INSTALLED BY OWNER'S VENDOR.

SOUND SYSTEM AMPLIFIER ROUGH-IN:
PROVIDE 120V POWER CONNECTION. VERIFY EXACT REQUIREMENTS WITH OWNER'S SYSTEM VENDOR. PROVIDE 1" CONDUIT FROM AMPLIFIER LOCATION TO EACH SYSTEM SPEAKER FOR CABLING. INSTALL AMPLIFIER BACKBOX FURNISHED BY OWNER'S VENDOR. VERIFY EACT NUMBER OF CONDUITS REQUIRED WITH OWNER'S VENDOR. AMPLIFIER AND SYSTEM CABLING FURNISHED AND INSTALLED BY OWNER'S VENDOR.

CLASSROOM TELEPHONE OUTLET ROUGH-IN:
4-11/16" SQUARE BY 2-1/8"DP BOX WITH SINGLE GANG DEVICE RING AND NO TRIM PLATE, 48" AFF ROUGH-IN. STUB 1" CONDUIT OUT TO ABOVE ACCESSIBLE CEILING SPACE.
OUTLETS, CABLING AND TRIMPLATE FURNISHED AND INSTALLED BY OWNER'S VENDOR.

JUNCTION BOX:
FUNCTION, SIZE AND USE AS REQUIRED
"PJ" ADJACENT TO J-BOX INDICATES CEILING PROJECTOR LOCATION, PROVIDE A QUADPLEX 120V RECEPTACLE FLUSH MOUNTED IN CEILING, COORDINATE THE FINAL EXACT LOCATION OF EACH RECEPTACLE WITH OWNER REPRESENTATIVE PRIOR TO INSTALLATION.

BRANCH CIRCUIT HOMERUN:
CONDUIT WITH CONDUCTORS EXTENDED AND CONNECTED TO OVERCURRENT DEVICE(S) NOTED. CROSSLINES INDICATE QUANTITY OF #12 AWG CONDUCTORS WHEN MORE THAN TWO. PROVIDE A DEDICATED NEUTRAL FOR EACH LINE-TO-NEUTRAL CIRCUIT IN A HOMERUN. WHERE ONE NEUTRAL IS PROVIDED FOR A MULTI-CIRCUIT HOMERUN THE CONTRACTOR SHALL PROVIDE DISCONNECTING MEANS FOR EACH CONDUCTOR AS REQUIRED BY THE 2008 NEC. GROUNDING CONDUCTOR IS NOT ILLUSTRATED.

CONDUIT:
SOLID LINE AND CLOSED DOT INDICATE INSTALLED IN WALL OR CEILING SHOWN TURNING DOWN. ALL CONDUITS SHALL CONTAIN AN EQUIPMENT GROUNDING CONDUCTOR WHICH IS NOT ILLUSTRATED.
BROKEN LINE AND OPEN DOT INDICATE INSTALLED IN FLOOR CONSTRUCTION OR UNDERGROUND SHOWN TURNING UP. ALL CONDUITS SHALL CONTAIN AN EQUIPMENT GROUNDING CONDUCTOR WHICH IS NOT ILLUSTRATED.

PLUG RECEPTACLE:
208V-1P, 18" AFF. VERIFY CONFIGURATION WITH EQUIPMENT SERVED.
"R" INDICATES RANGE RECEPTACLE, 1-PHASE, 4-WIRE WITH NEUTRAL, NEMA 14-50R. UNLESS NOTED OTHERWISE, ROUTE 1",3#6,1#10G TO PANEL INDICATED, PROVIDE 50AMP 2-POLE BREAKER.
"D" INDICATES DRYER RECEPTACLE, 1-PHASE, 4-WIRE WITH NEUTRAL, NEMA 14-30R. UNLESS NOTED OTHERWISE, ROUTE 3/4",3#10,1#10G TO PANEL INDICATED, PROVIDE 30AMP 2-POLE BREAKER.
"W" INDICATES WELDER RECEPTACLE, 1-PHASE, 3-WIRE, NEMA 6-50R. ROUTE 3/4",2#6,1#10G TO PANEL INDICATED, PROVIDE 50AMP 2-POLE BREAKER.
"WP" INDICATES WEATHERPROOF IN-USE "EXTRA DUTY" COVER.

STAGE SMOKE VENT DAMPER:
PROVIDE 120V POWER TO DAMPER FURNISHED BY OTHERS. PROVIDE ALL CONTROL MODULES NECESSARY TO CONNECT TO FIRE ALARM SYSTEM. PROVIDE MEANS OF DISCONNECT PER NEC REQUIREMENTS.

WIRELESS ACCESS POINT:
DEVICE PROVIDED AND INSTALLED BY OWNER'S VENDOR, LOCATION SHOWN FOR INFORMATION ONLY.
"W" ADJACENT TO DEVICE INDICATES WALL MOUNT 10'AFF. PROVIDE A 4-11/16" SQUARE BY 2-1/8"DP BOX WITH SINGLE GANG DEVICE RING AND BLANK TRIM PLATE, ROUTE 3/4"C TO ACCESSIBLE CEILING SPACE.

ELECTRIC DOOR STRIKE LOCATION:
3/4" FROM DOOR FRAME TO ACCESSIBLE CEILING SPACE COORDINATE EXACT REQUIREMENTS WITH DOOR HARDWARE SUPPLIER, REFER TO ACCESS CONTROL DETAIL. SYSTEM FURNISHED AND INSTALLED BY OWNER'S VENDOR, ROUGH-IN BY ELECTRICAL CONTRACTOR.

DOOR CONTACT ROUGH-IN LOCATION:
3/4" FROM DOOR FRAME TO ACCESSIBLE CEILING SPACE COORDINATE EXACT REQUIREMENTS WITH DOOR HARDWARE SUPPLIER, REFER TO ACCESS CONTROL DETAIL. SYSTEM FURNISHED AND INSTALLED BY OWNER'S VENDOR, ROUGH-IN BY ELECTRICAL CONTRACTOR.

ELECTRONIC LOCK SET ROUGH-IN LOCATION:
3/4" FROM DOOR FRAME TO ACCESSIBLE CEILING SPACE COORDINATE EXACT REQUIREMENTS WITH DOOR HARDWARE SUPPLIER, REFER TO ACCESS CONTROL DETAIL. SYSTEM FURNISHED AND INSTALLED BY OWNER'S VENDOR, ROUGH-IN BY ELECTRICAL CONTRACTOR.

CARD READER ROUGH-IN LOCATION:
WALL MOUNT 42"AFF. 4-11/16" SQUARE BY 2-1/8"DP BOX WITH SINGLE GANG DEVICE RING AND NO TRIM PLATE REFER TO ACCESS CONTROL DETAIL THIS SHEET. SYSTEM FURNISHED AND INSTALLED BY OWNER'S VENDOR, ROUGH-IN BY ELECTRICAL CONTRACTOR. SEE DETAIL SHEET E4.02.

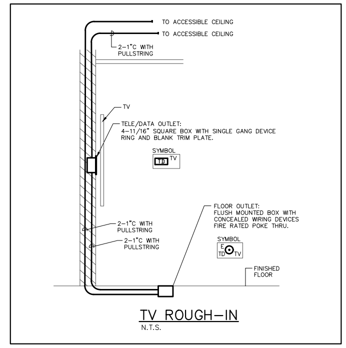
INTERCOM ROUGH-IN LOCATION:
WALL MOUNT 42"AFF. 4-11/16" SQUARE BY 2-1/8"DP BOX WITH SINGLE GANG DEVICE RING AND NO TRIM PLATE, ROUTE 3/4"C TO ACCESSIBLE CEILING SPACE. SYSTEM FURNISHED AND INSTALLED BY OTHERS, ROUGH-IN BY ELECTRICAL CONTRACTOR.

CCTV CAMERA
WALL MOUNTED CLOSED CIRCUIT CAMERA. PROVIDE 3/4"C, TO ACCESSIBLE CEILING SPACE. MOUNT 12'AFF UNLESS OTHERWISE NOTED. CAMERA PROVIDED AND INSTALLED BY OWNER VENDOR, ROUGH-IN BY ELECTRICAL CONTRACTOR.

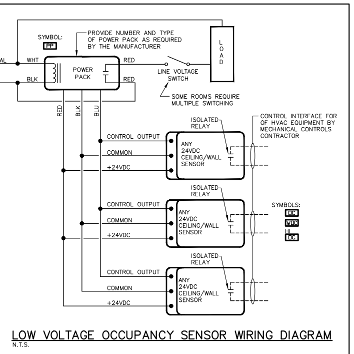
REQUEST EXIT BUTTON:
WALL MOUNT 42"AFF. 4-11/16" SQUARE BY 2-1/8"DP BOX WITH SINGLE GANG DEVICE RING AND NO TRIM PLATE, ROUTE 3/4"C TO ACCESSIBLE CEILING SPACE. SYSTEM FURNISHED AND INSTALLED BY OTHERS, ROUGH-IN BY ELECTRICAL CONTRACTOR.
"C" SPECIAL MOUNTING HEIGHT IN OR AROUND CASEWORK, SEE ARCHITECTURAL DRAWINGS AND CASEWORK ELEVATIONS

NOTES:

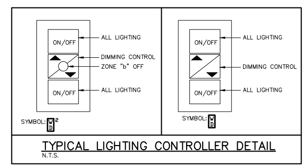
1. DEVICES LOCATED ON OPPOSITE SIDES OF FIRE RATED PARTITIONS MUST BE SEPARATED BY A MINIMUM OF 24" HORIZONTAL DISTANCE. REFER TO ARCHITECTURAL PLANS FOR LOCATIONS OF FIRE RATED PARTITIONS. WHERE CONDITIONS PROHIBIT A 24" MINIMUM SEPARATION OF DEVICES, USE FIRESTOP PUTTY PADS, HILTI CP617 SERIES OR APPROVED EQUAL, ON DEVICE BOXES TO MAINTAIN FIRE RATING OF PARTITION. INSTALL PADS PER MANUFACTURER'S SPECIFICATIONS. DEVICE BOXES SHALL NOT BE MOUNTED BACK TO BACK. PRIOR TO INSTALLATION OF PADS, VERIFY METHOD WITH ARCHITECT AND FIRE INSPECTOR.
2. WHERE MORE THAN ONE VISUAL DEVICE (STROBE) IS LOCATED WITHIN AN AREA, ALL VISUAL DEVICES (STROBES) WITHIN THAT AREA SHALL BE SYNCHRONIZED. THIS APPLIES TO ALL AND ANY LOCATIONS WHERE AN INDIVIDUAL CAN SEE MORE THAN ONE DEVICE FROM THE SAME LOCATION FROM WHERE THEY ARE STANDING, SITTING, ETC. PROVIDE ALL REQUIRED SYNCHRONIZED DEVICES, SYNCHRONIZING MODULES ETC. IN ORDER TO ACCOMPLISH THIS FUNCTION. REFER TO FIRE ALARM SPECIFICATIONS FOR ALL OTHER INFORMATION IN REGARD TO FIRE ALARM SYSTEM REQUIREMENTS.
3. ALL CONDUITS SHALL CONTAIN AN EQUIPMENT GROUNDING CONDUCTOR WHICH IS NOT ILLUSTRATED.
4. PRIOR TO LOCATING ANY AND ALL DEVICES AT CASEWORK, COUNTERTOPS ETC., THE CONTRACTOR SHALL REFER TO FINAL ARCHITECTURAL CASEWORK ELEVATIONS AND SHOP DRAWINGS TO VERIFY MOUNTING HEIGHTS AND LOCATIONS. ALL DEVICE LOCATIONS SHALL BE COORDINATED WITH THESE DRAWINGS AND/OR THE ARCHITECT PRIOR TO ROUGH-IN.
5. ALL 120V, 20 AMP CIRCUITS WITH HOMERUNS GREATER THAN 70 FEET SHALL HAVE CIRCUIT CONDUCTORS OF #10AWG AS MINIMUM. ANY 120V, 20 AMP CIRCUIT WITH OUTLETS GREATER THAN 100 FEET OF BRANCH CIRCUIT LENGTH SHALL HAVE MINIMUM CIRCUIT CONDUCTOR OF #10AWG TO ALL OUTLETS AND HOMERUN. ANY 120V, 20 AMP CIRCUIT WITH HOMERUN GREATER THAN 140 FEET SHALL HAVE BRANCH CIRCUIT CONDUCTOR OF #8AWG MINIMUM. PROVIDE ADEQUATE BOX TO SPLICE #12AWG FOR TERMINATION TO DEVICE. LARGER CONDUCTORS MAY REQUIRE THE UTILIZATION OF LARGER CONDUIT SIZES - REFER TO NEC TABLES.
6. PROVIDE A DEDICATED NEUTRAL FOR EACH LINE-TO-NEUTRAL CIRCUIT IN A MULTI-CIRCUIT HOMERUN AS REQUIRED BY THE 2008 NEC.
7. PROVIDE NYLON PULLSTRING IN ALL EMPTY CONDUITS.



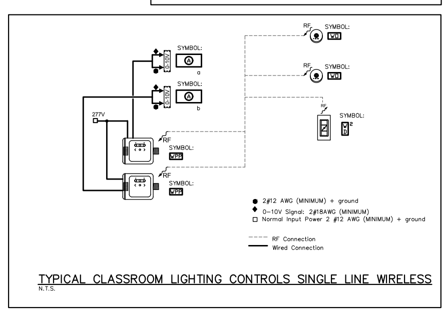
TV ROUGH-IN
N.T.S.



LOW VOLTAGE OCCUPANCY SENSOR WIRING DIAGRAM
N.T.S.



TYPICAL LIGHTING CONTROLLER DETAIL
N.T.S.



TYPICAL CLASSROOM LIGHTING CONTROLS SINGLE LINE WIRELESS
N.T.S.

LIGHTING FIXTURE SCHEDULE

TYPE	LAMPS	MOUNTING	FIXTURE DESCRIPTION	MANUFACTURER'S NAME AND CATALOG NUMBER	WATTAGE
A	LED 7800 LUMEN 3500 K	RECESSED	2'x4' CONTEMPORARY ARCHITECTURAL TROFFER WITH DIMMING	COLUMBIA LCAT24-35VLG-EDU	58 WATT
B	LED 5000 LUMEN 3500 K	RECESSED	2'x4' CONTEMPORARY ARCHITECTURAL TROFFER	COLUMBIA LCAT24-35MLG-EU	40 WATT
C	LED 3500 LUMEN 3500 K	RECESSED	2'x2' CONTEMPORARY ARCHITECTURAL TROFFER	COLUMBIA LCAT22-35HLG-EU	32 WATT
D	LED 2000 LUMEN 3500 K	RECESSED	6" DIA. DOWNLIGHT WITH CLEAR REFLECTOR AND DIMMING	PRESCOLITE LF6SL-DM1-6LFSL20L-35K8	22 WATT
E	LED 4500 LUMEN 3500 K	RECESSED	2'x2' CONTEMPORARY ARCHITECTURAL TROFFER	COLUMBIA LCAT22-35VLG-EU	38 WATT
F	LED 3000 LUMEN 3500 K	RECESSED	6" DIA. DOWNLIGHT WITH CLEAR REFLECTOR AND DIMMING	PRESCOLITE LF6ML-DM1-6LFML30L-35K8	33 WATT
G	LED 4050 LUMEN 3500 K	SURFACE	4' STRIP WITH FROSTED ACRYLIC LENS	COLUMBIA CSL4-4035	30 WATT
H	LED 1700 LUMEN 3500 K	PENDANT	8" DIA. DECORATIVE PENDANT FIXTURE VERIFY FINISHES AND PENDANT LENGTH WITH ARCHITECT	CONTECH LIGHTING CGL84035KMVD2	38 WATT
I	LED 7200 LUMEN 3500 K	RECESSED	2'x4' EDGE LIT PANEL WITH DIMMING	COLUMBIA SRP24-35VL-G-ED-U	69 WATT
J			NOT USED TO DESIGNATE A LIGHTING FIXTURE		
K	LED 2047 LUMEN 3500 K	WALL ABOVE DOOR	24" LINEAR DIFFUSED CHANNEL WITH ROUNDED LENS	LUMAX CLDLED-20L-35K-23	19 WATT
L	LED 757 LUMEN 4100 K	WALL 7'6"AFF	VAPORTITE FIXTURE WITH GLASS GLOBE AND GUARD, WET LOCATION LISTED	HUBBELL VWGL-1	11 WATT
M	LED 5678 LUMEN 4000 K	WALL 10'AFF	QUARTER SPHERE WALL PACK, TYPE IV DISTRIBUTION	HUBBELL QSP2-24L-50-4K7-4-UNV	49 WATT
N	LED 3000 LUMEN 3500 K	RECESSED	6" DIA. DOWNLIGHT WITH CLEAR REFLECTOR AND DIMMING, WET LOCATION	PRESCOLITE LC6ML-DM1-6LCML-30L-35K8	42 WATT
O	LED	WALL 8'AFF	ARCHITECTURAL EMERGENCY LIGHT LISTED FOR WET LOCATIONS PROVIDE WITH BATTERY HEATER	COMPASS CUWZ-HTR	59 WATT
P	LED 4700 LUMEN 3500 K	SURFACE	4' WRAPAROUND	COLUMBIA LAW4-35ML-EU	43 WATT
Q	LED 1,000 LUMEN 3500 K	RECESSED	4" DIA. SHOWER DOWNLIGHT WITH CLEAR REFLECTOR AND DIMMING	PRESCOLITE LTR-4RD-H-SL10L-DM1-LTR-4RD-SHSL35K8	12 WATT
R	LED 29878 LUMEN 3500 K	FLUSH WITH BOTTOM OF STEEL	HIGH BAY LIGHTING FIXTURE WITH FROSTED ACRYLIC LENS, WIRE GUARD AND SAFETY CHAIN	COLUMBIA PEL2-35MV-FAW-EDU-WG	197 WATT
S	LED 3500 K	SURFACE	AISLE LIGHTING FIXTURE WITH 4" LAMP SPACING, SUITABLE FOR FLOOR TO FLOOR APPLICATIONS (NO CARPET) PROVIDE END CAPS AT THE END OF EACH STRIP. PROVIDE BRACKETS, POWER SUPPLY AND ALL OTHER REQUIRED COMPONENTS	TIVOLI SATT-CE-35-04-C- AS REQUIRED+PSU BNS-TT-R-12 (FLOOR TO FLOOR TRANSITION) SATT-CE-LS-EC-06 SATT-CE-RS-EC-06 (END CAPS) JT-240-4-5-12-D (POWER SUPPLY)	360 MILLIWATTS/FT
T	LED 7800 LUMEN 3500 K	RECESSED	2'x4' CONTEMPORARY ARCHITECTURAL TROFFER WITH TUNABLE COLOR DRIVER	COLUMBIA LCAT24-2765T-VLG-EDU	58 WATT
SA	LED-4000K 27175 LUMENS	30' POLE	SINGLE SITE LIGHT FIXTURE WITH TYPE II OPTICS, DIE CAST ALUMINUM HOUSING, DARK BRONZE FINISH, SQUARE STEEL POLE, 90MPH WIND RATING	HUBBELL BEACON #VPL/96NB-220/4K7/2/UNV /A/DBT	218 WATTS
SB	LED-4000K 19059 LUMENS PER HEAD	30' POLE	TWIN HEAD SITE LIGHT FIXTURE AT 180° WITH TYPE IV OPTICS, DIE CAST ALUMINUM HOUSING, DARK BRONZE FINISH, SQUARE STEEL POLE, 90MPH WIND RATING	HUBBELL BEACON #VPL/96NB-220/4K7/4F/UNV /A/DBT	435 WATTS
SC	LED-4000K 19059 LUMENS	30' POLE	SINGLE HEAD SITE LIGHT FIXTURE WITH TYPE IV OPTICS, DIE CAST ALUMINUM HOUSING, DARK BRONZE FINISH, SQUARE STEEL POLE, 90MPH WIND RATING	HUBBELL BEACON #VPL/96NB-220/4K7/4F/UNV /A/DBT	218 WATTS
SD	LED 4000K 12313 LUMENS	STANCHION	FLOOD LIGHT WITH DARK BRONZE FINISH, FIXTURE MUST BE ABLE TO BE AIMED STRAIGHT UP (180°)	HUBBELL FML-20L-52-4K-M-U-DB	52 WATT
SE	LED 4000K 6805 LUMENS	POLE TOP, PROVIDE HARDWARE AS REQUIRED	FLOOD LIGHT WITH WIDE DISTRIBUTION, DARK BRONZE FINISH, PROVIDE HARDWARE TO TANDEM MOUNT TO FIXTURE TO TYPE "SC"	HUBBELL FLL-28L-95-4K-7-W-U-DB	96 WATT
X	LED	SURFACE	EXIT SIGN WITH WHITE DIE-CAST HOUSING, RED LETTERS AND SELF DIAGNOSTIC BATTERY BACK-UP	DUALLITE SE S/D RWEI	3.8 WATT

LIGHTING FIXTURE NOTES:

1. SHOP DRAWING SUBMITTALS: AS PART OF THE SHOP DRAWING SUBMITTALS THE CONTRACTOR SHALL PROVIDE A LIGHTING POWER DENSITY STATISTICS. TABLE INDICATING ROOM NAME, NUMBER OF LUMINAIRES, TOTAL WATTS PER AREA, AND DENSITY (WATTS PER SQ FT) PER AREA AND A SEPARATE LINE ITEM INDICATING THE TOTALS FOR THE ENTIRE BUILDING INTERIOR. IN ADDITION PROVIDE FOOTCANDLE PRINTOUTS FOR ALL AREAS. SUBMITTALS WILL NOT BE REVIEWED UNLESS THE ABOVE INFORMATION IS PROVIDED IN WHOLE AS PART OF THE LIGHTING SUBMITTAL PACKAGE. FAILURE TO SUBMIT THIS INFORMATION AS PART OF THE SUBMITTAL WILL RESULT IN REJECTING THE LIGHTING SUBMITTAL IN IT'S ENTIRETY, NO EXCEPTIONS.
2. ALL LINEAR FIXTURES UTILIZING A HINGED DOOR SHALL HAVE SPRING LOADED CAM LATCHES WHETHER SPECIFIED IN THE FIXTURE SCHEDULE OR NOT AND BE PAINTED AFTER FABRICATION WITH NO SHARP EDGES
3. ALL LIGHT FIXTURES, EMERGENCY EGRESS FIXTURES AND EXIT SIGN FIXTURES SHALL BE "UNIVERSAL VOLTAGE", 120 AND 277, WHETHER SPECIFIED IN THE LIGHTING FIXTURE SCHEDULE OR NOT. WHERE FIXTURES ARE NOT AVAILABLE WITH UNIVERSAL VOLTAGE OPTION IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE VOLTAGE WITH THE ELECTRICAL PLANS TO ENSURE COMPATIBILITY WITH THE DESIGNED ELECTRICAL SYSTEM.
4. LIGHT FIXTURES OTHER THAN THOSE SPECIFIED IN THE LIGHTING FIXTURE SCHEDULE AS MANUFACTURED BY H.E. WILLIAMS, ACUITY BRAND, PHILLIPS BRAND, COOPER BRAND AND HUBBELL BRAND WILL BE CONSIDERED FOR SUBSTITUTING, ONLY IF THEY MEET OR EXCEED THE REQUIREMENTS OF THE SPECIFIED LIGHT FIXTURE. THE PREVIOUSLY LISTED MANUFACTURES LIGHT FIXTURES MAY BE SUBMITTED FOR REVIEW BY THE DESIGN TEAM DURING THE SHOP DRAWINGS PHASE OF THE PROJECT, HOWEVER, THIS DOES NOT CONSTITUTE THE PRE-APPROVAL OF THE SUBMITTED LIGHT FIXTURE, ONLY THE MANUFACTURER BRAND NAME. ALL PROPOSED ALTERNATE LIGHT FIXTURES SHALL BE EQUIVALENT TO THE BASIS OF DESIGN (SPECIFIED FIXTURES) IN ALL RESPECTS AS TO PERFORMANCE, LIGHT OUTPUT, QUALITY OF CONSTRUCTION, FINISH, SUSTAINABILITY FOR THE APPLICATION AND OVERALL APPEARANCE AND DIMENSIONS

ENGINEERING SERVICES GROUP, INC.
CONSULTING ENGINEERS
900 EAST HILL AVE. SUITE 350
KNOXVILLE, TENNESSEE 37915
(865) 522-0393
PROJECT NO. 19539

NEW
JASPER MIDDLE
JASPER, TENNESSEE

KAATZ, BINKLEY, JONES & MORRIS ARCHITECTS, INC.
NASHVILLE
1008 CHARLIE DANIELS PKY, MT. JULIET, TN 37122
P.O. BOX 713, MT. JULIET, TN 37122
PHONE: (615) 754-5393 FAX: (615) 754-5340

REVISIONS	
NO.	DATE

DWN.	MWE
CHK'D.	ECH
APP'D.	ECH

ELECTRICAL LEGEND, SCHEDULES & DETAILS

PROJ. NO. 2697-14
DATE 11/23/2021
DWG. NO. E2.1
NEW JASPER MIDDLE