ADDENDUM
NO. 3

June 30, 2020

Zionsville New Elementary School
4400 S. 875 East
Zionsville, IN 46077

TO: ALL BIDDERS OF RECORD

This Addendum forms a part of and modifies the Bidding Requirements, Contract Forms, Contract Conditions, the Specifications and the Drawings dated June 5, 2020, by Fanning Howey Associates, Inc. Acknowledge receipt of the Addendum in the space provided on the Bid Form. Failure to do so may subject the Bidder to disqualification.

This Addendum consists of Page ADD 3-1 through ADD 3-2, Owner Furnished Equipment Matrix, and attached Fanning Howey Associates, Inc. Addendum No. 2, dated June 29, 2020, consisting of 44 items, 10 pages, New Drawing Sheet: A4.01 and Revised Drawing Sheets: Index A, Index B, GD0.1, GD1.7, G1.0, G1.0A, G2.0, G2.3, G2.7, G2.10, G2.11,G2.12, G2.13, G2.14, G2.15, G2.16, G2.17, G3.1, G4.2, SU1.0A, SU2.0, SU2.1, SU2.2, SU2.4, SU2.5, SU2.6, SU2.7, SU3.3, SU5.1, L1.0, L1.1, L1.2, A0.01, A2.01, A2.03, A3.02, A3.03, A3.04, A3.05, A7.01, A7.03, A7.07, A7.08, A7.09, A7.11, A7S.01, A8S.01, A9.07, P1.1, P2.1, P2.2, P2.3, P2.5, P2.6, P2.7, P2.8, P2.9, P2.10, P3.1, P3.2, P4.1, P4.2, P4.3, P4.4, P4.5, P4.6, P4.7, P4.8, PFP.1, PFP.2, M2.01, M2.02, M2.03, M2.04, M2.05, M5.01, M5.02, M5.03, E2.01, E3.01, E.3.02, E3.03, E3.04, E3.05, E3.06, E3.07, E4.01, E4.02, E4.03, E4.04, E4.05, E4.06, E5.01, E5.07, E5.08, E6.03, E6.04, E6.05, E7.01, E8.01, E8.02, E8.03, E8.04, E8.05, T1.01, T1.02, T1.05, T3.01, T3.02, T3.03, T3.04, T3.05, T4.01, T5.01, and T6.01.

SPECIFICATION SECTION 00 00 20 – TABLE OF CONTENTS

A. **INSERT** Specification "Section 27 41 12 Communications Audio-Video Mounts" under DIVISION 27: COMMUNICATIONS.

SPECIFICATION SECTION 01 12 00 – MULTIPLE CONTRACT SUMMARY

A. **INSERT** the following clarification under Part 1, 1.08 Work by Owner, A.:
   6. Owner will furnish and install equipment, technology and furnishings as noted in the attached "OFCI Project Equipment/Technology/Furnishings Matrix". Contractors shall coordinate with Owner/CM as needed.

B. **INSERT** Specification "Section 22 13 23 Sanitary Waste Interceptor" under Part 3, 3.03 Bid Categories, A. Bid Category No. 1 – General Trades".

C. **AMEND** Part 3, 3.03 Bid Categories, A. Bid Category No. 1 – General Trades", Bid Category No. 1 Clarifications, 23.:

23. The General Contractor shall provide all water-distribution piping and related components for combined, domestic water, and services lines, storm and sanitary piping (including sanitary waste interceptors), to within 5' of the building limits.

D. **INSERT** the following clarifications under Part 3, 3.03 Bid Categories, A. Bid Category No. 1 – General Trades", Bid Category No. 1 Clarifications:

28. The gas service is going to be installed by the utility company, and coordinated by the General Contractor, up to the meter on the building. The Mechanical Contractor shall connect to the service provided by the gas utility.

29. The General Trades Contractor shall provide incoming fire protection water service up to the flange/spigot 6" above finished floor at the riser (refer to Detail 2/PFP.2).

E. **INSERT** the following clarifications under Part 3, 3.03 Bid Categories, M. Bid Category No. 13 – Fire Suppression", Bid Category No. 13 Clarifications:

8. The General Trades Contractor shall provide incoming fire protection water service up to the flange/spigot 6" above finished floor at the riser (refer to Detail 2/PFP.2).

F. **DELETE** Specification "Section 22 13 23 Sanitary Waste Interceptor" under Part 3, 3.03 Bid Categories, N. Bid Category No. 14 – Mechanical: Plumbing & HVAC".

G. **INSERT** the following clarifications under Part 3, 3.03 Bid Categories, N. Bid Category No. 14 – Mechanical: Plumbing & HVAC", Bid Category No. 14 Clarifications:

10. The General Contractor shall provide all water-distribution piping and related components for combined, domestic water, and services lines, storm and sanitary piping (including sanitary waste interceptors), to within 5' of the building limits.

11. Refer to specification 23 07 00, 3.16, B. Chilled Water and Brine, (above 40 Degrees Fahrenheit), 1-1/2" thick mineral fiber insulation is acceptable.

H. **INSERT** Specification "Section 27 41 12 Communications Audio-Video Mounts" under Part 3, 3.03 Bid Categories, O. Bid Category No. 15 – Electrical, Communications, Safety & Security".

OFCI Project Equipment/Technology/Furnishings Matrix

Description	Ref. Drawings	Furnished by		Installed by		Notes
		Owner	Contractor	Owner	Contractor	
Vending Machine	A7.01	X		X		1, 2
Electric Range	A7.01 / A7.08	X		X		1, 2, 3
Refrigerator w/Ice Machine	A7.01	X		X		1, 2
Ice Maker	A7.01	X		X		1, 2
Under-Counter Refrigerator	A7.01	X		X		1, 2
TV Monitor	A7.01	X		X		1, 2
Clothes Washer	QF101	X		X		1, 2
Clothes Dryer	QF101	X		X		1, 2
Cash Register	QF101	X		X		1, 2
Soap Dispenser	Various	X			X	1, 2
Paper Towel Dispensers	Various	X			X	1, 2
Toilet Paper Dispensers	Various	X			X	1, 2
Telephones	Various	X		X		1, 2
Computer Network Electronics	Various	X		X		1, 2
Wireless Access Points	Various	X		X		1, 2
Access Controls	Various	X		X		1, 2, 6
Video Cameras (Surveillance)	Various	X		X		1, 2
LED Screens	Various	X		X		1, 2, 4
Classroom Projectors	Various	X		X		1, 2, 4, 5
Ultra Short Throw Projectors and Mounts	Various	X		X		1, 2, 5

Notes:

1. Contractors shall provide all MEPF connections and improvements to accept ALL specified equipment, including but not limited to power wiring, communications, mechanical and plumbing, whether or not the equipment is installed by the Contractor.
2. All equipment/furnishings/technology not listed in the above matrix and included within the Contract Documents shall be provided and installed by the Contractor.
3. Ventilation Hood provided by the Contractor.
4. TV mounts, suspended ceiling project mounts, and projection screens shall be provided by the Contractor. Coordinate with CM/Owner.
5. Ultra short throw (wall mounted) projector mounts provided by Owner along with the ultra short throw projectors.
6. Contractor shall provide hardware per Contract Documents.

A D D E N D U M N O. 2

New Zionsville Elementary School

Zionsville Community Schools
Zionsville, Indiana

Project No. 219124.00

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Addendum No. 2, 44 items, 10 pages
Revised Project Manual Sections: Sections 27 11 00 – Communications Equipment Room Fittings, 27 13 23 – Communications Fiber Optical Backbone Cabling, 27 15 15 – Communications Copper Horizontal Cabling (Category 6), 27 15 17 – Communications Copper Horizontal Cabling Category 6A, 27 51 16 – Public Address and Mass Notification Systems, and 27 53 19 – Distributed Antenna Systems (First Responder)
New Project Manual Sections: Section 27 41 12 – Communications Audio-Video Mounts
New Drawing Sheet: A4.01
Revised Drawing Sheets: Index A, Index B, GD0.1, GD1.7, G1.0, G1.0A, G2.0, G2.3, G2.7, G2.10, G2.11, G2.12, G2.13, G2.14, G2.15, G2.16, G2.17, G3.1, G4.2, SU1.0A, SU2.0, SU2.1, SU2.2, SU2.4, SU2.5, SU2.6, SU2.7, SU3.3, SU5.1, L1.0, L1.1, L1.2, A0.01, A2.01, A2.03, A3.02, A3.03, A3.04, A3.05, A7.01, A7.03, A7.07, A7.08, A7.09, A7.11, A7S.01, A8S.01, A9.07, P1.1, P2.1, P2.2, P2.3, P2.5, P2.6, P2.7, P2.8, P2.9, P2.10, P3.1, P3.2, P4.1, P4.2, P4.3, P4.4, P4.5, P4.6, P4.7, P4.8, PFP.1, PFP.2, M2.01, M2.02, M2.03, M2.04, M2.05, M5.01, M5.02, M5.03, E2.01, E3.01, E.3.02, E3.03, E3.04, E3.05, E3.06, E3.07, E4.01, E4.02, E4.03, E4.04, E4.05, E4.06, E5.01, E5.07, E5.08, E6.03, E6.04, E6.05, E7.01, E8.01, E8.02, E8.03, E8.04, E8.05, T1.01, T1.02, T1.05, T3.01, T3.02, T3.03, T3.04, T3.05, T4.01, T5.01, and T6.01

Date: June 29, 2020

I hereby certify that this Addendum was prepared by me or under my direct supervision and that I am a duly registered Architect/Engineer under the Laws of the State of Indiana.

FANNING/HOWEY ASSOCIATES, INC.
ARCHITECTS/ENGINEERS/CONSULTANTS

CHARLES ROBERT TYLER
REGISTERED
No.
4438
STATE OF
INDIANA
ARCHITECT

Charles R. Tyler, AIA
Indiana Registration No. 4438

TO: ALL BIDDERS OF RECORD

ADDENDUM NO. 2 to Drawings and Project Manual, dated June 5, 2020, for New Zionsville Elementary School, for Zionsville Community Schools, 900 Mulberry Street, Zionsville, Indiana; as prepared by Fanning/Howey Associates, Inc., Indianapolis, Indiana.
This Addendum shall hereby be and become a part of the Contract Documents the same as if originally bound thereto.

The following clarifications, amendments, additions, revisions, changes, and modifications change the original Contract Documents only in the amount and to the extent hereinafter specified in this Addendum.

Each bidder shall acknowledge receipt of this Addendum in his proposal or bid.

NOTE: Bidders are responsible for becoming familiar with every item of this Addendum. (This includes miscellaneous items at the very end of this Addendum.)

RE: ALL BIDDERS

ITEM NO. 1. REVISED PROJECT MANUAL SECTIONS

A. Sections 27 11 00 – Communications Equipment Room Fittings, 27 13 23 – Communications Fiber Optical Backbone Cabling, 27 15 15 – Communications Copper Horizontal Cabling (Category 6), 27 15 17 – Communications Copper Horizontal Cabling Category 6A, 27 51 16 – Public Address and Mass Notification Systems, and 27 53 19 – Distributed Antenna Systems (First Responder) have been revised, dated 6/29/20, and are included with and hereby made a part of this Addendum.

ITEM NO. 2. NEW PROJECT MANUAL SECTION(S)

A. New Project Manual Section 27 41 12 – Communications Audio-Video Mounts is included with and hereby made a part of this Addendum.

ITEM NO. 3. PROJECT MANUAL, SECTION 05 12 00 – STRUCTURAL STEEL FRAMING

A. Replace 1.7, C., as follows:

"C. Installer Qualifications: A qualified Installer who has a minimum of 10 years documented experience in erection of complex structures or Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE.
1. Non AISC-Certified Erectors will need to provide documented experience for review by A/E after completion of bidding and prior to award of Contract."

ITEM NO. 4. PROJECT MANUAL, SECTION 05 54 00 – COLD-FORMED METAL FRAMING

A. Article 2.2, B., 3., a: Change "1/600" to "L/800" within the paragraph.

ITEM NO. 5. PROJECT MANUAL, SECTION 06 61 16 – SOLID SURFACE FABRICATIONS

A. Add 2.5, G., as follows:

"G. Provide supplemental metal stud framing below countertop as required between angle support members to support other panel components of assembly."

ITEM NO. 6. PROJECT MANUAL, SECTION 07 24 19 – WATER-DRAINAGE EXTERIOR INSULATION AND FINISH SYSTEM (EIFS)

A. Add 1.2, C., as follows:

"C. Contractors Option: Contractor may utilize sheathing substrate approved within this addendum as sheathing substrate and air/water barrier in lieu of separate sheathing and water resistive coating specified herein."

ITEM NO. 7. PROJECT MANUAL, SECTION 07 24 23 – DIRECT APPLIED EXTERIOR FINISH SYSTEM

A. Add 1.2, C., as follows:

"C. Contractors Option: Contractor may utilize sheathing substrate approved within this addendum as sheathing substrate and air/water barrier in lieu of separate sheathing and water resistive coating specified herein."

ITEM NO. 8. PROJECT MANUAL, SECTION 08 14 16 – FLUSH WOOD DOORS

A. Replace 2.8, C., 2., as follows:

"2. Finish: WDMA TR-6 catalyzed polyurethane or TR-8 UV cured acrylated polyester/urethane."

ITEM NO. 9. PROJECT MANUAL, SECTION 08 33 13 – COILING COUNTER DOORS

A. Delete 2.3, J., 1., in its entirety.

ITEM NO. 10. PROJECT MANUAL, SECTION 08 80 00 - GLAZING

A. Replace 2.8, B., 5., c., as follows:

"c. Laminate Glass, type LT consisting of two lites of 1/8 inch thick heat strengthened glass with 0.090 clear plastic interlayer. Within insulated unit adjust thickness of air space as required to install into Aluminum Door and Storefront systems. Minimum thickness shall be 1 inch, 25mm."

ITEM NO. 11. PROJECT MANUAL, SECTION 09 21 16 – GYPSUM BOARD ASSEMBLIES

A. Add 3.11, 6., b., as follows:

"b. Level 5 shall be provided at all exposed portions of gypsum board bulkheads directly below the skylights regardless of paint type."

ITEM NO. 12. PROJECT MANUAL, SECTION 09 77 13 – STRETCHED-FABRIC WALL SYSTEMS

A. Add 3.3, A., 8., as follows:

"8. All locations: Install stretched-fabric system with a maximum 66 inch width between frames and flush reveals to subdivide length of stretched-fabric system. Equally space subdivision of system within the overall length of substrate to receive the stretch-fabric system. Smallest subdivision should be no less than 12 inches in width. Install fabric in vertical orientation."

ITEM NO. 13. PROJECT MANUAL, SECTION 10 44 16 – FIRE EXTINGUISHERS

A. Add 3.2, C., as follows:

"C. Inspect all fire extinguishers for operation and damage to be completed at install date or within 90 days of Substantial Completion, whichever is later."

ITEM NO. 14. PROJECT MANUAL, SECTION 11 31 00 – RESIDENTIAL APPLIANCES

A. Replace 1.2, A., 1., as follows:

"1. Ventilation Hood/Exhaust Hood."

ITEM NO. 15. PROJECT MANUAL, SECTION 11 40 00 FOOD SERVICE EQUIPMENT (Re-issued in Addendum No. 1)

A. Paragraph 3.10,:

1. **ITEM NO. 2 LOCKERS**; Lockers are by Division 10, Metal Lockers. Refer to Division 10, Section Metal Lockers.

2. **ITEM NO.14 VEGETABLE PREP TABLE**; Clarification of faucets, provide (1) one T & S Brass model B-0133-12CRB8TP over double sinks and (1) one T & S Brass model B-0133-CR-B8TP over disposer.

3. **ITEM NO. 18 ISLAND WORK TABLE**; add, (1) one T & S Brass faucet model B-0133-12CRB8TP.

4. **ITEM NO. 24 ISLAND WORK TABLE**; ADD, (1) one T & S Brass faucet model B-0133-12CRB8TP.

5. **ITEM NO. 28 – Pass-Thru Food Warmer**: Change quantity to "One".

6. **ITEM NO. 29 – Cold Food Pass-Thru**: Change quantity to "One".

7. **ITEM NO. 31 BRAISING PAN** MODEL BPM-40E-TK, 480V3; Change description:
Braising pan shall be equipped with 2" diameter draw off valve, clear plastic drain hose with hose clamp from the draw-off valve to the floor trough, T&S Brass BF-0176 Big-Flo single pantry faucet with sprayer and add-on faucet modified to include T&S Brass BF-1078-A Big-Flo double jointed spout in lieu of standard Big-Flo spout, pan support, counter balanced cover and a self-locking worm gear tilt mechanism.

   Provide unit with electric heat elements with all accessories ready for operation including a terminal box, magnetic contactor, thermostat and indicator light.

8. **ITEM NO. 42 HOT FOOD CABINET**; ADD, provide 12 sets of standard chrome plated wire universal angles and 6 raised wire grids.

9. **ITEM NO. 56 SOILED DISHTABLE**; Clarification of faucets, provide (1) one T & S Brass model B-0133-CR-B8TP at end of table opposite of Dishwasher.

10. ADD; ITEM NO. 73 – BLAST CHILLER

QUANTITY - ONE
MFG. AND MODEL: ALTO SHAAM QC3-20
ELEC. REQ'M'TS: 115V1, 16 AMP, provide a NEMA 5-20p

Provide unit with flush stainless steel top and rear enclosure panel, standard features, stainless steel exterior and interior, 5" diameter casters, cord and plug.

Unit shall be located in kitchen just outside kitchen office below window, next to shelf item 55.

ITEM NO. 16. PROJECT MANUAL, SECTION 12 32 16 – MANUFACTURED PLASTIC-LAMINATE FACED (EDUCATIONAL) CASEWORK

A. Article 1.2, A., 2: Add "and Charging Counter" at end of paragraph.

ITEM NO. 17. PROJECT MANUAL, SECTION 21 10 00 – WATER-BASED FIRE-SUPRESSION SYSTEMS

A. Delete 1.1, F., in its entirety.

B. Article 1.2, B., 1: Revise "Division 22" to read "Division 22 and Division 33".

C. Article 3.7, A: Revise "Division 22" to read "Division 22 and Division 33".

D. Delete 3.13, A., in its entirety.

ITEM NO. 18. PROJECT MANUAL, SECTION 23 09 00 – HVAC DIRECT DIGITAL CONTROLS

A. Article 1.3, A.: At end of paragraph change "..existing Central Server" to read "…existing or new Central Server."

B. Add 1.3, A., 4., as follows:

"4. The new controls shall either be fully integrated into the existing Trane Tracer Ensemble enterprise server, or a new server shall be provided in the School District Central Office that meets all of the requirements specified, including the Building Automation System, Utility Monitoring Dashboard, and Energy Management Software."

ITEM NO. 19. PROJECT MANUAL, SECTION 23 36 00 – AIR TERMINAL UNITS

A. Delete 2.1, A., 6., in its entirety.

ITEM NO. 20. PROJECT MANUAL, SECTION 23 64 27 – AIR-COOLED ROTARY SCREW CHILLER WITH REMOTE CONDENSER

A. Delete 2.1, A., 4., in its entirety.

ITEM NO. 21. PROJECT MANUAL, SECTION 23 72 00 – AIR-TO-AIR ENERGY RECOVERY EQUIPMENT

A. Delete 2.1, A., 3., in its entirety.

ITEM NO. 22. PROJECT MANUAL, SECTION 23 73 13 – MODULAR INDOOR CENTRAL-STATION AIR-HANDLING UNITS

A. Delete 2.1, A., 3., in its entirety.

ITEM NO. 23. PROJECT MANUAL, SECTION 23 82 19 – FAN COIL UNITS

A. Delete 2.1, A., 4., in its entirety.

ITEM NO. 24. PROJECT MANUAL, SECTION 26 27 26 – WIRING DEVICES

A. Delete 2.1, A., 1., 2., 3., and 4., in their entirety.

B. Delete 2.2, A., 1., a., b., c., and d., in their entirety.

C. Delete 2.2, B., 1., a., b., c., and d., in their entirety.

D. Delete 2.2, C., 1., a., b., c., and d., in their entirety.

E. Delete 2.2, D., 1., a., b., c., and d., in their entirety.

F. Delete 2.3, B., 1., a., b., c., and d., in their entirety.

G. Delete 2.3, C., 1., a., and b., in their entirety.

H. Delete 2.3, D., 1., a., b., and c., in their entirety.

I. Delete 2.4, A., 1., a., b., and c., in their entirety.

J. Delete 2.5, A., 1., a., b., and c., in their entirety.

K. Delete 2.6, A., 1., a., b., c., and d., in their entirety.

L. Delete 2.6, B., 1., a., b., c., and d., in their entirety.

M. Delete 2.6, C., 1., a., b., c., and d., in their entirety.

N. Delete 2.7, B., 1., a., b., c., and d., in their entirety.

O. Delete 2.7, C., 1., a., b., c., and d., in their entirety.

P. Delete 2.7, D., 1., a., b., c., and d., in their entirety.

Q. Delete 2.7, E., 1., a., b., c., and d., in their entirety.

R. Delete 2.7, F., 1., a., b., c., and d., in their entirety.

ITEM NO. 25. PROJECT MANUAL, SECTION 26 32 13 – ENGINE GENERATORS

A. Delete 2.1, A., 1., 2., 3., and 4., in their entirety.

ITEM NO. 26. PROJECT MANUAL, SECTION 26 55 61 – STAGE DIMMING SYSTEM

A. Change 3.02, B., 3., “16T”, to read “27T”.

B. Change 3.02, E., “16”, to read, “26”.

C. Change 3.02, F., “16”, to read, “26”.

D. Change 3.03, A., “16”, to read, “26”.

E. Change 3.07, A., 1., “8”, to read, “6”.

F. Delete 3.07, B., 6., in its entirety.

G. Change 3.07, D., “Fluorescent” and “Incandescent”, to read, “LED”.

H. Change 3.07, D., 43., “Ellipsoidal Spotlight – Front of House, Gym Side”, to read “SPARE”.

I. Change 3.07, D., 44., “Ellipsoidal Spotlight – Front of House, Gym Side”, to read, “SPARE”.

ITEM NO. 27. PROJECT MANUAL, SECTION 27 51 25 – IP BASED INTERCOMMUNICATIONS AND PROGRAM SYSTEMS

A. Remove and replace 2.5, F., 4, a. as follows:

“a. Middle Atlantic BRK16 or equal by CPI, Hubbell, Hoffman, or Lowell.”

B. Remove section 2.5, F., 4, b. in its entirety.

C. Remove section 2.5, F., 4, c. in its entirety.

ITEM NO. 28. PROJECT MANUAL, SECTION 32 13 13 – CONCRETE PAVING

A. Add Article 2.9, as follows:

“2.9 SEALERS

A. Penetrating Anti-Spalling Sealer (Exterior curbs and walks): Sealer shall be a siloxane-based compound or silane modified siloxane emulsion formulated to reduce chloride ion absorption/intrusion by 80 percent when tested in accordance with NCHRP #244, Test Method Series II tests. In addition, sealer-treated concrete shall exhibit no scaling when exposed to 125 cycles of freezing and thawing when tested in accordance with ASTM C 672. Tests shall be by an independent testing laboratory.

1. Products:
   a. Baracade ME (VOC Compliant); Euclid Chemical Co.
   b. Saltguard WB; PROSOCO, Inc.
   c. Aquapel Plus; L & M Construction Chemical Co.
   d. SpallGuard WB-10; ChemMasters
   e. Sikagard 701W; Sika Corporation
   f. Weather Worker J29; Dayton Superior Corporation
   g. Intraguard/Pentreat 244-40; W.R. Meadows
   h. V-Seal 102 Winter Guard; V-Seal Concrete Sealers and Concrete Coatings.

B. Add Article 3.9, as follows:

"3.9 SEALER INSTALLATION

A. Anti-Spalling Sealer: All exterior curbs and walks, unless otherwise noted, shall be sealed with specified penetrating anti-spalling sealer. Surface preparation of slabs and sealer application shall be in strict accordance with directions of manufacturer. Field service shall be provided, upon 5 days' notice, by manufacturer of sealer to assist contractor in obtaining maximum benefits of product under prevailing jobsite conditions. In addition, sealer representative shall attend pre-installationconference with A/E and contractor to discuss proper equipment and procedures."

ITEM NO. 29. PROJECT MANUAL, SECTION 33 13 13 – FACILITY SANITARY SEWERS

A. Revise 1.2, B., as follows:

B. Town of Zionsville Wastewater Specifications dated November 2019 or current edition available on www.zionsville-in.gov. Where discrepancies exist, the Town Specifications shall override.

ITEM NO. 30. ACCEPTABLE MANUFACTURERS

The following manufacturers are to be considered acceptable manufacturers (suppliers and fabricators) for the Sections of the Specifications listed. Listed manufacturers are required to bid on products equal in type and design, size, function, and quality to that originally specified. Final decision as to equality of products specified versus those proposed shall be made by the Architect.

Section 06 16 00 – Sheathing
- USG, Chicago, Illinois (Securock Exoair 430, for use as a substrate for EIFS and DEFS only)

Section 08 63 00 – Metal-Framed Skylights
- Wisconsin Solar Design, Inc., Middleton, Wisconsin
- Midwest Skylight Systems, South Elgin, Illinois (View Thru Skylights)

Section 08 91 19 – Fixed Louvers
- Pottorff

Section 09 67 12 – Fluid-Applied Cementitious Urethane Flooring (Kitchen)
- Florock Polymer Flooring, Chicago, Illinois

Section 10 28 00 – Toilet, Bath, and Laundry Accessories
- Saniflow Corp, Miami, Florida (Diaper Changing Station)

Section 22 40 00 – Plumbing Fixtures
- Sloan, Franklin Park, Illinois (Water Closets, Urinals, Lavatories, Faucets)

Section 23 09 00 – HVAC Direct Digital Controls
- Critical Room Control (Air Flow Measuring Stations)

Section 23 33 00 – Air Duct Accessories
- NCA Mfg. (2.3, A., and B., 2.4, A., 2.5., A., 2.6, A.)
- Pottorff (2.5, A., 2.6, A)

Section 23 34 23 – HVAC Power Ventilators
- Acme (2.1, A., 2.2, A.)

Section 23 36 00 – Air Terminal Units
- Metalaire
- Nailor Industries
- Tuttle & Bailey

Section 23 37 23 – HVAC Gravity Ventilators
- Twin City Fan
- Acme

Section 23 51 00 – Breechings, Chimneys, and Stacks
- Duravent

Section 23 82 19 – Fan Coil Units
- Krueger

Section 27 53 15 – Synchronous, Wireless Clock System
- Valcom, Roanoke, Virginia

Section 27 51 17 – Sound Reinforcement System
- Three Sixty, Rio Rancho, New Mexico (AES-30)

ITEM NO. 31. NEW DRAWING SHEETS

A. New Drawing Sheet No: A4.01 dated 6/29/2020, is included with and hereby made a part of this Addendum.

ITEM NO. 32. REVISED DRAWING SHEETS

A. Drawing Sheets: Index A, Index B, GD0.1, GD1.7, G1.0, G1.0A, G2.0, G2.3, G2.7, G2.10, G2.11, G2.12, G2.13, G2.14, G2.15, G2.16, G2.17, G3.1, G4.2, SU1.0A, SU2.0, SU2.1, SU2.2, SU2.4, SU2.5, SU2.6, SU2.7, SU3.3, SU5.1, L1.0, L1.1, L1.2, A0.01, A2.01, A2.03, A3.02, A3.03, A3.04, A3.05, A7.01, A7.03, A7.07, A7.08, A7.09, A7.11, A7S.01, A8S.01, A9.07, P1.1, P2.1, P2.2, P2.3, P2.5, P2.6, P2.7, P2.8, P2.9, P2.10, P3.1, P3.2, P4.1, P4.2, P4.3, P4.4, P4.5, P4.6, P4.7, P4.8, PFP.1, PFP.2, M2.01, M2.02, M2.03, M2.04, M2.05, M5.01, M5.02, M5.03, E2.01, E3.01, E.3.02, E3.03, E3.04, E3.05, E3.06, E3.07, E4.01, E4.02, E4.03, E4.04, E4.05, E4.06, E5.01, E5.07, E5.08, E6.03, E6.04, E6.05, E7.01, E8.01, E8.02, E8.03, E8.04, E8.05, T1.01, T1.02, T1.05, T3.01, T3.02, T3.03, T3.04, T3.05, T4.01, T5.01, and T6.01 have been revised, dated 6/29/20 and are included with and hereby made a part of this Addendum. These Drawings supersede the original documents.

ITEM NO. 33. DRAWING SHEET NO. GD1.5 and GD1.6

A. Revise demolition note 15 to read “Remove Tree and Roots (to 18” below subgrade)”

ITEM NO. 34. DRAWING SHEET: S0.1

A. Special Inspection: Revise Note No. 1 to read as follows:

“1. Special Inspection is a mandatory requirement for verifying conformance of the indicated construction. Special Inspection is required in addition to all material tests and inspections identified in the Contract Documents. See Special Inspection Schedule for required inspections.”

B. Special Inspection: Revise Note No. 3 to read as follows:

"3. The Owner, through the Construction Manager, will arrange for, and coordinate testing and special inspections as indicated in Division 01 Sections Quality Requirements and Testing Laboratory Services."

ITEM NO. 35. DRAWING SHEET: S3.02

A. Delete the "L14" masonry lintel and "LHS" steel lintel in Room B112.

B. Delete the "L14" masonry lintel and "LBR" steel lintel in Room B113.

ITEM NO. 36. DRAWING SHEET: S3.07

A. Elevation 4-S3.07, Elevation Grid Y1: Delete the "L14" masonry lintel at elevation 114'-0" in Room B112.

B. Elevation 4-S3.07, Elevation Grid Y1: Delete the "L14" masonry lintel at elevation 113'-4" in Room B113.

ITEM NO. 37. DRAWING SHEETS: A1.01 – A1.06

A. Architectural Plan Notes: Wall Type reference Note: Add "A1.19" within note after "Refer to Drawing Sheet.

ITEM NO. 38. DRAWING SHEET: A1.17

A. Mounting Height Notes: Delete Note No. 1 in its entirety.

ITEM NO. 39. DRAWING SHEET: A1.19

A. Wall Type General Notes: Replace Note No. 7 as follows:

"7. Provide Sound Attenuation Blankets in walls that require acoustical insulation and those indicated to be sound rated."

B. Wall Type General Notes: Delete Note No. 8 in its entirety.

ITEM NO. 40. DRAWING SHEET: A6S.01

A. Door Schedule Remarks: Delete this list of notes in their entirety.

ITEM NO. 41. DRAWING SHEET: A9.01 – A9.05

A. The symbol "J" within a circle denotes an electrical junction box above the ceiling. Refer to the Electrical Drawings for specific information. These items should have been removed from the A9 series Drawings.

ITEM NO. 42. DRAWING SHEET NO.QF 101

A. ITEM NO. 2; LOCKERS shall be by Division 10, Metal Lockers.

B. ITEM NO. 67; MOP SINK shall be by Division 22.

ITEM NO. 43. DRAWING SHEET NO.QF103

A. ITEM NO. 42 - HOT FOOD HOLDING CABINET; Omit reference to existing. New units with 208v1 shall be provided.

B. ADD ITEM 73 – BLAST CHILLER; 16 AMP, 115V1. Division 26 provide a NEMA 5-20p, 16" AFF. Unit shall be located in kitchen just outside of kitchen office below window, next to shelf unit, Item 55.

ITEM NO. 44. DRAWING SHEET NO.QF104

A. Condensate Exhaust Duct Riser Detail, Change note to indicate "vent openings" and "dishmachine" shall be by Food Service Equipment Contractor" in lieu of "by Others".

END OF ADDENDUM

SECTION 27 11 00 - COMMUNICATIONS EQUIPMENT ROOM FITTINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes, but is not limited to the following:
1. Equipment cabinets
2. Uninterruptible Power Supply (UPS)
3. Power strip
4. Two post racks
5. Power distribution system
6. Telecom rooms ladder trays
7. Miscellaneous items

B. Related section includes the following:
1. Division 01 General Requirements
2. Division 26 Electrical
3. Division 27 Communications
4. Division 28 Electronics Safety and Security

1.3 DESCRIPTION OF WORK

A. Provide labor, material, equipment, cabinets, racks, UPS's, wire managements, shelves, tie wraps, Velcro and accessories necessary for a complete installation of the communication equipment rooms as described in this section and as shown on the drawings.

B. The Contractor shall coordinate the extension of the electrical service to each communications cabinet or rack with the Electrical Contractor.

1.4 QUALITY ASSURANCE

A. See section 27 05 00- "Common Work Results for Communications" for more information.

B. All equipment must be UL listed.

C. All equipment and installation shall comply with latest ANSI/NFPA-70 National Electric Code.

D. All equipment shall comply with the latest ANSI-J-STD-607 grounding and bonding standards.

E. All equipment installations shall comply with the latest BISCI (TDMM) standards.

F. All equipment racks and cabinets shall comply with the latest ANSI-EIA-310 standard.

G. All UPS shall meet IEEEC62.41 standard.

H. Provide labeling per ANSI/EIA/TIA-606 requirement and in accordance with the Owner and the Technology Consultant.

1.5 SUBMITTALS / RECORD DRAWINGS / MAINTENANCE MANUAL

A. Shop Drawings

1. The Contractor shall provide shop drawings of all equipment. Drawings shall indicate the interconnection of equipment and wiring external to the various patch panels (MC/ER and TRs). These drawings shall be included in the submittal to the Architect/Engineer for approval.
2. Complete and comprehensive shop drawings shall be submitted to the Architect/Engineer for review.
3. Drawings shall be provided in latest revision of AutoCAD.
4. Provide equipment isometric with labeling.
5. Every port shall be labeled per specs.

B. See Common Work Results For Communications section 270500 for more submittal requirements.

C. Provide record drawings and maintenance manual, per the section titled "Operation and Maintenance of Communications Systems".

1.6 WARRANTY

A. Components, parts, and assemblies supplied by the Cabling Contractor/manufacturer shall be guaranteed against defects in materials and workmanship as specified in the section titled "Demonstration, Training, and Warranty of Communications Systems", commencing upon system start. Warranty services shall be provided by the installer of the equipment manufacturer during normal working hours.

1.7 TRAINING

A. Provide training as specified in the section titled "Demonstration, Training, and Warranty of Communications Systems.

PART 2 - PRODUCTS

2.1 TECHNOLOGY EQUIPMENT CABINETS

A. All communication equipment shall be housed in steel <u>or</u> aluminum equipment racks.

B. The equipment cabinets shall be 24” W x 36” D x 7’ H.

C. Provide copper bus bar (1/8 inch thick and threaded 10-32, 1 inch wide x 44 space) on each rack.

D. Provide vertical power strip with 20A receptacle on each rack.

E. The equipment cabinets shall have vertical cable management. (One on each side)

F. The equipment cabinets shall have 3RU shelves. See Manufacturers List Section 27 11 00TM for approved manufacturers and part numbers.

G. Provide wire management devices between each patch panel. Horizontal and vertical slotted openings and plastic wire holding clips.

H. See Manufacturers List Section 27 11 00TM for approved manufacturers and part numbers.

2.2 2-POST TECHNOLOGY RACK

A. All switches and patch panels shall be housed in 2 post racks.

B. Provide wire management panels as shown on the drawing. Provide three (3) extra units in each four post rack.

C. Provide copper bus bar (1/8 inch thick and threaded 10-32, 1 inch wide x 44 space) bonded to rack.

D. Provide vertical power strip with 20 amp receptacles.

E. See Manufacturers List Section 27 11 00TM for approved manufacturers and part numbers.

2.3 TECHNOLOGY RACK/CABINET MOUNTED UNINTERRUPTABLE POWER SUPPLY

A. Provide rack mounted UPS in each TR or MC/ER cabinet or rack as specified.

B. UPS shall be on-line double conversion type.

C. UPS shall have an output voltage of 120 volts or 208V, as needed (verify in the field).

D. UPS shall have an input voltage of 120 volts or 208V, as needed.

E. The UPS shall have output receptacles as follows:
1. 2000VA - (4) NEMA 5 – 20R
2. 3000VA - (4) NEMA 5 – 20R (1) NEMA L5 – 30R
3. 2700VA – (2) NEMA L6 – 15R (1) NEMA L6 – 20R

F. UPS shall have sine wave waveform.

G. UPS shall have maintenance free sealed lead acid battery.

H. UPS shall have DB-9, RS-232; Smart SNMP card.

I. Provide PC computer network card in the UPS for connection of the UPS to the data network.

J. UPS shall have management software.

K. UPS shall have control panel with LED status display.

L. UPS shall have audible alarm.

M. Provide rear mounted rails to support the UPS in the MC/ER cabinets and provide center mount shelf for equipment racks in each TR.

N. UPS shall have two years warranty for labor and material.

O. UPS shall be UL Listed 1778.

P. Power cord on the 2,000VA to have a 5-20P plug with 5-20R receptacle.

Q. Power cord on the 3,000VA to have L5-30P plug with L5-30R receptacle.

R. Battery run time (minimum):
1. 2000VA – 6 minutes at full load, 14 minutes at 50% load
2. 3000VA – 5 minutes at full load, 16 minutes at 50% load
3. 2700VA – 5 minutes at full load, 16 minutes at 50% load

S. Provide external battery cabinet, as shown in the telecommunication room/MC/ER Schedule.

T. See Manufacturers List Section 27 11 00TM for approved manufacturers and part numbers.

2.4 POWER STRIPS

A. Provide vertical power strip in each cabinet/rack as follows:
   1. 12-20 amp receptacles, 120 volts.
   2. Cord with NEMA 5-20P plug.
   3. 50 to 60 inches long.
   4. Single circuit.
   5. UL listed 1363.

B. Provide horizontal power strip as follows (in the sound system cabinets):
   1. 6 – 20 amp receptacles
   2. Cord with NEMA 5 – 20 plug
   3. Single circuit
   4. UL listed 1419

C. Unit shall be rack or cabinet mounted.

D. Provide one (1) spare vertical power strip and one (1) spare horizontal power strip.

E. See Manufacturers List Section 27 11 00TM for approved manufacturers and part numbers.

2.5 LADDER TRAY

A. Provide 18 inch wide by 1-1/2 inch high sectional ladder tray under the ceiling and above the TR and MC/ER cabinet.

B. Run ladder tray from the equipment cabinet/racks to the telephone terminal board.

C. Provide factory fittings, and supports.

D. See Manufacturers List Section 27 11 00TM for approved manufacturers and part numbers.

2.6 WATERFALL ACCESSORIES

A. Provide cable management waterfall at each location where cable exits or enters the cable tray.

B. See Manufacturers List Section 27 11 00TM for approved manufacturers and part numbers.

2.7 STACKABLE CABLE RACK SPACERS

A. Provide stackable cable rack spacers in each telecommunication room in cable tray.

B. Approved Manufacturer:
   1. Panduit CRx – xx Series
   2. Hubbell
   3. CPI
   4. Commscope
   5. B-Line

2.8 GROUNDING COMPONENTS

A. Provide #4 green grounding conductors from the grounding bus on the TTB to each telecommunications cabinet/rack.

B. Provide two hole ground lugs to meet J-STD-607A requirements

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install communications equipment room fittings as specified herein and as shown on the drawings.

3.2 LABELING AND MARKING

A. Provide labeling and markings for all communications equipment cabinets/racks.

B. Provide labeling for telecommunications rooms as follows:
   1. Black on white with TR # for each cabinet. (for example, TR.A1.1 fed from MC/ER-C1.1 panel A6-12)

C. Section titled "Identifications for Communications Systems" for more information.

3.3 EQUIPMENT CABINETS

A. At each telecommunication room provide communications equipment cabinets or racks as shown on the drawings and as specified here.

B. The communication equipment cabinets shall be arranged as shown on the drawings:

C. Provide complete equipment cabinet layout showing patch panels, wire management, and switches.

D. Coordinate the extension of the electrical service from the electrical junction box located in the room to each communications cabinet/rack.

3.4 COMMUNICATION GROUNDING AND BONDING

A. Provide grounding and bonding to each cabinet or rack with ground cable from the grounding bus bar in the TR and MC/ER to each cabinet/rack.

B. The grounding conductor shall be insulated copper with minimum of #4 AWG.

C. The grounding conductor shall be marked by distinctive green color.

D. Provide a minimum of #4 ground cable from the communications room busbar to the following:
   1. Each communication cabinet/rack
   2. Each file server cabinet/rack
   3. Each audio-video cabinet/rack
   4. Each voice communication switch (telephone)
   5. Each service entrance device
   6. Any other communications systems provided by this Contractor.

3.5 TELECOMMUNICATION ROOMS

A. The data cable, the telephone cable, and the video control cable shall be terminated on RJ45 copper patch panels.

B. Provide fire-rated plywood terminal board, (quantity as shown) 4 foot by 8 foot by 3/4 inches (minimum of 1) in each telecommunication room. (Paint to match wall.)

C. Provide two (2) 4 inch sleeves with plastic bushings above each terminal board. (Verify exact location in the field).

D. Provide ladder trays, as shown on the drawings.

E. Example Room, TR C1.1: Provide the following:
1. Provide two post racks as shown on plans with all miscellaneous hardware.
2. Bond to the building grounding system with #4 copper.
3. Provide ground bus bar.
4. Provide (1) 6 port fiber optic patch panels. (MM)
5. Provide (1) 6 port LC coupling panels. (MM)
6. Provide 48 port copper patch panels for work area outlets, IP cameras, and WAP as required per cable count with 25% spare..
7. Provide (1) 2,000VA, 120V, 60Hz UPS, rack mounted.
8. Provide (1) external battery for 2,000VA UPS.
9. Provide horizontal and vertical wire management panels.
10. Provide wire duct or wire management duct to bring cables from the ceiling to the equipment racks.
11. Provide (1) rack mounted vertical power strip, per cabinet.
12. Provide shelves as specified.
13. Provide space for data switches.

3.6 MAIN CROSS CONNECT/EQUIPMENT ROOM (MC/ER)

A. The data cable, the telephone cable, and the video control cable shall be terminated on RJ45 copper patch panels.

B. Provide fire-rated plywood terminal board, two (2) 4 foot by 8 foot by 3/4 inches or four (4) 4 foot by 8 foot by 3/4 inches in the main MC/ER room. (Paint to match wall.)

C. Provide two (2) 4 inch sleeves with plastic bushings above each terminal board. (Verify exact location in the field).

D. Provide ladder trays, as shown on the drawings.

E. Example Room, MC/ER: Provide the following:
1. Provide equipment cabinets with all miscellaneous hardware.
2. Bond to the building grounding system with #4 cu.
3. Provide ground bus bar.
4. Provide (1) 12 port fiber optic patch panels. (MM)
5. Provide (1) 6 port LC fiber coupling panels. (MM)
6. Provide (1) 6 port LC fiber coupling panels. (SM)
7. Provide 48 port copper patch panels for work area outlets, IP cameras, and WAP as required per cable count with 25% spare..
8. Provide (2) 3,000VA, 120V, 60Hz UPS, rack mounted.
9. Provide (2) external battery for 3,000VA UPS.
10. Provide horizontal and vertical wire management panels.
11. Provide wire duct or wire management duct to bring cables from the ceiling to the equipment rack. (Conduits to be painted black to match cabinets).
12. Provide (1) rack mounted vertical power strip, per cabinet.
13. Provide shelves as specified.
14. Provide space for data switches and chassis.
15. Provide space for VoIP file server.
16. Provide space for wireless controller.
17. Provide space for cable routers, etc.
18. Provide one (1) 48 ports and two (2) 24 port spare copper patch panel(s).
19. Provide ten (10) 1 meter MM fiber patch cords and ten (10) 3 meter MM fiber patch cords. (LC to LC)

END OF SECTION 27 11 00

SECTION 27 13 23 - COMMUNICATIONS FIBER OPTICAL BACKBONE CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes, but is not limited to the following:
   1. Indoor Enhanced 50 micron multimode fiber
   2. Outdoor Enhanced single-mode fiber
   3. Fiber connectors, fittings, patch panels, patch cords etc.
   4. Innerduct

B. Related section includes the following:
   1. Division 01 – General Requirements
   2. Division 26 – Electrical
   3. Division 27 – Communications Sections
   4. Division 28 – Electronic Safety and Security

1.3 DESCRIPTION OF WORK

A. Provide labor, material, equipment, terminations, and accessories necessary for a complete and operational fiber optic backbone cabling system as indicated on the Drawings and specified herein

B. Provide fiber optic back bone cabling from the Main Equipment room (MC/ER) and Demarc to each telecommunications rooms (TR) as described here and as shown on the drawings.

C. The fiber optic backbone cabling system shall be capable of 10 Gig bps transmissions via multimode fiber optic cable and single mode fiber optic cable and shall comply with EIA/TIA 492 requirements and IEC 60793.

D. The multi-mode fiber optic cable shall be terminated by using fusion spliced LC type pigtail connectors.

E. The single-mode fiber optic cable shall be terminated by using fusion spliced LC type pigtail connectors.

1.4 QUALITY ASSURANCE

A. All backbone cabling system components and equipment shall be listed by Underwriters Laboratories, Inc. for telecommunication use, and the components shall bear the UL label.

B. The system shall be installed in accordance with requirements set by ANSI/NFPA-70 National Electric Code.

C. All equipment shall meet the latest ANSI-J-STD 607 grounding and bonding standards.

D. All equipment shall meet the latest ANSI/TIA/EIA-568, 569, 606, and 607 standards.

E. All 50 micron multi-mode fiber shall comply with the latest American National Standard Institute, ANSI/TIA/EIA 492AAAB standards.

F. All single-mode fiber shall comply with the latest ANSI/TIA/EIA 492CAAA standards.

G. All fiber optic cable shall be installed in accordance with ANSI/EIA/TIA and BISCI standards.

H. Provide labeling per ANSI/EIA/TIA-606 requirement and in accordance with the Owner and the Technology Consultant.

I. See section – "Common Work Results for Communications" for more information.

1.5 CERTIFICATIONS

A. The Cabling Contractor shall certify that the backbone cabling is covered for 20-year Extended Product Warranty on Registered Installation, and is in compliance with the requirements established by EIT/TIA 568, 569, 492, IEC 60793, and BICSI Standards.

B. The certificate shall be provided with the shop drawings.

1.6 SUBMITTALS / RECORD DRAWING / MAINTENANCE MANUALS

A. Shop Drawings
1. The contractor shall provide point-to-point connection drawings of all equipment that will be provided. Drawings shall indicate the interlocking of equipment and wiring external to the various patch panels (MC/ER and TR). These drawings shall be included in the submittal to the Architect/Engineer for approval.
2. Drawings shall be provided in AutoCAD Release 2002 or higher format.

B. See front end submittals section for more information.

C. See Common Work Results for Communications section 270500 for more submittal requirements.

D. Provide record drawings and maintenance manual, per section – "Operation and Maintenance of Communications System".

1.7 WARRANTY

A. Components, parts, and assemblies supplied by the manufacturer shall be warranted against defects in materials and workmanship for a period as specified "Demonstration, Training, and Warranty of Communications Systems", from date of completion. Warranty services shall be provided during normal working hours.

1.8 TRAINING

A. Provide training as specified in section titled "Demonstration, Training, and Warranty of Communications Systems" for more information.

PART 2 - PRODUCTS

2.1 INDOOR ENHANCED 50 MICRON ARMORED MULTI-MODE FIBER

A. Multi-mode fiber shall be enhanced 50 micron multi-mode fiber optic cable to support 10 Gb/s Ethernet at 400 meter.

B. Multi-mode fiber shall comply with TIA 492AAAC as well as the OM4 specifications.

C. Multimode fiber shall be UL listed OFCP/OFNP, CSA FT6 and ICEA S-83-596.

D. Fiber shall be plenum rated.

E. Multimode fiber shall meet IEEE 802.3ae.

F. See Manufacturers List Section 27 13 23TM for approved manufacturers and part numbers.

2.2 OUTDOOR SINGLE MODE FIBER

A. The fiber optic cable shall be rugged outdoor single mode fiber.

B. Fiber shall be loose tube type cable with flame-retardant, UV-stabilized and fully water-blocked for use in indoor and/or outdoor applications.

C. Single-mode fiber shall comply with ANSI S-83-596 and S-104-696.

D. Single-mode fiber shall be UL listed OFNR, CSA certified, SCA OFN FT-4.

E. See Manufacturers List Section 27 13 23TM for approved manufacturers and part numbers.

2.3 FIBER OPTIC ENCLOSURE

A. Fiber optic enclosure shall be rack mounted.

B. The enclosure shall include the appropriate number of splice trays to safely store all splices and spare cable, saddle clips, spools, strain relief, etc.

C. Enclosure shall have bulkheads/adapters which include LC connectors.

D. See Manufacturers List Section 27 13 23TM for approved manufacturers and part numbers.

2.4 FIBER OPTIC CONNECTORS

A. Fiber optic cable shall be terminated at both ends by a qualified technician.

B. Fiber optic connections shall be LC type, fusion spliced pigtails with ceramic ferrule and bend limiting strain relief.

C. See Manufacturers List Section 27 13 23TM for approved manufacturers and part numbers.

2.5 MULTIMODE PATCH CORDS (MMPC)

A. The fiber patch cords shall be duplex LC connectors to duplex LC connectors as required.

B. Multi-mode patch cords shall comply the OM4 specifications.

C. The fiber patch cords shall be 10Gbe, 50/125 micron optical fiber cable.

D. The fiber patch cords shall be 3 meters long.

E. The fiber patch cords size shall be 1.6 mm.

F. The fiber patch cords type shall be jacketed, aqua in color.

G. The fiber patch cords shall be riser OFNR type.

H. The fiber patch cords shall meet TIA/EIA-568.B.3 performance requirements.

I. See Manufacturers Material List for approved products and manufacturers.

2.6 SINGLE MODE PATCH CORDS (SMPC)

A. The patch cords shall be duplex LC connector to duplex LC connectors as required.

B. The patch cords shall be 9/125 micron optical fiber cable.

C. The patch cords shall be 3 meters long.

D. The fiber patch cords size shall be 1.6mm.

E. The fiber patch cords type shall be jacketed, yellow in color.

F. The fiber patch cords shall be riser ONNR type.

G. The fiber patch cords shall meet TIA/EIA-568-B.3 performance requirements.

H. See Manufacturers List Section 27 13 23TM for approved manufacturers and part numbers.

2.7 INNERDUCT (OUTDOOR)

A. Provide 1.0 inch I.D. non-plenum polyethylene-type, ribbed inside tube, innerduct in the 4-inch outside raceway as shown on the drawing.

B. Innerduct shall be UL listed.

C. See Manufacturers List Section 27 13 23TM for approved manufacturers and part numbers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fiber optic cable, patch cords, and connectors as specified here and as shown on the drawings.

3.2 FIBER OPTIC

A. Provide fiber optic cable from the MC/ER to each TR as shown on the Drawings.

B. The runs shall consist of the following:
   1. Multimode fiber cable shall be run from MC/ER to each TR as shown on the Drawings.

C. Termination of the fiber optic cabling shall consist of the following:
   1. In each TR and MC/ER, the fiber optic cabling shall be terminated with an approved fiber optic type connector and patch panel.

D. All outdoor fiber optic cables only shall be installed in innerduct.

E. The armored fiber optic cable shall be grounded to the telecom grounding system.

F. All fiber optic cable run outdoor and under slab in the conduit shall be rated for outdoor.

G. Provide service loops as follows:
   1. 25 foot in each TR
   2. 50 foot in each MC/ER
   3. 50 foot in each communications manhole.
   4. Support as needed.

3.3 CABLE PULLING

A. Cable rollers shall be used when pulling cable. Cable pulleys shall be used when pulling cable around bends and corners of wireways. Pulleys shall have a minimum diameter of 6 inches.

B. Contractor shall use basket grips wherever possible and exercise care while pulling cable as not to exceed the maximum allowable pulling strength of the cable.

C. Cable rollers used for pulling cable in the cable tray shall be mounted close to cable tray supports and shall be placed at the beginning of the run and spaced every 25 feet along the run.

3.4 LABELING AND MARKING

A. Provide labeling as shown on the Drawings and in the project manual.

B. Contractor shall install labels as follows:
   1. One label at each end of each cable.
   2. One label at the end of each cable, where it enters the fiber optic patch panel in back of the distribution panel, plus one label on the front of the TR/MC/ER, plus one label on the front of the.
   3. All markings shall be carefully done so as to present a neat, professional appearance.

C. See section – "Identification for Communications Systems" for more information.

3.5 CABLE SEPARATION FROM POWER WIRING (ARMORED FIBER)

A. The minimum distance shall be 5 inches between the cabling system and any fluorescent, neon, incandescent, or high intensity discharge lamp fixtures.

B. Cable may be installed closer to lighting and convenience outlet power cable (single phase, 120V, 20A maximum), in metal cable channels for limited distances if the following guidelines are observed:
   1. Coincident (parallel) runs of no more than 15 feet are permissible if a 1 inch separation between the power cable and the cabling system cable is maintained by separators or suitable retention hardware. If necessary, the separation may be less than 1 inch for a run of up to 6 inches if no contact between the cabling system cable and the power cable occur.
   2. Coincident runs of no more than 30 feet are permissible if a 2 inch separation is maintained. The separation may be less than 2 inches for a run of up to 12 inches, if no contact occurs between the cabling system cable and the power cable.

3.6 TESTING

A. After fiber installation is complete, the fiber shall be tested to the latest TIA/EIA standards using light source and power meter that is factory calibrated. The copies of these records shall be marked post measurements and supplied to the Engineer and Owner as a separate file submitted at the same time as the O&M Manual.

B. All installation work shall be done in a neat, high quality manner and in conformity with local and federal building codes.

C. Cables shall be placed with sufficient bending radius so as not to kink, shear, or damage outer jacket.

D. Provide cable certification summary report for all test results on 8-1/2 by 11 sheets.

E. Cable test results shall be stored and presented to the architect/engineers in both hard copy and electronic format for approval, and cable tester records designations shall match the associated cable labels and associated patch panel label designations.

F. Attenuation level shall be less than 3 dB.

3.7 CROSSOVERS/POLARITY CONNECTIONS

A. The backbone and horizontal premises cabling must be installed so as to pair an odd numbered optical fiber with the next consecutive even numbered optical fiber (e.g., optical fiber 1 with 2, 3, with 4) to form two fiber transmission paths. Each premises cabling segment must be installed in a pair wise crossover orientation such that:
   1. Odd numbered optical fiber strands are Position A at one end and Position B at the other end.
   2. Even numbered optical fiber strands are Position B at one end and Position A at the other end.

B. For the duplex LC, the crossover must be achieved by using consecutive optical fiber numbering (e.g., 1, 2, 3, 4…) on both ends of an optical fiber link, but the duplex optical fiber adapters must be installed in opposite manners on each end (e.g., A-B, A-B on one end and B-A, B-A on the other).

C. For other duplex optical fiber styles, polarity may be achieved by the same method or by using reverse pair positioning. Reverse pair positioning is achieved by installing optical fiber (strands) in consecutive numbering sequence (e.g., 1, 2, 3, 4…) on one end of an optical fiber link, and installing optical fiber (strands) using reverse pair numbering (e.g., 2, 1, 4, 3…) on the other end of the optical fiber link.

3.8 TELECOMMUNICATION ROOMS (TR)

A. See section 27 11 00 – "Communications Equipment Rooms Fittings" for more information.

B. The fiber cable shall be terminated on fiber optic patch panels with connectors.

3.9 MAIN CROSS CONNECT/EQUIPMENT ROOM (MC/ER)

A. See section 27 11 00 – "Communications Equipment Rooms Fittings" for more information.

B. The fiber cable shall be terminated on fiber optic patch panels with connectors.

END OF SECTION 27 13 23

SECTION 271515 - COMMUNICATIONS COPPER HORIZONTAL CABLING (CATEGORY 6)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes, but is not limited to the following:
   1. Local area network
   2. Horizontal cabling
   3. Patch panels compatible with the structured cabling system
   4. Patch cords compatible with the structured cabling system
   5. Modular jacks
   6. Termination of all horizontal cabling
   7. Testing of all horizontal cabling

B. Related section includes the following:
   1. Division 01 – All Sections
   2. Division 26 - Electrical
   3. Division 27 – Communications Sections
   4. Division 28, Electronic Safety and Security.

1.3 SYSTEM DESCRIPTION

A. The voice and data horizontal cabling system shall be capable of 10/100/1000 Mbps full duplex transmission via 4 PR UTP copper cable, Category 6 horizontal cable and shall comply with TIA/EIA 568B requirements for color coding.

B. Provide labor, material, equipment, and accessories necessary for a complete operation of a complete network system. The Data/Cabling Contractor shall furnish the equipment, accessories and necessary material as described herein.

C. The cabling for the voice and data cabling system shall include but not limited to the following:
   1. Provide UTP cables (horizontal).
   2. Provide patch panels and patch cords compatible with the horizontal cabling system.
   3. Provide modular jacks and cover plates compatible with the horizontal cabling system.
   4. Provide and terminate cabling within each room and the data cabinets (MC/ER's and TR's).

D. The modular computer/data eight-position jack shall match the color scheme of EIA-568 B.

1.4 QUALITY ASSURANCE

A. Communications cabling system components and equipment shall be listed by Underwriters Laboratories, Inc. for Computer use, and the components shall bear the UL label.

B. The system shall be installed in accordance with requirements set by National Electric Code.

C. All equipment shall comply with the latest ANSI-J-STD-607 grounding and bonding standards.

D. All equipment and installation practices shall comply with latest BICSI (TDMM) standards.

E. All equipment shall comply with the latest ANSI/TIA/EIA-568, 569, 60, 607, and 862 standards, as applicable.

F. Cables shall be installed in accordance with ANSI/EIA/TIA and BISCI standards.

G. Provide labeling per ANSI/EIA/TIA-606 requirement and in accordance with the Owner and the Technology Consultant.

H. All cabling shall be tested in accordance with the ANSI/TIA/EIA-568-B2 standards with the required testing equipment.

I. See section 270500 – "Common Work Results for Communications".

1.5 CERTIFICATION

A. Cabling Contractor shall provide the services of a component manufacturer and provide equipment listed by Underwriters Laboratories, Inc. The Contractor shall issue a equipment certification stating that the equipment and connected wiring and devices which form the specified system, together with installation have a 25-year Application Assurance and 25-year Extended Product Warranty on Registered Installation, and are in compliance with the requirements established by TIA/EIA 568, 569, and BICSI Standards. Also this Contractor shall submit with his/her bid a letter from the manufacturer indicating that his/her installation will be certified for a 25-year Application Assurance and 25-year Extended Product Warranty on Registered System Installation.

B. The certificate shall be provided with the shop drawing submittal.

1.6 SUBMITTALS / RECORD DRAWINGS / MAINTENANCE MANUALS

A. Shop Drawings
   1. Complete and comprehensive shop drawings with labeling, etc. shall be submitted to the Architect/Engineer for approval.
   2. Drawings shall be provided in AutoCAD Release 2002 format or higher.

B. See front end submittals section for more information.

C. See Common Work Results For Communications section 270500 for more submittal requirements.

D. Provide record drawings and maintenance manual, per section – "Operation and Maintenance of Communications Systems".

1.7 WARRANTY

A. Components, parts, and assemblies supplied by the Communications Contractor/manufacturer shall be guaranteed against defects in materials and workmanship for a period as specified in section – "Demonstration, Training, and Warranty of Communications Systems", commencing upon system. Warranty services shall be provided by an installer certified by the equipment manufacturer during normal working hours.

B. The manufacturer's statement of warranty shall be included in the shop drawing submittals.

1.8 CHANNEL WARRANTY FOR HORIZONTAL CABLING SYSTEM

A. The channel ACR performance warranty: 19 dB at 100 MHz.

B. The link ACR performance warranty: 22 dB at 100 MHz.

C. Application systems supports: 10/100 Base T, fast Ethernet, 155 ATM, 250 MHZ video, and gigabit Ethernet (1000 Base T).

1.9 Provide training as specified in section titled "Demonstration, Training, and Warranty of Communications Systems" for more information.

PART 2 - PRODUCTS

2.1 VOICE AND DATA CABLE AND COMPONENT PRODUCTS

A. Contractors shall provide a system where the component and cable manufacturer have formed a partnership to create a complete channel solution. This solution shall be warranted by the component manufacturer.

B. See Manufacturers List Section 27 15 15TM for approved manufacturers and part numbers.

2.2 COMPUTER/DATA CABLE (CATEGORY 6)

A. The computer/data cable shall be four unshielded twisted pair (UTP), 23 AWG, solid bare copper, FEP insulation for all 4 pairs to reduce skew (skew shall be less than 18 nsec), Flamarrest KJT.

B. UL listed CMP with transmission characteristics that meet or exceed those of FCC-68/EIA/TIA, 568A-5 and EIT/TIA TSB-95 performance and NEMA low loss, extended frequency, jacket shall be sequentially marked at 2 foot intervals and must be plenum rated.

C. Pair twisting shall be maintained to meet the cable performance. Maximum cable, untwisting allows is one half (1/2) inch.

D. Cable shall meet ANSI/TIA/EIA-568-B2-1 transmission performance.

E. See Manufacturers List Section 27 15 15TM for approved manufacturers and part numbers.

2.3 OUTDOOR COMPUTER/DATA CABLE (CATEGORY 6)

A. The computer/data cable shall be four unshielded twisted pair (UTP), 24 AWG, solid bare CU, insulation for all 4 pairs to reduce skew (skew shall be less than 18 nsec).

B. UL listed CM with transmission characteristics that meet or exceed those of FCC-68/EIA/TIA, 568A-5 and EIT/TIA TSB-95 performance and NEMA low loss, extended frequency, jacket shall be sequentially marked at 2 foot intervals.

C. Pair twisting shall be maintained to meet the cable performance, but maximum cable untwisting allowed is one half (1/2) inch, cable diameter .2-inch.

D. See Manufacturers List Section 27 15 15TM for approved manufacturers and part numbers.

2.4 VOICE AND DATA JACKS

A. Provide a flush mounted modular data jack RJ-45 to fit in a one or two gang 3-1/2 inch deep box and/or to fit in the surface mounted raceway or floor boxes as shown on the Drawings and as specified herein.

B. Data jacks shall be 8-position configurations and shall meet all the transmission performance of specified cable.

C. The data jacks shall be UL listed and must meet TIA/EIA 568B.2 requirements.

D. The data jacks to be wired to TIA/EIA 568B color scheme.

E. Modular data jacks shall be mounted in modular cover plates.

F. Provide one spare bag of RJ45 jacks.

G. See Manufacturers List Section 27 15 15TM for approved manufacturers and part numbers.

2.5 MODULAR COVER PLATES (TWO GANG)

A. Provide modular cover plates as shown on the drawing and as specified.

B. Provide decorative modular mounting frames for all jacks in surface raceway. (Panduit CFG4IG-Series).

C. Provide the cover plate inside floor boxes to match receptacle cover plates (verify with site electrical contractor).

D. Jacks shall be mounted on stainless steel plate (Panduit KWP6PY or equal) where required.

E. Cover plate shall be adjustable either in field or by factory (1/4 inch minimum).

F. Provide blanks in unused openings for all cover plates and in floor boxes.

G. Cover plates:
1. See Manufacturers List Section 27 15 15TM for approved manufacturers and part numbers.

H. Wall adapter:
1. See Manufacturers List Section 27 15 15TM for approved manufacturers and part numbers.

I. Surface raceway:
1. See Manufacturers List Section 27 15 15TM for approved manufacturers and part numbers.

2.6 MODULAR COVER PLATES (3-GANG DECORATIVE COVER PLATE)

A. Provide modular cover plates, as shown.

B. Modular plate shall be 3-gang decorative type.

C. Approved Manufacturer: Hubbell HPWWSCS3MMO

D. See approved Manufacturers Material List.

2.7 STAINLESS STEEL COVER PLATES

A. Provide stainless steel cover plates to fit the modular jacks as shown on the Drawings.

B. Stainless steel cover plate shall single gang or double gang.

C. Provide stainless steel cover plates in the following areas:
   1. Lobby
   2. Corridors
   3. Gymnasium
   4. Auditorium
   5. Cafeteria
   6. LGI – Room with risers
   7. Kitchen
   8. Any other areas as directed by Owner or Architect/Engineer.

D. See Manufacturers List Section 27 15 15TM for approved manufacturers and part numbers.

2.8 WEATHER PROOF COVERPLATE

A. Provide weather proof coverplate for outdoor devices.
   1. See Manufacturers List Section 27 15 15TM for approved manufacturers and part numbers.

2.9 VIDEO PROJECTOR LOCATIONS

A. Cable Connection
   1. Provide two ports UL listed surface mount box to terminate the RJ45 jack and cable.
      a. See Manufacturers List Section 27 15 15TM for approved manufacturers and part numbers.
   2. Provide 5 foot patch cord and/or as required.
   3. Patch the video projector to the data jack in the box above the ceiling.

2.10 COVER PLATES COLOR

A. Color of the modular communications cover plates shall be coordinated with the Architect prior to submission of submittal.

2.11 COPPER PATCH PANELS

A. Provide 24 port RJ45 patch panels for termination of all UTP cable with 24-RJ45 jacks.

B. Provide 48 port RJ45 patch panels for termination of all UTP cables with front and back cable management with 48-RJ45 jacks.

C. Patch panels shall meet or exceed all transmission performance of the specified cable as outlined in TIA/EIA-568B.2 - 1, TSB-95.

D. Each RJ45 jack shall be terminated with 4 pair of UTP wire and shall be wired to meet TIA/EIA 568B color scheme.

E. Provide extra wire management for data switches in each rack/cabinet.

F. See Manufacturers List Section 27 15 15TM for approved manufacturers and part numbers.

2.12 PATCH CORDS

A. Provide patch cords with modular RJ45 at each end. UL listed, 3 foot (1m), 5 foot (1.5m), 7 foot (2.1m), 10 foot (3m), and 15 foot (4.6m) long.

B. Patch cord manufacturer must match connector/patch panel manufacturer.

C. See Manufacturers List Section 27 15 15 TM for approved manufacturers and part numbers.

D. Patch cable quantity
   1. Furnish one blue patch cord for each data jack (within patch panel) with 20% spare; provide 50% three (3) foot patch cables, 30% five (5) foot patch cables, and 20% seven (7) foot patch cables.
   2. Furnish one hundred (100) ivory patch cords; provide 50% three (3) foot patch cables, 30% five (5) foot patch cables, an d 20% seven (7) foot patch cables.
   3. Furnish one blue station patch cable for each data jack (within faceplate) with 20% spare; provide 90% ten (10) foot patch cables and 10% fifteen (15) foot patch cables.
   4. Furnish one black station patch cable for each HD jack (within faceplate) with 20% spare; furnish 50% ten (10) foot patch cables and 50% five (5) foot patch cables.
   5. Furnish one gray station patch cable for each WB jack (within faceplate) with 20% spare; furnish 50% ten (10) foot patch cables and 50% five (5) foot patch cables.

E. Approved Manufacturer:
   1. Panduit UTPSPxx (CAT 6) – blue.

F. See approved manufacturers' material list.

2.13 CAT 6 OSP PROTECTOR

A. Provide solid sheet CAT 6 OSP protector for each 4 pair data cabling entering the building.

B. Unit shall be UL497 listed.

C. See Manufacturers List Section 27 15 15 TM for approved manufacturers and part numbers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide communications copper horizontal cabling, connectors, jacks, cover plates, patch panels, cords, etc., as specified and as shown on drawings.

B. Cabling at patch panels shall be terminated in numerical order, so as to provide a logical pattern that will provide the end user the greatest ease in the system administration.

C. See labeling details for more information.

3.2 UNSHIELDED TWISTED PAIR CABLE (UTP)

A. Maximum pulling force shall be as recommended by the manufacturers and the maximum bending radius shall be (10) times the cable diameter.

B. Outdoor computer/data cable shall be used in all floor box locations where concrete is slab on grade.

C. Terminate the data jacks per the manufacturer's recommendations and ensure the termination bar is positioned as close as possible to the cable jacket edge.

3.3 CABLE PULLING

A. Cable rollers shall be used when pulling cable. Cable pulleys must be used when pulling cable around bends and corners of wireways. Pulleys shall have a minimum diameter of 6 inches.

B. Contractor shall use basket grips wherever possible and exercise care while pulling cable as not to exceed the maximum allowable pulling tension of the cable.

C. Cable rollers used for pulling in cable shall be mounted close to wireway supports and shall be placed at the beginning of the run and spaced every 25 feet along the run.

D. Provide 1.5 foot service loop at each jack. Loops shall be laced above the ceiling at the conduit.

E. Provide 15 foot service loop in each TR and MC/ER. Loops shall be laced above the ceiling in the cable tray.

F. Support service loop above ceiling properly.

3.4 LABELING AND MARKING

A. See Drawings for Technology Schedules for more information.

B. Contractor shall install labels as follows:
1. One label at each end of each cable at the end of the cable sheath, after stripping.
2. One label on the outside of each face plate in the space provided.
3. Label as shown on drawing
4. All markings shall be carefully done so as to present a neat, professional appearance.

3.5 CABLE SEPARATION FROM POWER WIRING

A. Between the cabling system and any fluorescent, neon, incandescent, or high intensity discharge lamp fixtures, the minimum distance shall be 5 inches.

B. Cable may be installed closer to lighting and convenience outlet power cable (single phase, 120V, 20A maximum), in metal cable channels for limited distances if the following guidelines are observed:
1. Coincident (parallel) runs of no more than 15 feet are permissible if a 1 inch separation between the power cable and the cabling system cable is maintained by separators or suitable retention hardware. If necessary, the separation may be less than 1 inch for a run of up to 6 inches if no contact between the cabling system cable and the power cable occur.
2. Coincident runs of no more than 30 feet are permissible if a 2 inch separation is maintained. The separation may be less than 2 inches for a run of up to 12 inches, if no contact occurs between the cabling system cable and the power cable.

3.6 TESTING

A. The Cabling Contractor shall be responsible for testing each Cat6A horizontal cable run to verify the performance of the permanent link to the latest TIA/EIA Cat 6A testing standards.

B. System and Wiring Testing, Checking, and Reports:
1. Cabling Contractor shall provide necessary technical personnel and testing instruments as required to perform complete testing of all systems installed by Contractor and coordinate this testing activity with the Architect/Engineer and Owner's representative.
2. All wiring, terminations, equipment, etc. shall be checked and tested by qualified field representative or equipment vendor. A report shall be submitted to Architect/Engineer and Commissioning Agent by vendor representative and/or Contractor indicating results of such final check-out and testing processes. Final payment will not be approved until such report is submitted and any "failure" results are corrected.

3. Cabling Contractor shall conduct such other tests and make necessary adjustments of equipment and installation infrastructure required by Architect/Engineer and/or Commissioning Agent, as requested or necessary to verify performance requirements. Submit all data gathering information taken during such tests to Architect/Engineer and Commissioning Agent.
4. Cabling Contractor must input the specified cable parameters, manufacturers' name and number in the tester. (Test results will not be accepted with generic cable type.)
5. Reporting to be done in compliance with standards and schedules published by authority and agencies defined in the Specifications.

C. Cable test results shall be stored and presented to the architect/engineers in electronic format for approval, and cable tester records designations shall match the associated cable labels and associated patch panel label designations.

D. Submit complete cable test results in electronic format.

E. Test results must NOT require special software download to read/open.

3.7 TELECOMMUNICATION ROOMS

3.7A. See section 27 11 00 – "Communications Equipment Room Fittings" for more information.

3.7B. The data cable and the telephone cable shall be terminated on RJ45 copper patch panels with modular insert jacks.

3.7

3.8 MAIN CROSS CONNECT/EQUIPMENT ROOM

3.7

A. See section 27 11 00– "Communications Equipment Room Fittings" for more information.

3.7

B. The data cable and the telephone cable shall be terminated on cabinet RJ45 copper patch panels with modular inserts for jacks.

3.7

END OF SECTION 271515

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SECTION 27 15 17 - COMMUNICATIONS COPPER HORIZONTAL CABLING (Augmented Category 6 Cable)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes, but is not limited to the following:
1. Local area network
2. Horizontal cabling
3. Patch panels compatible with the structured cabling system
4. Patch cords compatible with the structured cabling system
5. Modular jacks
6. Termination of all horizontal cabling
7. Testing of all horizontal cabling

B. Related section includes the following:
1. Division 01 – All Sections
2. Division 26 - Electrical
3. Division 27 – Communications Sections

1.3 SYSTEM DESCRIPTION

A. Provide labor, material, equipment, terminations, and accessories necessary for a complete and operational communications copper horizontal cabling system as indicated on the Drawings and specified herein. The contractor shall furnish the equipment, accessories and necessary material as described herein.

B. Provide communications copper horizontal cabling from each communication jack to each TR/MC/ER as described here and as shown on the drawings.

C. The voice and data horizontal cabling system shall be capable of 10 Gig transmissions via 4 PR UTP copper Augmented Category 6 horizontal cable and shall comply with TIA/EIA 568B, 2-10 requirements.

D. The cabling for the voice and data horizontal cabling system shall include but not limited to the following:
1. Provide UTP cables (horizontal).
2. Provide patch panels and patch cords compatible with the horizontal cabling system.
3. Provide modular jacks and cover plates compatible with the horizontal cabling system.
4. Provide and terminate cabling within each room and the data cabinets (MC/ER's and TR's).

E. The modular computer/data eight-position jack shall match the color scheme of EIA-568 B.

1.4 QUALITY ASSURANCE

A. Communications cabling system components and equipment shall be listed by Underwriters Laboratories, Inc. for Computer use, and the components shall bear the UL label.

B. The system shall be installed in accordance with requirements set by ANSI/NFPA-70 National Electric Code.

C. All equipment shall comply with the latest ANSI-J-STD-607 grounding and bonding standards.

D. All equipment and installation practices shall comply with latest BICSI (TDMM) standards.

E. All equipment shall comply with the latest ANSI/TIA/EIA-568, 569, 60, 607, and 862 standards, as applicable.

F. Cables shall be installed in accordance with ANSI/EIA/TIA and BISCI standards.

G. Provide labeling per ANSI/EIA/TIA-606 requirement and in accordance with the Owner and the Technology Consultant.

H. All cabling shall be tested in accordance with the ANSI/TIA/EIA-568-B2 standards with the required testing equipment.

I. See section 270500 – "Common Work Results for Communications".

1.5 CERTIFICATION

A. Cabling Contractor shall provide the services of a component manufacturer and provide equipment listed by Underwriters Laboratories, Inc. The Contractor shall issue a equipment certification stating that the equipment and connected wiring and devices which form the specified system, together with installation have a 20-year Application Assurance and 20-year Extended Product Warranty on Registered Installation, and are in compliance with the requirements established by TIA/EIA 568, 569, and BICSI Standards. Also this Contractor shall submit with his/her bid a letter from the manufacturer indicating that his/her installation will be certified for a 20-year Application Assurance and 20-year Extended Product Warranty on Registered System Installation.
   1. See Manufacturer Material List for approved manufacturers with part numbers.

1.6 SUBMITTALS / RECORD DRAWINGS / MAINTENANCE MANUALS

A. Shop Drawings
   1. Provide complete and comprehensive shop drawings with labeling to the Architect/Engineer for approval.
   2. Drawings shall be provided in AutoCAD Release 2002 format or higher.

B. See front end submittals section for more information.

C. See Common Work Results For Communications section 270500 for more submittal requirements.

D. Provide record drawings and maintenance manual, per section – "Operation and Maintenance of Communications Systems".

E. Contractor shall include the following with their submittal:
   1. Manufacturer’s Certificate stating each testing device used on the project and shall contain the most current revision of software.
   2. Manufacturer’s Certificate stating that each testing device used on the project has been calibrated within the last 12 months.

1.7 WARRANTY

A. Components, parts, and assemblies supplied by the Communications Contractor/manufacturer shall be guaranteed against defects in materials and workmanship for a period as specified in section – Demonstration, Training, and Warranty of Communications Systems, commencing upon system start-up. Warranty services shall be provided by an installer certified by the

equipment manufacturer during normal working hours. The manufacturer's statement of warranty shall be included in the submittals.

1.8 TRAINING

A. Provide training as specified in the section titled "Demonstration, Training, and Warranty of Communications Systems.

PART 2 - PRODUCTS

2.1 VOICE AND DATA CABLE AND COMPONENT PRODUCTS

A. Contractors must provide a system where the component and cable manufacture have formed a partnership to create a complete channel solution. This solution shall be warranted by the component manufacturer.

B. See Manufacturers List Section 27 15 17TM for approved manufacturers and part numbers.

2.2 VOICE AND DATA JACKS

A. Provide a flush mounted modular data jack RJ-45 to fit in a one or two gang 3-1/2 inch deep box and/or to fit in the surface mounted raceway or floor boxes as shown on the Drawings and as specified herein.

B. Data jacks shall be 8-position configurations and shall meet all the transmission performance of the specified cable.

C. The data jacks shall be UL listed and must meet TIA/EIA 568B.2-AD10 requirements.

D. The data jacks to be wired to TIA/EIA 568B .wiringscheme.

E. Modular data jacks shall be mounted in modular wall plates for one, two, three, four, five, and/or six modular opening.

F. See Manufacturers List Section 27 15 17TM for approved manufacturers and part numbers.

2.3 MODULAR COVER PLATES (TWO GANG)

A. Provide decorative modular cover plates with number of modular data jack as shown on the drawing and (minimum one each) as specified in this section.

B. Provide modular mounting frames for all jacks in the exposed surface raceway only (Panduit CFG4 Series).

C. Provide floor cover plate to match receptacle cover plates (verify with site electrical contractor).

D. Wall jacks shall be mounted on a stainless steel plate (Panduit KWP6P or equal).

E. Cover plate shall be adjustable either in field or by factory (1/4 inch minimum).

F. Provide blanks for wall and floor boxes.

G. Cover plate:
   1. See Manufacturers List Section 27 15 17TM for approved manufacturers and part numbers.

H. Wall adapter:

1. See Manufacturers List Section 27 15 17TM for approved manufacturers and part numbers.

I. Surface boxes:
   1. See Manufacturers List Section 27 15 17TM for approved manufacturers and part numbers.

2.4 MODULAR COVER PLATES (3-GANG DECORATIVE COVER PLATE)

A. Provide modular cover plates, as shown.

B. Modular plate shall be 3-gang decorative type.

C. Approved Manufacturer:
   1. Hubbell HPWWSCS3MMO

D. See approved Manufacturers Material List.

2.5 STAINLESS STEEL COVER PLATES

A. Provide stainless steel cover plates to fit the modular jacks as shown on the Drawings.

B. Stainless steel cover plate shall be double gang.

C. Provide stainless steel cover plates in the following areas:
   1. Lobby
   2. Corridors
   3. Gymnasium
   4. Auditorium
   5. Cafeteria
   6. LGI – Room with risers
   7. Kitchen
   8. Any other areas as directed by Owner or Architect/Engineer.

D. See Manufacturers List Section 27 15 17TM for approved manufacturers and part numbers.

2.6 COVER PLATE COLOR

A. Color of the modular communications cover plates shall be coordinated with the Architect prior to submission of submittal.

2.7 COPPER PATCH PANELS

A. Provide 24 port RJ45 patch panels for termination of all UTP cable with 24-RJ45 jacks.

B. Provide 48 port RJ45 patch panels for termination of all UTP cables with 48-RJ45 jacks.

C. Patch panels shall meet or exceed all transmission performance for augmented category 6 as outlined in TIA/EIA-568B.2-10.

D. Each RJ45 jacks shall be terminated with 4 pair of UTP wire and shall be wired to meet TIA/EIA 568B wiring scheme.

E. See Manufacturers List Section 27 15 17TM for approved manufacturers and part numbers.

2.8 PATCH CORDS

A. Provide patch cords with modular RJ45 at each end. UL listed, 3 foot (1m), 5 foot (1.5m), 7 foot (2.1m), 10 foot (3m), and 15 foot (4.6m) long.

B. Patch cord manufacturer must match connector/patch panel manufacturer.

C. See Manufacturers List Section 27 15 17TM for approved manufacturers and part numbers.

D. Patch cable quantity
   1. Furnish one blue patch cord for each data jack (within patch panel) with 20% spare; provide 50% three (3) foot patch cables, 30% five (5) foot patch cables, and 20% seven (7) foot patch cables.
   2. Furnish one green patch cord for each wireless access point jack (within patch panel) with 20% spare cables; provide 50% three (3) foot patch cables, 30% five (5) foot patch cables, an d 20% seven (7) foot patch cables.
   3. Furnish one white patch cord for each IP camera jack (within patch panel) with 20% spare; provide 50% three (3) foot patch cables, 30% five (5) foot patch cables, an d 20% seven (7) foot patch cables.
   4. Furnish one blue station patch cable for each data jack (within faceplate) with 20% spare; provide 90% ten (10) foot patch cables and 10% fifteen (15) foot patch cables.
   5. Provide one fifteen (15) foot green station patch cable at the Wireless Access point location plus 20% spare.
   6. Provide one ten (10) foot white station patch cable for each IP camera jack with 20% spare cables.
   7. Furnish one black station patch cable for each HD jack (within faceplate) with 20% spare; furnish 50% ten (10) foot patch cables and 50% five (5) foot patch cables.

E. Furnish one gray station patch cable for each WB jack (within faceplate) with 20% spare; furnish 50% ten (10) foot patch cables and 50% five (5) foot patch cables.

2.9 COMPUTER/DATA CABLE (AUGMENTED CATEGORY 6)

A. The computer/data cable shall be four unshielded twisted pair (UTP), 23 AWG, solid bare copper.

B. The insulated conductors shall be twisted in pairs and shall be insulated with FEP material, and all 4 insulated pairs shall be laid into an insulated plastic jacket.

C. UL listed CMP with transmission characteristics that meet or exceed those of FCC-68/ TIA /EIT, 568A-5 and TIA /EIA TSB-95 performance and NEMA low loss, extended frequency, jacket shall be sequentially marked at 2 foot intervals and must be plenum rated. UL listed 1459 and 1863.

D. Pair twisting shall be maintained to meet the cable performance, but maximum cable, untwisting allows is one half (1/2) inch.

E. Cable shall meet ANSI/TIA/EIA-568-B2-AD10 transmission performance specifications for 4 pair UTP augmented category 6 cabling.

F. See Manufacturers List Section 27 15 17TM for approved manufacturers and part numbers.

2.10 OUTDOOR COMPUTER/DATA CABLE (CATEGORY 6A)

A. The computer/data cable shall be four unshielded twisted pair (UTP), 24 AWG, solid bare CU, insulation for all 4 pairs to reduce skew (skew shall be less than 18 nsec).

B. UL listed CM with transmission characteristics that meet or exceed those of FCC-68/TIA/EIA, 568A-5 and TIA/EIT TSB-95 performance and NEMA low loss, extended frequency, jacket shall be sequentially marked at 2 foot intervals.

C. UL listed 1459 and 1863.

D. Pair twisting shall be maintained to meet the cable performance.

E. Maximum cable untwisting allowed is one half (1/2) inch, cable diameter .2-inch.

F. See Manufacturers List Section 27 15 17TM for approved manufacturers and part numbers.

2.11 CAT 6 OSP PROTECTOR

A. Provide solid sheet CAT 6 OSP protector for each 4 pair data cabling entering the building.

B. Unit shall be UL497 listed.

C. See Manufacturers List Section 27 15 17TM for approved manufacturers and part numbers.

2.12 WIRELESS ACCESS POINTS, AND CAMERA LOCATIONS

A. Cable Connection
1. Provide two ports UL listed surface mount box to terminate the RJ45 jack and cable.
   a. See Manufacturers List Section 27 15 17TM for approved manufacturers and part numbers.
2. Provide 5 foot patch cord and/or as required.
3. Patch the wireless access point and camera to the data jack in the box above the ceiling.
4. Provide one 4 inch square box with cover plate as shown for CEILING mounted devices.
5. Mount the biscuit in a 4 square junction box with cover plate and mounting hardware to attach to the ceiling grid, box to be mounted with face up.

2.13 WIRE AND CABLE FOR CCTV CAMERA SYSTEM

A. Provide video cables as follows:
1. Indoor video cable shall be 4PR UTP type, plenum rated.
2. Outdoor video cable shall be 4PR UTP type, water blocked.

B. Provide 24/VAC12VDC camera power cable as follows:
1. Indoor power cable shall be 16AWG three conductor unshielded, plenum rated.
   a. Approved Manufacturer: Belden 6201 UE (#16).
2. Outdoor power cable shall be 16 AWG three conductor, unshielded.
   a. Approved Manufacturer: Belden 5201 UE (#16).
3. Approved Manufacturers: West Penn, Commscope.

C. Provide PTZ Control Cable as follows:
1. Provide 4 twisted pair unshielded (UTP), 23 AWG, solid bare copper cable, plenum rated for each camera for the PTZ control.

D. Approved Equal: See Manufacturer's Material List.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide communications copper horizontal cabling, connectors, jacks, cover plate, blank inserts, patch panels, cords, etc., as specified here and as shown on the drawings.

B. Cabling at patch panels shall be terminated in numerical order, so as to provide a logical pattern that will provide the end user the greatest ease in the system administration.

C. See labeling details for more information.

3.2 UNSHIELDED TWISTED PAIR CABLE (UTP)

A. Maximum pulling force shall be as recommended by the manufacturers and the maximum bending radius shall be (10) times the cable diameter.

B. Outdoor computer/data cable shall be used in all floor box locations where concrete is slab on grade.

C. Terminate the data jacks per the manufacturer's recommendations and ensure the termination bar is positioned as close as possible to the cable jacket edge.

3.3 CABLE PULLING

A. Cable rollers shall be used when pulling cable. Cable pulleys must be used when pulling cable around bends and corners of wireways. Pulleys shall have a minimum diameter of 6 inches.

B. Contractor shall use basket grips wherever possible and exercise care while pulling cable as not to exceed the maximum allowable pulling tension of the cable.

C. Cable rollers used for pulling cable in cable tray shall be mounted close to wireway supports and shall be placed at the beginning of the run and spaced every 25 feet along the run.

D. Provide 3 foot service loop at each jack.

E. Provide 25 foot service loop in each TR and MC/ER.

F. Support service loop above ceiling properly.

3.4 LABELING AND MARKING

A. See Drawings for Technology Schedules for more information.

B. Contractor shall install labels as follows:
   1. One label at each end of each cable at the end of the cable sheath, after stripping.
   2. One label on the outside of each face plate in the space provided.
   3. Label as shown on drawings.
   4. All markings shall be carefully done so as to present a neat, professional appearance.

3.5 CABLE SEPARATION FROM POWER WIRING

A. Between the cabling system and any fluorescent, neon, incandescent, or high intensity discharge lamp fixtures, the minimum distance shall be 5 inches.

B. Cable may be installed closer to lighting and convenience outlet power cable (single phase, 120V, 20A maximum), in metal cable channels for limited distances if the following guidelines are observed:
   1. Coincident (parallel) runs of no more than 15 feet are permissible if a 1 inch separation between the power cable and the cabling system cable is maintained by separators or suitable retention hardware. If necessary, the separation may be less than 1 inch for a run of up to 6 inches if no contact between the cabling system cable and the power cable occur.

2. Coincident runs of no more than 30 feet are permissible if a 2 inch separation is maintained. The separation may be less than 2 inches for a run of up to 12 inches, if no contact occurs between the cabling system cable and the power cable.

3.6 TESTING

A. The Cabling Contractor shall be responsible for testing each Cat6A horizontal cable run to verify the performance of the permanent link to the latest TIA/EIA Cat 6A testing standards.

B. The contractor shall configure the tester for the cable and connectors used in the installation.

C. The cable tester shall be factory calibrated no more than 12 months prior to the date of the tests..

D. The contractor shall use the same tester(s) from the same manufacturer for the entire project(s).

E. All test reports shall look the same and all test reports shall be done with the same manufacture tester to assure all test results have the same appearance.

F. The contractor shall test each Cat 6A cable certifying that it complies with the latest TIA/EIA Cat6 A standards and shall provide a passing test report for each Cat 6A cable installed. The cable test results shall be submitted in an electronic format that can be read with the tester manufactures reader software as well as a separate PDF file along with the O and M manual.

G. System and Wiring Testing, Checking, and Reports:
   1. Cabling Contractor shall provide necessary technical personnel and testing instruments as required to perform complete testing of all systems installed by Contractor and coordinate this testing activity with the Architect/Engineer and Owner's representative.
   2. All wiring, terminations, equipment, etc. shall be checked and tested by qualified field representative or equipment vendor. A report shall be submitted to Architect/Engineer and Commissioning Agent by vendor representative and/or Contractor indicating results of such final check-out and testing processes. Final payment will not be approved until such report is submitted and any "failure" results are corrected.
   3. Cabling Contractor shall conduct such other tests and make necessary adjustments of equipment and installation infrastructure required by Architect/Engineer and/or Commissioning Agent, as requested or necessary to verify performance requirements. Submit all data gathering information taken during such tests to Architect/Engineer and Commissioning Agent.
   4. Cabling Contractor must input the specified cable parameters, manufacturers' name and number in the tester. (Test results will not be accepted with generic cable type.)
   5. Reporting to be done in compliance with standards and schedules published by authority and agencies defined in the Specifications.

H. Cable test results shall be stored and presented to the architect/engineers in electronic format for approval, and cable tester records designations shall match the associated cable labels and associated patch panel label designations.

I. Submit one complete cable test results in electronic format.

J. Test results must <u>NOT</u> require special software download to read/open.

3.7 TELECOMMUNICATION ROOMS

A. See section 27 11 00– "Communications Equipment Room Fittings" for more information.

B. The data cable and the video control cable shall be terminated on RJ45 copper patch panels with modular insert jacks.

3.8 MAIN CROSS CONNECT/EQUIPMENT ROOM

A. See section 27 11 00 – "Communications Equipment Room Fittings" for more information.

B. The data cable and the video control cable shall be terminated on RJ45 copper patch panels with modular inserts for jacks.

END OF SECTION 27 15 17

SECTION 27 41 12 - COMMUNICATIONS AUDIO-VIDEO MOUNTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes, but is not limited to the following:
1. Audio - Video mounts
2. Fixed length extension columns
3. Ceiling truss adapters
4. Escutcheon ring
5. Vibration absorber ceiling mount
6. Lightweight adjustable suspended ceiling plate/kit
7. Adjustable suspended ceiling kit
8. Wall mounted projector mount
9. Multi A/V mount
10. Miscellaneous items

B. Related section includes the following:
1. Division 01 – General Requirements
2. Division 08 – Ceilings
3. Division 11 - Equipment
4. Division 26 – Electrical
5. Division 27 – Communications Sections
6. Division 28 – Electronic Safety and Security

1.3 DESCRIBTION OF WORK

A. Provide audio - video mounts for all AV equipment, video projectors, and all accessories to attach to the building structural steel and or walls.

B. Provide labor, material, equipment, and accessories necessary for a complete installation of video display mounts.

C. It shall be the responsibility of the audio - video mounts contractor to verify the video locations and provide the proper mounts as specified here.

1.4 QUALITY ASSURANCE

A. The audio - video mounts and accessories shall bear the UL label and must be CSA certified.

B. All equipment installation practices shall comply with the latest BICSI (TDMM) standards.

C. All equipment shall comply with the latest ANSI/TIA/EIA-568, 569, 606, 607, and 862 standards, as applicable.

D. Provide labeling per ANSI/EIA/TIA-606 requirement and in accordance with the Owner and Technology Consultant.

E. See section – "Common Work Results for Communication" for more information.

1.5 SUBMITTALS / RECORD DRAWINGS / MAINTENANCE MANUALS

A. Shop Drawings
   1. Complete and comprehensive shop drawings including all mounting components shall be submitted to the Architect/Engineer for approval.
   2. A complete technical data sheet shall be included.
   3. Provide complete detail drawings for each type of bracket support.
   4. Certification letter.

B. See Common Work Results for Communications section 270500 for more submittal requirements.

C. Provide record drawings and maintenance manual, per section – "Operation and Maintenance of Communications Systems".

1.6 WARRANTY

A. Components, parts, and assemblies supplied by the manufacturer shall be warranted against defects in materials and workmanship for a period as specified in section – "Demonstration and Training of Communications Systems" from date of completion. Warranty services shall be provided during normal working hours.

PART 2 - PRODUCTS

2.1 GENERAL AUDIO - VIDEO MOUNT REQUIREMENTS

A. Provide audio - video mount as shown on the Drawings.

B. Mounts shall comply with the following:
   1. Constructed of 14 gauge cold rolled steel and finished in black fused epoxy.
   2. Provide proper model for the size and weight of the television set specified.
   3. Mount shall be capable of adjustable tilt (0 to 30 degrees) and 360 degree swivel action.
   4. Provide top and front roll out protection.

C. Ceiling Support
   1. Provide accessories, rigid pipe, unistrut or structural steel above the ceiling to allow proper support of the television mounting devices. Ensure that the structure is capable of supporting the TV as well as the mounting hardware.
   2. Accessories:
      a. Provide adaptors for attachment of brackets to round, rectangular, I-beams, or I-beam trusses.

D. Wall Support
   1. Provide blocking or suitable reinforcement to allow a safe, secure wall bracket installation. See technology detail for blocking.
   2. Secure wall bracket with anchors suitable for the installation as recommended by the manufacturer.
      a. Provide information on the proposed anchors to the A/E for approval prior to installation.

2.2 FIXED LENGTH EXTENSION COLUMNS

A. Provide fixed length extension columns, 6 inches to 10 feet for all video projectors. Color shall be black fused epoxy finish.

B. The length of the stem shall be so the top of the projector is in line with the top of the viewing surface or the electronic whiteboard.

C. Approved Manufacturers:
   1. Peerless ADD – Series (verify length)
   2. Bretford TV-Series (verify length)
   3. Lucasey CMAP150-Series (verify length)
   4. Chief CMS-Series (verify length)

2.3 CEILING TRUSS ADAPTERS

A. Provide truss ceiling stress decoupler to attach to round, rectangular or I-beam trusses, 3 inch diameter, black color.

B. Approved Manufacturer:

1.	Peerless	DCT100
		DCT 300
		ACC 600
		DCS 400
		DCT 500
		ACC 557
		ACC 556
2.	Bretford	TVCM-BK
		TVCCB-BK
		TVSTBL-BK
		TVUCA-BK
		TVCP16-BK
3.	Lucasey	CMAUSF15
		CMACC150
		CMAUDB12
		CMASF125
4.	Chief	CMA-165
		CMA-385
		CMA-300
		CMA-360
		CMA-362
		CMA-365

C. Provide internal joist mount, maximum load 300 pound.
   1. Approved Manufacturers:
      a. Peerless ACC 120
      b. Bretford tvmp24-bk
      c. Lucasey 1700IS series
      d. Chief CMA-385

2.4 ESCUTCHEON RING

A. Provide escutcheon ring where mounting column penetrates the finished ceiling. Color shall be chrome.

B. Approved Manufacturers
   1. Peerless ACC 640
   2. Bretford TVER-BK
   3. Lucasey CMAEF125
   4. Chief CMA-640

2.5 VIBRATION ABSORBER CEILING MOUNT (FOR ALL SUSPENDED PROJECTORS THROUGHOUT BUILDING UNLESS OTHERWISE NOTED)

A. Provide vibration absorber ceiling mount with uni-strut as shown on the Drawings and as described herein. (Install per manufacturer's recommendations.)

B. Unit shall use shock absorbing rubber bumpers.

C. Unit shall be mounted directly to uni-strut using spring nuts.

D. Unit shall have cord management access holes on ends of mounts.

E. Unit shall have scratch resistant black fused epoxy finish.

F. Unit shall be assembled per the manufacturer's instructions.

G. Provide cord wrap for the video projector power cord.

H. Approved Manufacturers
1. Peerless ACC845, anti-vibration mount, unistrut, threaded rod, stems, escutcheon ring, cord management, cord wrap, miscellaneous hardware
2. Bretford
3. Lucasey
4. Chief CMA 345 series, anti-vibration mount, unistrut, threaded rod, stems, escutcheon ring, cord management, cord wrap, miscellaneous hardware.

2.6 ADJUSTABLE SUSPENDED CEILING KIT (for suspended video projectors mounted in rooms with sloped ceilings)

A. Provide Truss Ceiling Adapter with stress de-coupler and all miscellaneous hardware (3/8" threaded rod, nuts, bolts, washers, 2inch pipe support, etc.) as shown on the detail drawing. (Install per manufacturer's recommendations.)
1. Approved Manufacturers:
a. Peerless DCT 100 (decoupler assembly, U-bolts, etc.)
b. Bretford TVCCB-BK
c. Lucasey CMAUSF15
d. Chief CMA 165

B. Provide 1.5" diameter extension column, threaded at both ends, from the Truss Ceiling Adapter to just below finished ceiling.
1. Approved Manufacturer:
a. Peerless EXT*xxx*
b. Bretford TVxx-BK
c. Lucasey CMAP150 series
d. Chief CMS series

C. Provide cord wrap for the video projector power cord.
1. Approved Manufacturers:
a. Peerless ACC852 or ACC856 series, color to match stem.
b. Bretford TVWJK-BK
c. Chief CW wrap series

D. Verify exact location with Owner prior to installation.

2.7 WALL MOUNTED MONITOR MOUNTS

A. Provide monitor mounts as listed below to match Owner-provided monitor sizing. Coordinate with Owner and provide as necessary.

B. Provide 32”-50” LED articulated universal wall brackets as follows:
1. Arm extended from 4.5 inches to 27 inches.
2. Integrated cable management.
3. Adjustable tilt +15/-5 degrees.
4. 28.7 inches W X18 inches H X 4.5-27 inches D.
5. Scratch resistant black epoxy finish.

6. Wall plate covers fasteners.
7. Maximum load 50 Lbs.
8. Provide all mounting hardware, stud fasteners and concrete anchors.
9. Approved Manufacturers:
    a. Chief TS318TU series.
    b. Peerless SA746PU series.
    c. Premier Mounts: AM50

C. Provide 47”-55” LED articulated universal wall brackets as follows:
1. Arm extended from 4.5 inches to 27 inches.
2. Integrated cable management.
3. Adjustable tilt +15/-5 degrees.
4. Scratch resistant black epoxy finish.
5. Wall plate covers fasteners.
6. Maximum load 80 Lbs.
7. Provide all mounting hardware, stud fasteners and concrete anchors.
8. Approved Manufacturers:
    a. Chief TS318TU series.
    b. Peerless SA746PU series.
    c. Premier Mounts: AM80

D. Provide 65”-70” LED articulated universal wall brackets as follows:
1. Arm extended from 4.5 inches to 27 inches.
2. Integrated cable management.
3. Adjustable tilt +15/-5 degrees.
4. Scratch resistant black epoxy finish.
5. Wall plate covers fasteners.
6. Maximum load 150 Lbs.
7. Provide all mounting hardware, stud fasteners and concrete anchors.
8. Approved Manufacturers:
    a. Chief PNRUB series.
    b. Peerless SA771PU series.
    c. Premier Mounts: AM175

2.8 MULTI A/V MOUNT

A. Provide multi mount as follows:
1. For DVD/VCR.
2. Color shall be black.
3. Height and width adjustable.
4. Wall plate.
5. Dual wall arms.
6. Safety belt.
7. Approved Manufacturers:
    a. Peerless PM 600
    b. Bretford
    c. Lucasey
    d. Chief

PART 3 - EXECUTION

3.1 PREMISES DISTRIBUTION SYSTEM

A. Contractor shall be responsible for all the miscellaneous support, steel, hardware, brackets, metal stud wall plates, concrete wall plates, ceiling attachments, adapters and decouplers, safety belts, bumper guards, etc. to provide a safe and secure installation and shall comply with the manufacturer’s instructions.

B. Provide universal tilt wall monitor brackets in all areas unless otherwise noted.

C. All A/V equipment shall be mounted at 7' – 2" A.F.F. in rooms with interactive whiteboards and 8' – 2" A.F.F. in rooms with screens to the bottom of the mounts in all teaching areas unless otherwise noted. A/V equipment that is mounted below 7'-6" AFF shall be raised at NO cost to the Owner if the Architect/Engineer finds the installation to be a potential hazard. (The top of the video projector lens shall be at the top of the screen or the interactive whiteboard.)

D. Coordinate the location of the video projector, projector heights, locations, etc. with the Architect/Engineer, Owner, electronic whiteboard, projection screen and other.

E. The Architect/Engineer will pre-approve the installation methods and verify all mounting heights of all audio/video display devices in the field. A pre-installation conference must be scheduled by the Contractor prior to the installation of the audio/video display mounts.

F. The contractor shall provide a mock room for Owner and Architect to review and approve.

3.2 MAINTENANCE

A. Response times for failures must not exceed 24 clock hours, Monday through Friday, 8:00 a.m. - 5:00 p.m., excluding holidays.

3.3 TESTING

A. A certified trained technician shall test the video display mounts and must report his test as part of the operation and maintenance manual.

3.4 CERTIFICATION

A. As a condition of final acceptance by the Owner, the Contractor shall issue to the Owner a letter of certification stating that the audio/video mounts were installed per the manufacturer's recommendations.

END OF SECTION 27 41 12

SECTION 27 51 16 - PUBLIC ADDRESS AND MASS NOTIFICATION SYSTEMS

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 but is not limited to the following:
1. Loud speakers.
2. Ceiling speakers.
3. Program sources and recorders.
4. Power amplifiers.
5. Audio signal processors.
6. 2/3 octave graphic equalizer.
7. Mic/line mixers.
8. Automatic mic/line mixers.
9. Mixing consoles.
10. Wired microphones
11. Wireless microphones.
12. Assistive listening systems.
13. Sound system equipment cabinets and its accessories.
14. Miscellaneous sound equipment, cables, hardware, etc.

B. Related section includes the following:
1. Division 01 – General Requirements
2. Division 26 – Electrical
3. Division 27 – Communications Sections.
4. Division 28 – Electronic Safety and Security

1.3 SECTION DEFINITIONS

A. CD: Compact disc.

B. HF: High frequency.

C. IR: Infrared.

D. LAN: Local area network.

E. LF: Low frequency.

F. SPL: Sound Pressure Level.

G. VU: Volume unit.

H. 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.

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

1.4 SUBMITTALS

A. Shop Drawings: Signed and sealed by a qualified sound system engineer.

1. Design Calculations: Calculate requirements for selecting seismic restraints for central control cabinets.
2. Equipment Details: Detail equipment assemblies and indicate dimensions, weights, required clearances, method of field assembly, components, and location of each field connection.
3. Console layouts.
4. Control panels.
5. Rack arrangements.
6. Wiring Diagrams: Power, signal, and control wiring. Include the following:
   a). Identify terminals to facilitate installation, operation, and maintenance.
   b). Single-line diagram showing interconnection of components.
   c). Cabling diagram showing cable routing.
7. Loudspeakers mounting details.
8. Loudspeakers locations and aiming details.

B. Quality Assurance/Control Submittals:
1. Product Data: For each item specified.
2. Calculations: For sizing backup battery.
3. 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:
   a). Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

C. Closeout Submittals:
1. Operation and Maintenance Data: For public address and music equipment to include in emergency, operation, and maintenance manuals.
2. Extra Materials: Receipt for extra materials.
3. Loose Equipment: Receipt for loose materials not fastened in place.

D. See Common Work Results For Communications section 270500 for more submittal requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
1. Maintenance Proximity: Not more than 2 hours' normal travel time from Installer's place of business to Project site.
2. Cable installer must have on staff a registered communication distribution designer certified by Building Industry Consulting Service International.
3. Installation shall be by personnel certified by National Institute for Certification in Engineering Technologies as audio systems Level III technician.

B. Source Limitations: Obtain public address and music equipment through a single source authorized by manufacturer to distribute each product.

C. 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.

D. Comply with NFPA 70 – National Electrical Code.

E. Comply with UL 50.

F. TIA/EIA-607 Telecommunications grounding.

G. Latest edition of BISCI – TDMM – manual

H. Americans with Disabilities Act (ADA)

I. Federal Communications Commission, Part 15

J. Sound System Engineering (Davis and Patronics) 3rd Edition 2006.

K. NSCA – Certified Systems Installer, C-SI

L. InfoComm International – Certified Technology Specialist, CTS.

M. Provide labeling per ANSI/EIA/TIA-606 requirement and in accordance with the Owner and Technology Consultant.

1.6 COORDINATION

A. 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.

1.7 WARRANTY

A. The public address and mass notifications system shall carry a warranty as specified in Section "Demonstration and Training of Communications Systems".

1.8 TRAINING

A. Provide training per Section "Demonstration and Training of Communications Systems".

1.9 RECORD DRAWINGS/OPERATION AND MAINTENANCE MANUALS

A. Provide record drawings and operation and maintenance manuals as described in Sections "Operation and Maintenance of Communications" and "Common Works Results for Communication Systems".

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The following manufacturers' and their products are approved products to be used, shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. AKG Acoustics; A Harman International Company (AKG).
2. AMK
3. Allen & Heath Limited (A&H).
4. Ashly Audio, Inc. (Ashly).
5. Atlas Soundolier; Atlas Sound (Atlas).
6. Audio Technica, U.S., Inc.
7. Bogen Communications International, Inc. (Bogen)
8. Crown Audio, Inc.; A Harman International Company (Crown).
9. D & M Professional; Denon Professional products (Denon).
10. D & M Professional; Marantz Professional products (Marantz).
11. Eastern Acoustic Works (EAW).
12. Electro-Voice, Inc.; Telex Communications, Inc. (EV).
13. Federal Signal Corporation; Electrical Products Division (Federal Signal).
14. Gentner ALS; A Starin Company (Gentner).
15. Intelix, LLC (Intelix).
16. JBL Professional; A Harman International Company (JBL).
17. Lab Gruppen
18. Listen Technologies Corporation.
19. LOUD Technologies, Inc.; Mackie products (Mackie).
20. Lowell Manufacturing Company (Lowell).
21. Meyer Sound Laboratories Inc. (Meyer).
22. Midas U.S.A; Telex Communications, Inc. (Midas).

23. Peavey Electronics Corporation; Architectural Acoustics by Peavey products. (Peavey).
24. ONE Systems
25. QSC Audio Products, Inc. (QSC).
26. Quam Nichols Company (Quam).
27. Rane Corporation (Rane).
28. Rauland-Borg Corporation (Rauland).
29. Renkus-Heinz, Inc.
30. Sennheiser Electronic Corporation.
31. Shure Incorporated (Shure).
32. Soundcraft; A Harman International Company (Soundcraft).
33. Symetrix, Inc. (Symetrix).
34. TASCAM; a division of TEAC America, Inc. (TASCAM).
35. Telex Communications, Inc. (Telex).
36. TOA Electronics, Inc. (TOA).
37. Yamaha Corporation of America (Yamaha).

2.2 EQUIPMENT AND MATERIALS

A. Coordinate features to form an integrated system. Match components and interconnections for optimum performance of specified functions.

B. Equipment: Modular type using solid-state components, fully rated for continuous duty, unless otherwise indicated. Select equipment for normal operation on input power usually supplied at 110 to 130 V, 60 Hz.

C. Waterproof Equipment: Listed and labeled for outdoor use.

2.3 LOUDSPEAKER SYSTEMS

A. 2-Way 60 by 45 Full-Range Loudspeakers (MUSIC ROOM)

1. Provide 2-way 60 by 45 full range trapezoidal loudspeaker, rotatable horn, as follows:
   a). LH Transducer: 12 inch cone, vented.
   b). HF Transducer: 1.4 inch exit, 3 inch voice coil compression driver, horn-loaded.
   c). Operating Mode: [Single-amp] [Bi-amp].
   d). Operation Range: 70 – 20kHz
   e). Nominal Beamwidth: 60 deg horizontal by 45 deg vertical.
   f). Axial Sensitivity:
      1) LF/HF: 97 dB, 70 to 20,000 Hz.
      2) LF: 97 dB, 70 to 1820 Hz.
      3) HF: 111 dB, 1290 to 17,000 Hz.
   g). Input Impedance:
      1) LF/HF: 8 ohms, nominal; 7.2 ohms at 178 Hz, minimum.
      2) LF: 8 ohms, nominal; 7.1 ohms at 290 Hz, minimum.
      3) HF: 8 ohms, nominal; 8.5 ohms at 6050 Hz, minimum.
   h). High Pass Filter: Equal to or greater than 60 Hz, 12 dB per octave Butterworth.
   i). Calculated Axial Output Limit:
      1) LF/HF: 125 dB, average; 131 dB, peak.
      2) LF: 125 dB, average; 131 dB, peak.
      3) HF: 133 dB, average; 139 dB, peak.
   j). Finish: Black or white as selected by Architect.
   k). Grille: Foam-backed, powder-coated, perforated steel.
   l). Housing: Baltic birch plywood.
2. Provide universal bracket and mounting hardware.
3. Provide wire guard in gyms and other similar spaces.
4. Approved Manufacturer:
   a). EAW model MK2364 series.
   b). Electro-Voice, Inc., EVF-1122S 64.
   c). JBL Professional, AM7212/64.

B. 2-Way 105 by 60 Full-Range Loudspeakers (GYMNASIUM).

1. Provide 2-way 105 by 60 full range trapezoidal loudspeaker, rotatable horn, as follows:
   a). Operating Mode: Single-amp.
   b). Operation Range: 60 – 16kHz
   c). Nominal Beamwidth: 105 deg horizontal by 60 deg vertical.
   d). Axial Sensitivity:
      1) LF/HF: 97 dB, 70 to 20,000 Hz.
      2) LF: 97 dB, 70 to 1820 Hz.
      3) HF: 111 dB, 1290 to 17,000 Hz.
   e). Input Impedance:
      1) LF/HF: 8 ohms, nominal; 7.2 ohms at 178 Hz, minimum.
      2) LF: 8 ohms, nominal; 7.1 ohms at 290 Hz, minimum.
      3) HF: 8 ohms, nominal; 8.5 ohms at 6050 Hz, minimum.
   f). High Pass Filter: Equal to or greater than 60 Hz, 12 dB per octave Butterworth.
   g). Calculated Axial Output Limit:
      1) LF/HF: 125 dB, average; 131 dB, peak.
      2) LF: 125 dB, average; 131 dB, peak.
      3) HF: 133 dB, average; 139 dB, peak.
   h). Finish: Black
   i). Grille: Foam-backed, powder-coated, perforated steel.
   j). Housing: Weather resistant Copolymer.
2. Provide universal bracket and pole mounting hardware.
3. Provide wire guard
4. Approved Manufacturer:
   a). One Systems - 112IM
   b). EAW
   c). Electro-Voice, Inc.
   d). JBL Professional
   e). QSC Audio Products, Inc.,
   f). Renkus-Heinz, Inc.
   g). Community

2.4 CEILING LOUDSPEAKERS

A. 4-Inch Ceiling Loudspeaker System (CAFETERIA).

1. Approved Manufacturer:
   a). Atlas Model FAP42.
   b). Electro-Voice, Inc. EVID C4.2 series
   c). JBL Professional, Control 24CT.
   d). Lowell Manufacturing Company ES-4T
   e). Bogen HFSF1
   f). EAW CIS300
   g). Soundtube CM 400i
   h). Community D4LP Series
   i). Denon DN-104S
2. Provide 4-inch coaxial ceiling loudspeaker system with ported bass reflex enclosure as follows:
   a). LH Transducer: 4 inch cone.
   b). HF Transducer: 3/4 inch diaphragm.
   c). Voice Coil Diameter: 1 inch.
   d). Magnet Weight: 10 oz., nominal.
   e). Impedance: 8 ohms, nominal.
   f). Power Rating: 25 W RMS.
   g). Sensitivity: 88 dB average.
   h). Frequency Response: 75 to 20,000 Hz, plus or minus 7 dB.
   i). Dispersion Angle: 130 degrees.

j). Enclosure: 285 cu. in. fiberglass lined 18 gauge steel, textured white finish with 24 gauge steel tile bridge.
k). Grille: Round one-piece perforated steel, textured white finish.
l). Transformer: 25/70 V, 1.5 dB insertion loss, rated 16 W with at least 5 primary taps, and bypass position for direct-coupled 8 ohm operation.

2.5 POWER AMPLIFIERS

A. Approved Manufacturers:
1. Crown Audio, Inc. Ct or Cdi- series.
2. Electro-Voice, Inc. Q- series
3. Peavey Electronics Corporation IPA Series.
4. QSC Audio Products, Inc., CX- series
5. TOA Electronics, Inc. 900-series
6. Crest Audio, Pro- series

B. Provide power amplifiers, as shown, that meets to the following requirements:
1. Comply with TIA/EIA SE-101-A.
2. Mounting: TIA/EIA-310-D, standard 19-inch rack mounted.
3. Output Power: As indicated on the system riser diagram, balanced lines (minimum 120 watts).
4. Frequency Response: 20 – 20KHz +1dB / -3dB
5. Minimum Signal-to-Noise Ratio: 60 dB, at rated output.
6. Total Harmonic Distortion: Less than 3 percent at rated power output from 50 to 12,000 Hz.
7. Output Regulation: Less than 2 dB from full to no load.
8. Controls: On/off, input levels, and low-cut filter.
9. Outputs: 8 ohms at 25 / 70V balanced
10. Input Sensitivity: Matched to preamplifier and providing full-rated output with sound-pressure level of less than 10 dynes/sq. cm impinging on speaker microphone or handset transmitter.

C. Accessories
1. Rack-mount kit
2. Power cable

D. Rack Spaces
1. Up to 1200 watt – 2U

2.6 DIGITAL SIGNAL PROCESSORS (DSP)

A. Minimum 4-Input, 6-Output digital signal processor with Feedback Reduction.
1. Provide a minimum 4 input, 6 output audio processor with feedback reduction, as follows:
a). Supplied Windows software displays interaction between dynamics processes.
b). 5-, 10-, and 16-filter, automatic, adaptive, feedback filters in single-channel and stereo modules
c). Parametric and graphic EQ.
d). 20 seconds of delay.
e). Mono and stereo compressors and limiters.
f). Gate/downward expander.
g). Ducker.
h). Automatic gain control.
i). 2 to 5-way crossovers.
j). Route any of 2 inputs to any of 6 outputs in any combination.
k). Adjust signal levels at crosspoints.
l). 128 presets.
m). Frequency response: 20 – 20kHz ±1.0dB, -3dB loss
2. Accessories
a). External control options:

1) Provide a wall mounted volume and selection control interface. Interface must be programmed for volume control functions in addition to zone selection settings (Example: Combined Gym/Cafeteria, etc.). Coordinate zone settings with owner.
2) Provide a mobile tablet app interface. Software app interface must be programmed for volume control functions. Coordinate settings with owner.
3) Logic Outputs: Provide indication of preset changes and mutes.

b). Rack-Mount Bracket: TIA/EIA-310-D, standard 19-inch.

3. Approved Manufacturer
   a). Ashly NE4800
   b). Symetrix Solus 8
   c). DBX DriveRack 4820
   d). BSS Audio Soundweb London BLU-100

B. 2-Channel Audio Processor with Feedback Reduction.
1. Approved Manufacturer:
   a). Shure Model DFR22 Series
   b). QSC Audio Products, Inc.DSP-30/SC28-series
   c). Rane Corporation, RPM 22 Series
   d). Symetrix, Inc., DBX 220i series.
   e). Sabine NAV240-series.
   f). Ashly GQX-series.
   g). Community dspec 226 series.
2. Provide a 2 channel audio processor with feedback reduction, 2 input, 2 output, audio processor with 5-, 10-, and 16-filter, automatic, adaptive, feedback filters in single-channel and stereo modules, equalizer, limiter and delay, as follows:
   a). Supplied Windows software displays interaction between dynamics processes.
   b). Parametric and graphic equalizers.
   c). Cut/shelf equalizer.
   d). Compressors/limiters.
   e). Automatic gain control.
   f). Gate/downward expander.
   g). Ducker.
   h). 2-Way crossover.
   i). Subwoofer processor.
   j). Splitter.
   k). Delay processors.
   l). 2 by 2 matrix mixer.
   m). PC system configuration.
   n). Phantom power.
   o). Frequency response: 20 – 20kHz ±1.0dB loss
3. Accessories
   a). Rack-Mount Bracket: TIA/EIA-310-D, standard 19-inch.
   b). Power cable

2.7 2/3 OCTAVE GRAPHIC EQUALIZER

A. Approved Manufacturers:
1. Ashly Audio, Inc.,GQX-1502 series
2. Rane Corporation ME – 15S series
3. DBX iEQ15-series.
4. TOA E232 series
5. Art Pro audio 441-series.

B. Provide two channel 2/3 octave graphic equalizer, as follows:
1. Two-channel of 15 band
2. Dual 2/3-octave, graphic equalizer

3. 20-mm sliders
4. Frequency response: 20 – 20kHz ±.25dB
5. XLR and TRS connections.
6. 12dB active
7. Balanced input.
8. Peak LED indicators.
9. Accessories
   a). TIA/EIA-310-D, standard 19-inch rack mount (1U rack space)
10. Provide all required patch cables.

2.8 8-INPUT AUTOMATIC MIC/LINE MIXER

A. Approved Manufacturer:
1. Shure Incorporated, SCM810 series
2. Peavey Electronics Automix-Control8-series.
3. Rane Corporation AM2 series

B. Provide 8 channel automatic mic/line mixer, as follows:
1. 8-channel automatic, mic/line mixer.
2. Automatic gain control
3. Standard, Last-Mic-On, or First-Come-First Served modes of automatic operation
4. Filibuster override.
5. Low-cut filter.
6. Balanced inputs and outputs.
7. 48 V phantom powers.
8. RS232 controlled.
9. 10/100 Ethernet port.
10. Frequency: 20 – 20kHz
11. Accessories
    a). Rack-Mount Bracket: TIA/EIA-310-D, standard 19-inch. (3U rack space)
12. Provide all required patch cables.

2.9 8- INPUT STEREO MIC/LINE MIXER

A. Approved Manufacturer:
1. Rane Corporation., MLM82S series
2. Biamp 801i series
3. Bogen CAM8-PRO

B. Provide 8-input, stereo mic/line mixer, as follows:
1. 8 input stereo mic/line mixer
2. Balanced left and right ¼ inch stereo outputs.
3. Independent mono outputs.
4. Two auxiliary sends and returns.
5. Balanced inputs and outputs.
6. 48 V phantom power.
7. 1/4-inch TRS headphone jack.
8. Transformer balanced XLR Mono output.
9. 20dB Microphone pad switch.
10. Stereo aux input control.
11. Aux master output control.
12. Frequency: 20 – 20kHz
13. Accessories
    a). Rack-Mount Bracket: TIA/EIA-310-D, standard 19-inch (3U rack space)
14. Provide all required patch cables.

2.10 16-INPUT SMALL MIXING CONSOLE

A. Approved Manufacturer:
1. Mackie Model 1604-VLZ 3 series
2. Allen & Heath Limited Gl2400-series.
3. Midas Venice 160-series.
4. Soundcraft; SI Expression series

5. Yamaha Corporation of America, MG166 C series

B. Provide 16-input small self-contained mixing console, as follows:
1. 16 line or microphone inputs.
2. 48 V phantom power.
3. 16 send/return channel inserts.
4. 8 channel direct outputs.
5. 4 stereo pairs auxiliary return inputs.
6. 1 stereo pair main mix output.
7. 1 main mix mono output.
8. 1 stereo pair control room input.
9. 1 stereo pair control room output.
10. 4 submaster outputs.
11. 6 aux send outputs.
12. 1 stereo pair RCA-type phono tape outputs.
13. 1 stereo headphone output.
14. 1 12 VDC BNC-type socket for external lamp.
15. 1 external LED gooseneck lamp.
16. Hard shell, foam lined storage case.

C. Provide all required patch cables.

D. Provide all required patch cables.

2.11 PROGRAM SOURCES AND RECORDERS

A. AM/FM Synthesized Digital Tuner.
1. Approved Manufacturer:
a). TOA Model DT-930.
b). Denon DN-300H.
c). Rolls RS81B
d). TASCAM, TU–690
e). Bogen DST1
f). Galaxy Audio RM-RDSTNR
2. Provide frequency synthesized digital AM mono and FM stereo radio receiver, as follows:
a). AM Frequency Band: 520 to 1,710 kHz in 10 kHz steps.
b). FM Frequency Band: 87.9 to 107.9 MHz in 200 kHz steps.
c). AM Sensitivity: 24 micro-volts.
d). FM Sensitivity: 4 micro-volts.
e). Presets: Any combination of 40 AM or FM stations.
f). A multi-function digital display shall be included with automatic station
g). Scanning and Manual Tuning: Automatic station storage to memory shall be possible using auto-scan mode. Direct station frequency tuning shall be possible using manual entry.
h). Connections: Two RCA-type jacks for stereo operation and removable terminal block for monaural operation. Push-type terminals shall be provided for connection of included AM and FM antennas.
i). Housing: Painted, black steel
j). Power: 120 V, 60 Hz, 180 mA.
3. Accessories:
a). Rack-Mount Bracket: TIA/EIA-310-D, standard 19-inch. (1U rack space)
b). Antenna: AM/FM stainless steel whip.

B. CD/MP3 Player.
1. Approved Manufacturer:
a). TASCAM Model CD-01U, series.
b). Denon, DN-C615 series.
c). Marantz UD5005-series
d). Numark, MP102 series
2. Provide 1-disc CD/MP3 player as follows:

a). CD-R/RW playback, including 12 cm and 8 cm CDs.
b). MP3 playback.
c). 20-second RAM buffer for shock protection.
d). RCA unbalanced analog outputs.
e). S/PDIF optical digital output.
f). Slot-loading CD transport.
g). Repeat, single-play and program playback modes.
h). Plus or minus 12.5 percent pitch control.
i). Key original mode allows you to change the speed without changing the pitch.
j). Call function returns to last play start point.
k). Auto ready and auto cue.
l). Fade in/out function (up to 10 seconds in 1/2 second steps.)
m). Eject block function.
n). Serial control via RS-232C.

3. Accessories
a). Rack-Mount Bracket: TIA/EIA-310-D, standard 19-inch. (2U rack space)
b). Wireless remote control.

C. CD/MP3/Bluetooth

1. Approved Manufacturer:
a). TASCAM CD-200BT.
b). Denon DN-500CB
c). Marantz PMD-526C

2. Provide as follows:
a). Rack mountable.
b). Connect up to 8 Bluetooth devices simultaneously
c). Play CD, CD-R, CD-RW, WAV, MP2, MP3, Data CD
d). Multiple playback modes, continuous, single, programmed, random
e). Shock/skip prevention memory buffer.
f). Pitch control.
g). ¼ inch stereo headphone output.
h). Wireless remote control.

3. Accessories
a). Rack-Mount Bracket: TIA/EIA-310-D, standard 19-inch.

2.12 WIRED MICROPHONES

A. Ensemble Microphone

1. Approved Manufacturer:
a). Shure Model SM81 series.
b). AKG Acoustics C1000S-series.
c). Electro-Voice, Inc. RE510 series
d). Sennheiser Electronic Corporation.
e). Audio-Technicam AE5100 series

2. Provide ensemble microphone, as follows:
a). Unidirectional condenser microphone.
b). Steel construction with stainless steel hardware.
c). Balanced, transformer coupled, male XLR-type connector.
d). Frequency Response: 20 to 20,000 Hz.
e). Rated Impedance: 150 ohms.
f). Signal-to-Noise Ration: 78 dB at 98 dB SPL.
g). Sensitivity at 1000 Hz: Minus 45 dBV per Pascal.
h). Clipping Level at 1000 Hz: Minus 4 dBV into 800 ohm load.
i). Total Harmonic Distortion: Less than 0.5 percent (131 dB SPL at 250 Hz into 800 ohm load.)
j). Storage case.

3. Accessories

a). Windscreen
b). Cable
c). Snap in stand clamp.
d). Floor stand with boom arm

B. Vocal Microphone
1. Approved Manufacturer:
a). Shure Model SM58S series
b). AKG Acoustics D5-series.
c). Electro-Voice, Inc. RE410-series.
d). Sennheiser Electronic Corporation, MD431 II.
e). Audio-Technica – AE6100 or 822 series
2. Provide vocal microphone, as follows:
a). Unidirectional, cardioids, dynamic microphone.
b). On/Off Switch
c). Steel construction with stainless steel hardware.
d). Balanced, transformer coupled, male XLR-type connector.
e). Frequency Response: 50 to 15,000 Hz.
f). Rated Impedance: 150 ohms.
g). Sensitivity at 1000 Hz: Minus 54.5 dBV per Pascal.
h). Storage case.
3. Accessories
a). Windscreen
b). Desk stands with push-to-talk switch.
c). Cable
d). Snap in stand clamp.
e). Floor stand with boom arm

C. Stereo Microphone
1. Approved Manufactures
a). AKG Acoustics C214-series.
b). Audio-Technica U.S., Inc., AT822 series
c). Electro-Voice, Inc. N/D967-series.
d). Sennheiser Electronic Corporation, e865 series
e). Shure Model VP88 series.
2. Provide stereo microphone, as follows:
a). Stereo microphone combining two condenser cartridges in single housing.
b). Steel or aluminum construction with stainless steel hardware.
c). Balanced, transformer coupled, male XLR-type connector.
d). Frequency Response: 40 to 20,000 Hz.
e). Rated Impedance: 150 ohms.
f). Signal-to-Noise Ration: 70 dB at 94 dB SPL.
g). Sensitivity at 1000 Hz: Minus 66 dBV (mid) per Pascal.
h). Clipping Level at 1000 Hz: Minus 12 dBV (mid), minus 10 dBV (side) into 800 watt load.
i). Total Harmonic Distortion: Less than 0.5 percent (131 dB SPL at 250 Hz into 800 ohm load.)
j). Windscreen.
k). Storage case.
3. Accessories
a). Windscreen
b). Cable
c). Snap-in stand clamp
d). Floor stand with boom arm

D. Stage Floor Boundary Microphone
1. Approved Manufacturer:

a). Crown Model PCC-160 series
b). AKG Acoustics PCC170-series.
c). Electro-Voice, Inc. Inc. RE90B series
d). Sennheiser Electronic Corporation, E912 series
e). Shure Incorporated, Easyflex eZB/C series

2. Provide stage floor boundary microphones, as follows:
   a). Half-supercardioid, condenser microphone.
   b). Steel construction with stainless steel hardware.
   c). 15-foot black cord with Switchcraft TA3F connector and A3M connector.
   d). Frequency Response: 50 to 18,000 Hz.
   e). Rated Impedance: 150 ohms.
   f). Signal-to-Noise Ration: 72 dB at 94 dB SPL.
   g). Sensitivity at 1000 Hz: Minus 33 dBV per Pascal.
   h). Total Harmonic Distortion: Less than 3 percent at 120 dB SPL.
   i). Storage case.
3. Accessories
   a). Cable

E. Suspended Microphone
1. Approved Manufacturer:
   a). AKG model CHM 21 series
   b). Electro-Voice, Inc. RE92H-series.
   c). Sennheiser Electronic Corporation.
   d). Shure Incorporated, EZ0 easyflex
   e). Crown Audio, CM30 series
2. Provide suspended microphones, as follows:
   a). Cardioids unidirectional condenser microphone for flown use with non-twisting cable.
   b). Pickup Angle: 125 degrees.
   c). Steel construction with matte dark gray finish.
   d). 30-foot black cord and associated electronics with male XLR-type connector.
   e). Frequency Response: 70 to 18,000 Hz.
   f). Rated Impedance: Greater than 600 ohms.
   g). Signal-to-Noise Ration: 73 dB at 94 dB SPL.
   h). Sensitivity at 1000 Hz: Minus 35 dBV per Pascal.
   i). Total Harmonic Distortion: Less than 1 percent at 125 dB SPL.

2.13 WIRELESS MICROPHONES

A. Approved Manufacturer:
1. Shure Model ULXS124/85 series
2. Audio Technica, 3000 series
3. Sennheiser Electronic Corporation, G2 300 series
4. Telex Communications, Inc. FMR500L w/WT60 belt packs etc.
5. EVI FMR-500HL/FMR-500 series

B. Provide combination wireless systems as follows:
1. Professional wireless receivers.
2. Wireless body pack transmitter.
3. Cardioids microphone.
4. Lavaliere condenser microphone.
5. Provide one receiver and transmitter for each microphone.
6. Systems in the 600 MHz service band are not acceptable.

C. Wireless headset microphone:
1. Approved manufacturer:
   a). Country Man E6
   b). Shure

c). EV
d). Crown CM-312A
e). Sennheiser
f). Audio technical AT-889cW

2. Provide wireless microphones, as follows:
   a). Head worn condenser microphone, 3 foot plug-in cable, battery belt pack.
   b). Electrets condenser
   c). Freq. response: 50 Hz to 17,000Hz
   d). Impedance: 75 ohm balanced
   e). Load impedance: 1,000 ohms or greater
   f). Signal to noise ratio: 63 dB at 94 dB SPL
3. Provide UHF wireless, as follows:
   a). UHF wireless frequency agile, diversity microphone system
   b). Handheld transmitter
   c). Rack mounted receiver
   d). Body pack transmitter
   e). Omni-directional lapel microphone
   f). Two (2) 1/4-wave rack mounted antennas
   g). UHF Antenna distribution system
4. Provide water resistant microphones, as follows:
   a). Water resistant head-worn microphone
   b). Aerobic sports pouch for housing bodypack transmitter.
5. Approved Manufacturers:
   a). Shure model WH30TQG and custom pouch.
   b). Sennheiser Electronic Corporation.
   c). Telex models WPHS-746 and WP-23.
   d). Audio-Technica U.S., Inc. model AT889cW and custom pouch.

2.14 ASSISTIVE LISTENING SYSTEMS

A. Approved Manufacturer:
1. Gentner model TX-37A transmitter and model Digital-1 receivers.
2. Listen Technologies Corporation, LS-O3 /LT803 series
3. Telex Communications, Inc.; Sound Mate products SM-2 series
4. Sennheiser Electronic Corporation.
5. Williams Sound, PPA 375 series

B. Provide rack mounted assistive listening transmitter, remote mounted 1/2-wave antenna, ear bud receivers, tele coils, and wall plaque, as follows:
1. Provide hard shell, foam lined storage case to house receivers.
2. Provide one complete set and one spare set of batteries.
3. Provide rack mount
4. Provide universal antenna mounting kit.
5. Provide receivers with ear speaker.
6. Provide hearing aid compatible receivers (minimum of one per four receivers).
7. Provide one set which includes the following:
   a). Antenna and mount
   b). Coax cable
   c). Charger
   d). Rack-mounted transmitter
   e). Body pack style receivers (4)
   f). Storage case

C. Each system within the building shall be on a separate frequency and each receiver shall be able to tune to any frequency inside the building.

D. Provide extra body style receivers, 4 total.

2.15 FREE STANDING SOUND EQUIPMENT CABINETS

A. All sound equipment shall be housed in free-standing steel protective cabinets.

B. The equipment cabinets shall have solid sides and vented back panels and lockable and latching front and back doors. Units to have front vented hinged door. (All locks shall be keyed alike).

C. The sound system equipment cabinets shall be 22 inches wide by 25 inches deep and 83-1/8 inches high with leveling feet/or casters.

D. The equipment cabinets shall be made of steel construction and fully welded corners.

E. The equipment cabinets shall have powder coat finish, finish shall be black.

F. Provide integrated quiet fan with 150-250 CFM in each equipment cabinet with fan guards (external and internal), fan shall have less than 47 - 49 dBA noise rating.

G. Provide vertical power strip with 20 amp receptacles for each cabinet.

H. At each equipment cabinet provide plastic wire holding clips.

I. Provide copper bus bar.

J. Provide 100 spare mounting screws for each equipment cabinet.

K. Provide mounting rails.

L. Provide vented panels between sound equipment as needed.

M. Provide blank panels between sound equipment as needed.

N. Provide adjustable vented shelves, shelf shall adjust from 23 to 32 inches, with a weight capacity of 200 Lbs, steel with black powder finish.

O. Provide telescoping full depth heavy duty vented shelves ,shelf shall adjust from 16 to 44 inches, with a weight capacity of 500 Lbs, 16 GA steel with durable black powder finish.

P. Provide heavy duty sliding shelf , full 14 “ extension, heavy gauge steel with black powder finis, weight capacity of 50 Lbs.

Q. Equipment cabinet shall be UL listed.

R. Provide 2 U drawers.

S. Approved Manufacturer:
   1. Middle Atlantic ERK-series (22"W x 25"D)
   2. CPI C-series.
   3. Hoffman EER-series type I
   4. B Line V-Line series.

2.16 PORTABLE SOUND EQUIPMENT CABINETS

A. All sound equipment shall be housed in free-standing steel protective cabinets.

B. The equipment cabinets for shall have solid sides and vented back panels and lockable and latching front and back doors. Units to have front plexi-glass hinged door. (All locks shall be keyed alike for all provided cabinets).

C. The sound system equipment cabinets shall be 23 inches wide by 26 inches deep and 30/42/52 inches high (as needed) with casters as required.

D. The equipment cabinets shall be made of steel construction and fully welded corners.

E. The equipment cabinets shall have powder coat finish, finish shall be black.

F. Provide vertical power strip with 20 amp receptacles for each cabinet.

G. At each equipment cabinet provide plastic wire holding clips.

H. Provide copper bus bar.

I. Provide 100 spare mounting screws for each equipment cabinet.

J. Provide mounting rails.

K. Provide vented panels between sound equipment as needed.

L. Provide blank panels between sound equipment as needed.

M. Equipment cabinet shall be UL listed.

N. Provide 1U space for future equipment w/ blank cover.

O. Approved Manufacturer:
1. Middle Atlantic ERK OR PTRK -series (23"W x 26"D)
2. CPI C-series.
3. Hoffman EER-series Type I series.
4. B Line V-Line series.
5. Lowell LPR-series.

2.17 MISCELLANEOUS COMPONENTS

A. Monitor Panel: Mounted above amplifiers.
1. Equip with VU or dB meter, speaker with volume control, and multiple-position rotary selector switch.
2. Connect selector switch and volume control to permit selective monitoring of output of each separate power amplifier via VU or dB meter and speaker.

B. Volume Attenuator Station: Wall-plate-mounted autotransformer type with paging priority feature.
1. Wattage Rating: 10 W, unless otherwise indicated.
2. Attenuation per Step: 3 dB, with positive off position.
3. Insertion Loss: 0.4 dB maximum.
4. Attenuation Bypass Relay: Single pole, double throw. Connected to operate and bypass attenuation when all-call, paging, program signal, or prerecorded message features are used. Relay returns to normal position at end of priority transmission.
5. Label: "PA Volume."

C. Provide microphone outlet, as follows:
1. Three-pole, polarized, locking-type, microphone receptacles in single-gang boxes.
2. Provide wall outlets with brushed stainless-steel device plates.
3. Provide floor outlets with gray tapered rubber or plastic cable nozzles and fixed outlet covers.

D. Conductors and Cables: Jacketed, twisted pair and twisted multi-pair, untinned solid copper.
1. Insulation for Wire in Conduit: Thermoplastic, not less than 1/32 inch thick.
2. Microphone Cables: Neoprene jacketed, not less than 2/64 inch thick, over shield with filled interstices. Shield No. 34 AWG tinned, soft-copper strands formed into a braid or approved equivalent foil. Shielding coverage on conductors is not less than 60 percent.

3. Plenum Cable: Listed and labeled for plenum installation.

E. Provide portable equipment case to house a mixer, CD/PM3/iPod, wireless microphone, antenna and power strip as follows (see drawings for more info):
1. Black molded polyethylene design
2. 19-inch rack-able depth
3. Full-sized front and rear lids
4. Molded-in, ergonomic side carry handles
5. Recessed steel twist latches
6. Made from recycled materials
7. Rack, rails, and screws
8. Dimensions:
   a). 21.50" L x 21.25" W x (size to fit equipment) H
9. Approved manufacturers:
   a). Gator G-PRO,
   b). SKB Roto Shock Mount,
   c). Hardigg Blackbox Rack Mount

2.18 UNIVERSAL POWER SEQUENCE/POWER MODULAR GROUNDING OUTLETS

A. Unit shall be rack mounted.

B. Unit shall operate on 120 volt AC, 60Hz.

C. Unit shall LED indicator.

D. Unit shall have on/off master switch.

E. Provide modular raceway system.

F. Unit shall be connected to 20 amp circuits for 6.20 amp circuits.

G. Approved manufacturers:
1. Middle Atlantic USC-6R universal sequence with MPR6-R-20 (quantity of 6) modular raceway system.

2.19 POWER STRIPS

A. Provide vertical power strip in each sound system cabinet, as follows:
1. 12 – 20 amp receptacles, 120 volts.
2. Cord with NEMA 5 – 20P plug.
3. 50 to 60 inches long.
4. Single circuit.
5. UL listed 1363.

B. Provide horizontal power strip in each sound system cabinet.
1. 6 – 20 amp receptacles
2. Cord with NEMA 5 – 20 plug
3. Single circuit
4. UL listed 1419

C. Unit shall be rack or cabinet mounted.

D. Approved manufacturers:
1. Middle Atlantic PD-2020C-NS (Vertical).
2. Hubbell PR20620 (Vertical)
3. Panduit CMRPSVD20 (Vertical)
4. Middle Atlantic PDS-620R (Horizontal).
5. Hubbell PR1020 (Horizontal)
6. Panduit CMRPSHD20 (Horizontal)

2.20 POWER DISTRIBUTION

A. Illuminated Power Distribution Unit: Horizontally rack-mounted power distribution unit consisting of power conditioner with 15-amp circuit breaker and 8 rear-mounted 15-amp receptacles, master power switch, retractable LED rack lights with on/off/dimmer control. Back panel connector for gooseneck lamp with front panel switch. Unit shall fit in one rack unit and supplied with 10 foot heavy duty power cord.
   1. Approved Manufacturers:
      a). Middle Atlantic: PDLT-815RV-RN
      b). Atlas Sound: ACRL-291 series
      c). Furman: PL-8 series.
   2. Arrange unit at top of rack.

B. Power Distribution Unit: Horizontally rack mount power distribution unit consisting of power conditioner with 15-amp circuit breaker and 8 rear mounted 15-amp receptacles. Unit shall fit in one rack unit and supplied with 10 foot heavy duty power cord.
   1. Approved Manufacturers:
      a). Middle Atlantic: PDS-615R.
      b). Atlas Sound: ACRL 191B series
      c). Furman: M-8 series
   2. Arrange unit at top of rack.

2.21 WIRELESS PORTABLE SOUND SYSTEM

A. Approved manufacturers:
   1. Teachlogic Titan PA-880.
   2. EAW.
   3. Altec Lansing.

B. General description:
   1. Output power: 50 watts.
   2. Maximum SPL: 122 dB
   3. Frequency response: 20-20kHz
   4. Speaker “8” LF woofer, 1” HF horn.
   5. Audio input: XLR-Mic In, RCA-Line In.
   6. Audio output: RCA (line output), external speaker output, 1/4” phone, 8 ohm microphone, bass, treble, master volume.
   7. Wireless handheld microphone
   8. Power: 120 volts AC or rechargeable batteries.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Wiring Method: Install wiring in raceways unless otherwise noted.

B. Wiring Method: Install wiring in raceways except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces where cable wiring method may be used. Use plenum cable in environmental air spaces including plenum ceilings.

C. Install exposed cables in finished areas parallel and perpendicular to surfaces or exposed structural members, and follow surface contours. Secure and support cables by straps, staples, or similar fittings so designed and installed to avoid damage to cables. Secure cable at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, or fittings.

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

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

F. 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.

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

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

I. 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.

J. Wall-Mounting Outlets: Flush mounted.

K. Floor-Mounting Outlets: Conceal in floor and install cable nozzles through outlet covers. Secure outlet covers in place. Trim with carpet in carpeted areas.

L. Conductor Sizing: Unless otherwise indicated, size speaker circuit conductors from racks to loudspeaker outlets not smaller than No. 18 AWG and conductors from microphone receptacles to amplifiers not smaller than No. 22 AWG.

M. Weatherproof Equipment: For units that are mounted outdoors, in damp locations, or where exposed to weather, install consistent with requirements of weatherproof rating.

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

O. Connect wiring according to local and national codes.

3.2 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.

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

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

3.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:
1. Schedule tests with at least seven days' advance notice of test performance.
2. After installing public address and music equipment and after electrical circuitry has been energized, test for compliance with requirements.
3. Operational Test: Perform tests that include originating program and page messages at microphone outlets, preamplifier program inputs, and other inputs. Verify proper routing and volume levels and that system is free of noise and distortion.
4. Signal-to-Noise Ratio Test: Measure signal-to-noise ratio of complete system at normal gain settings as follows:

a). Disconnect microphone at connector or jack closest to it and replace it in the circuit with a signal generator using a 1000-Hz signal. Replace all other microphones at corresponding connectors with dummy loads, each equal in impedance to microphone it replaces. Measure signal-to-noise ratio.

b). Repeat test for each separately controlled zone of loudspeakers.

c). Minimum acceptance ratio is 50 dB.

5. Distortion Test: Measure distortion at normal gain settings and rated power. Feed signals at frequencies of 50, 200, 400, 1000, 3000, 8000, and 12,000 Hz into each preamplifier channel. For each frequency, measure distortion in the paging and all-call amplifier outputs. Maximum acceptable distortion at any frequency is 3 percent total harmonics.

6. Acoustic Coverage Test: Feed pink noise into system using octaves centered at 500 and 4000 Hz. Use sound-level meter with octave-band filters to measure level at five locations in each zone. For spaces with seated audiences, maximum permissible variation in level is plus or minus 2 dB. In addition, the levels between locations in the same zone and between locations in adjacent zones must not vary more than plus or minus 3 dB.

7. Power Output Test: Measure electrical power output of each power amplifier at normal gain settings of 50, 1000, and 12,000 Hz. Maximum variation in power output at these frequencies must not exceed plus or minus 1 dB.

8. Signal Ground Test: Measure and report ground resistance at public address equipment signal ground. Comply with testing requirements specified in Division 26 Section "Grounding and Bonding for Electrical Systems."

B. 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.

C. 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.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements.

C. Complete installation and startup checks according to manufacturer's written instructions.

3.5 ADJUSTING

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

B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purpose, without additional cost.

END OF SECTION 27 51 16

SECTION 27 53 19 – DISTRIBUTED ANTENNA SYSTEM (FIRST RESPONDER)

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 the following:
   1. Emergency (first) responder radio coverage system.

1.3 SYSTEM GENERAL

A. The system shall be comprised of a roof mounted donor antenna, bi-directional amplified (BDA), a series of interconnected interior distributed antennas and cabling (DAS).

B. This is a delegated design specification. The vendor shall verify the radio system frequencies, channels, talk groups, etc. that are utilized by the Police, Fire, and first responders responsible for coverage at the building site and shall incorporate those specifications into the system design. All Public Safety 700 – 900 Mhz, UHF, VHF, cellular, and other frequencies as may be required shall be included in the system as directed by Owner and local public agencies. The intent is to provide adequate coverage for any and all first responders throughout the building for complete coverage, regardless of which agency they work for, so local, county, city, state, and federal frequencies shall be boosted as required.

C. The BDA and any associated secondary power supplies shall meet all requirements of the local codes and the Authority Having Jurisdiction.

D. Preliminary system design shall be established by utilizing an on-site RF survey of the new building and utilizing predictive RF software with the building model available from the Architect. There will be no charge to this vendor for one set of electronic files.

E. Final system design and layout shall be established utilizing an on-site RF survey once the building structure is closed in and moisture levels are stabilized.

F. General building coverage shall be provided with a minimum of 95% of floor area radio coverage.

G. System shall include testing / commissioning once the system is complete.

1.4 Submittals

A. General:
   1. System Design
      a. Shop drawings – provide results of field RF surveys and RF predictive modeling indicating locations of antennas and signal coverage heat maps.
      b. Include a minimum of (1) building elevation which includes the location of outdoor antenna. Include height of antenna above building, orientation, and location of all grounding connections.
      c. Include a plan view of each building unit where indoor antenna systems are proposed. Match Architectural unit matchlines and scale. Include antenna numbers, coaxial cable routes, and the locations of any other system components such as splitters, couplers, amplifiers, etc. All components shall be labeled for reference in power budget calculation tables. Include approximated coverage radii indicating a -95 dBm downlink signal strength at each coverage antenna. Include results of any previous coverage testing per grid, if applicable.

d. Specify antenna grounding and surge protection in accordance with NEC Article 810.
e. Provide calculations and results of power budget calculations.
f. Provide backup power source calculations to ensure that backup power requirements are met.

2. Equipment Specification Sheets
   a. Provide electronic copies of manufacturer specification sheets of all system components, including:
      1) Amplifiers
      2) Antennas
      3) Coaxial cable, couplers, splitters, combiners, and other passive components.
   b. Operation and maintenance data
   c. Backup battery and charging system
3. Supply product certificates from manufacturer of radio system components certifying that their products comply with specified requirements.
4. Extra Materials: Receipt for extra materials.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain components from a vendor with 5 years of experience installing similar sized systems located within 200 miles of project site.

B. 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.

C. Comply with NFPA 70, NFPA, ADA, UL, and provide Factory Mutual approved products.

D. Installation shall be by authorized installer in accordance with all FCC regulations.

1.6 WARRANTY

A. The system shall be warranted by the contractor for a period of three (3) years from date of substantial completion. Provide onsite annual testing for years 1 – 3 as part of this bid.

1.7 COORDINATION

A. Coordinate installation of distributed antenna system with other trades. Refer to Architectural plans for potential routings. Cabling shall be concealed above ceilings or run in neat and workmanlike manner in open ceiling areas. Coordinate with other trades and CM in advance.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Indoor Distributed Antennas: No fewer than 3 of each type and size.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. G-Wave Solutions to match other equipment within District. No other manufacturers will be accepted.

2.2 EQUIPMENT

A. All signal booster components shall be contained in a NEMA 4X type waterproof cabinet.

B. The signal booster and battery system shall be electrically supervised and monitored through the fire alarm system.

C. Equipment shall have FCC certification prior to installation.

D. Bidirectional amplifier
   1. The BDA shall be of modular design and use digital filtering to mitigate interference and accommodate multiple services.
   2. Compliance – FCC type certified and in compliance with 2012 NFPA 72, chaper 24 requirements for supervision and monitoring.

E. Fiber-optic master unit
   1. When the building size dictates an Active fiber DAS, the fiber optic master unit shall convert radio over coax to radio over fiber for distribution to fiber optic remote units. Provide for single mode fiber transmission media and remote supervision.

F. Donor Antenna
   1. Provide Yagi antennas or other suitable antennas meeting frequency range and RF requirements, suitable for pole mounted on roof, suitable for up to 120 mile per hour wind speed.
   2. Provide antennas matched to signal booster components.
   3. Donor antenna cabling – provide cabling with fire retardant jacket, meeting UL 1666/CATVR/CMR fire retardancy test methods, IEC 61034 smoke test method, and IED 60754-1/-2 toxicity index test methods.

G. Omni-directional coverage antannas
   1. Provide 360 degree coverage, single small antennas featuring multi-band design with frequency range 450 – 2700 MHz,, UV stabilized ABS plastic with built in pigtail and stud mount.

H. Standby Power
   1. The system shall be provide with standby power capable of operating the system for a duration of not less than 24 hours.
   2. Batteries shall be contained in a NEMA 4X type waterproof cabinet.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The installation of the distributed antenna system shall be accordance with all Federal, State, and local laws.

B. Amplification systems capable of operation on frequencies licensed to any public safety agency by the FCC shall not be installed without prior coordination and approval of the fire code official.

C. The contractor shall design, install, commission, and test the DAS in accordance with the manufacturer’s installation instructions and recommendations.

D. Locate equipment, antennas, and splitters at locations shown on the shop drawings and approved by Architect.

E. Extend cabling from enclosure to the splitters / antennas in a neat and orderly manner per the routing on the shop drawings. Support cabling in compliance with NEC Chapter 8 requirements

and manufacturer's recommendations. Cabling installed above accessible ceilings shall be supported approved cable support systems and shall comply with other sections.

F. All wiring shall be color coded and labeled at each end with self-laminating, machine printed labels.

G. Install headend equipment as indicated on drawings. Fasten to wall or floor as applicable in accordance with local codes.

3.2 COORDINATION WITH OTHER TRADES

A. Field coordinate the installation of the equipment (and remotes) to ensure that each location is provided with the following:
   1. A 120V, 20A circuit served from the life safety generator system.
   2. (2) strands of single mode fiber from the headend location to each remote location terminated in the appropriate connectors.
   3. Grounding per NEC and TIA standards.
   4. Coordinate the following Alarm and Monitoring points with the Fire Alarm contractor.
      a. Antenna malfunction.
      b. Signal booster failure.
      c. Loss of normal ac power.
      d. Failure of battery charger.
      e. Low-battery capacity.

3.3 TESTING

A. Acceptance testing will be performed after the system is commissioned. Vendor / supplier shall work with installer to confirm system is functioning properly in all manner before testing is conducted.

B. Refer to International Fire Code Section 510 for requirements for testing. In general, each floor is divided into a grid of 20 test squares, approximately equal sized. A test location within each square shall be selected and the test conducted from each location, approximate center of each test area. Signal level measurements will be recorded in the coverage areas using a CW test signal. Use a portable spectrum analyzer and dipole antenna for this test. If more than two non-adjacent test squares fail this test, it results in failure of the test.

C. If the 20 test square failed, a second test with 40 grids may be done.

D. The measurement results shall be included in a report so that the Owner can review during their subsequent annual testing.

E. The Contractor shall submit an Acceptance Test Plan (ATP) for approval. The DAS system shall be tested by person(s) who hold an FCC General Radio Operator's License (GROL) or by the AHJ or their designees.

F. Exact location of measurement shall be marked on the grid print. Screen shots must be taken in all designated grid spaces.

G. Report results of testing to the project engineer for analysis and reporting.

H. Provide Architect and Owner with 30 days notice of final system testing, and include approved test plans and procedures. Notify Architect and Owner with 10 working days notice of the opportunity to witness all testing.

3.4 TRAINING

A. Organize a structured demonstration of acceptance testing, a minimum of 1 hour in duration.

B. Provide management, operational, and maintenance manuals to Owner in advance of training.

C. The training shall be by a qualified instructor and shall be hands-on to cover operation and maintenance of all installed elements. All training shall be completed prior to Final Acceptance.

END OF SECTION 27 53 19