COLLEGE OF DuPAGE
REGULAR BOARD MEETING

BOARD APPROVAL

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1. SUBJECT

General Contractor for Student Resource Center (SRC) Conference Center Upgrade Project.

2. REASON FOR CONSIDERATION

Construction projects that exceed the statutory limit of $50,000 must be approved by the Board of Trustees.

3. BACKGROUND INFORMATION

The SRC Conference Center Upgrade Project includes updated audiovisual equipment and controls, presentation lighting, acoustic enhancements, together with floor and wall finishes. A location map, floor plan of the existing area and architectural renderings of the renovated area are included in this request.

A legal notice for an Invitation for Bids was published on December 21, 2017 in the Daily Herald; the invitation was also posted to the College of DuPage Purchasing Website and distributed to in-district Chambers of Commerce. Ninety-five (95) vendors were directly solicited. Twenty-five (25) vendors downloaded the bid document. A Pre-Bid meeting and site visit was held on January 4, 2018 at 11:00 a.m. in the College of DuPage Purchasing Department Conference Room (BIC 1B03A). A public opening of the bids was held on January 26, 2018 at 10:00 a.m. in the College of DuPage Purchasing Department Conference Room (BIC 1B03A). The following individuals were in attendance: Jacoby Radford (COD Purchasing Manager/Recorder), John McGarry (COD Buyer/Facilitator), John Gandor (COD Manager, Fixed Assets and Facilities/Construction Accountant/Agent of the Board), Don Inman (COD Senior Project Manager), Bruce Schmiedl (COD Director, Facilities Planning & Development) and representatives from nine (9) companies. Nine (9) bids were received. Three (3) women/minority owned businesses submitted a bid.

The following is a recap of the bid tabulation.

General Contractor for SRC Conference Center Upgrade Project	
Vendor	**Total Bid**
Integral Construction, Inc.	**$963,200.00**
**RoMAAS, Inc	$1,044,900.00
Accel Construction Services Group, LLC	$1,123,900.00
Paul Borg Construction Company	$1,197,000.00
Troop Contracting, Inc.	$1,295,000.00
Pacific Construction Services, Inc.	$1,343,401.00
**Burling Builders, Inc.	$1,405,260.00
**Manusos General Contracting, Inc.	$1,629,000.00
Lite Construction, Inc.	$1,670,000.00

** *Women Business Enterprise / Women/Minority Business Enterprise*

Recommended award in bold. No alternatives were requested in this bid package; therefore, none are offered in the bid responses.

A successful scope review meeting has been conducted with the lowest bidder, Integral Construction, Inc., who has successfully completed several projects at the College.

Budget Status

	FY2017	FY2018		
GL Account	Prior Year Spend	Annual Budget	YTD Spend	Available Balance
03-90-36825-5804001	$ -	$ 1,509,702	$ 481	$ 1,509,221
Audio Visual System Upgrades : Building Remodeling Exps				
			FY2018 Request	**$ 963,200**

**YTD Spend equals actuals plus committed as of 01/31/2018.*

This purchase supports Goal #8 of the Strategic Long Term Plan: Maintaining, improving and developing structures, systems, and facilities necessary for the delivery of high quality education and meaningful cultural events.

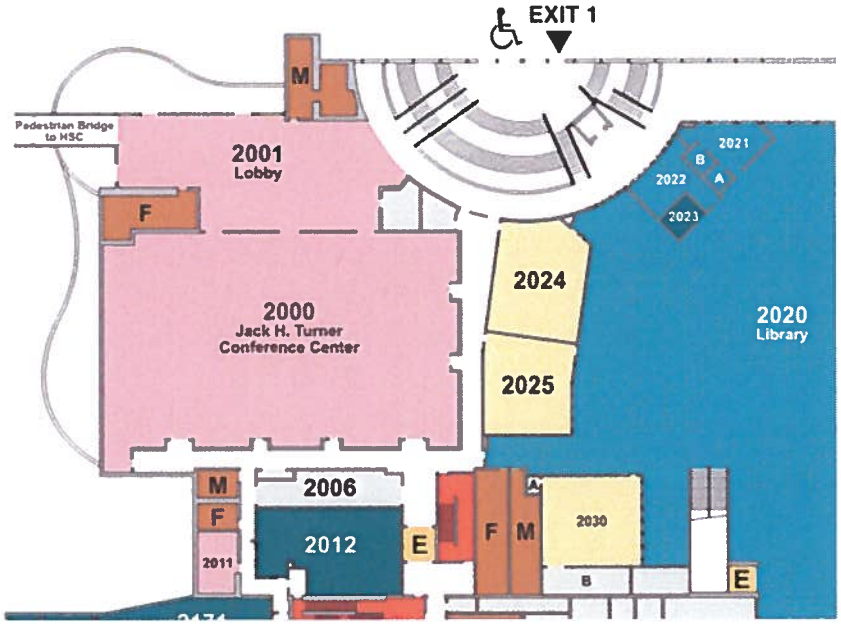
This purchase complies with State Statute, Board Policy and Administrative Procedures.

4. RECOMMENDATION

That the Board of Trustees awards the SRC Conference Center Upgrade Project to the lowest responsible bidder, Integral Construction, Inc., 320 Rocbaar Drive, Romeoville, IL 60446 for the lump sum bid amount of $963,200.00.

Staff Contact: Bruce Schmiedl – Director, Facilities Planning & Development

Location Plan SRC Conference Center



EXISTING CONDITIONS & FINISHES

PROPOSED CONDITIONS & FINISHES

Item 8I
February 15, 2018

BOARD APPROVAL

Signature Page

General Contractor for SRC Conference Center Upgrade Project

ITEM(S) ON REQUEST

That the Board of Trustees awards the SRC Conference Center Upgrade Project to the lowest responsible bidder, Integral Construction, Inc., 320 Rocbaar Drive, Romeoville, IL 60446 for the lump sum bid amount of $963,200.00.

Board Chairman — Date: 2/15/18

Christine M. Ferne — Date: 2/15/18

Board Secretary — Date

College of DuPage

Purchasing Department

425 Fawell Boulevard
Glen Ellyn, Illinois 60137-6599
PHONE (630) 942-2355
FAX (630) 942-4322

2018-B0031 Student Resource Center (SRC) 2000 Event Space Upgrade

ADDENDUM # 3

January 10, 2018

This addendum is being issued to update the specifications and provide additional information.

This information becomes part of the Bid/RFP Documents upon receipt. Please review and incorporate into your Bid/Proposal accordingly.

For which Bids are scheduled to be received on January 23, 2018 no later than 2:00 p.m., Central Time.

Bids will be received by the College of DuPage, District 502, at the office of the Purchasing Manager, Berg Instructional Center (BIC) Building, **Room 1B03**, 425 Fawell Blvd., Glen Ellyn, IL 60137.

The signed Addendum acknowledgment is required to be returned with your Bid no later than the due date set forth for this Invitation for Bid.

This Addendum No. 3 includes revisions and answers to questions found relevant as set forth in the Bid:

I. Answers to 25 questions submitted for clarification on or before January 11, 2018 pursuant to the above referenced Invitation for Bid;
II. Notice of Revisions and Changes;
III. Addendum Receipt Acknowledgment

The information contained in this **Addendum No. 3** is incorporated by reference into the original Bid document issued on December 21, 2017.

Below are clarifications to this bid:

Section I. Clarification / Answers

1. **Section 274116 referenced for basis of design is not included in the bid package.**

   Response: Section 274116 has been issued with this Addendum #3.

2. **The plans indicate stretch fabric wall coverings. How is the purchase and install of this material being procured?**

   Response: The College is procuring this scope within the General Contractor bid package scope as opposed to the College purchasing this direct from any specialty vendor.

3. **Index on drawings do not match the set of provided drawings, please provide drawings and correct index.**

   Response: A revised title sheet with correct index has been issued with this Addendum #3.

4. **According to the drawing list, the bid set is to include drawings E7.1 and ED1.2, they are not included in the bid package.**

   Response: The title page issued with Addendum #3 has been revised to exclude reference to E7.1 and ED1.2, which are not a part of this bid package.

5. **According to the drawing list, the bid set is to include 8 QT drawings, but they are not in the bid package downloaded.**

   Response: The 8 QT drawings define the theater equipment portion of the work and are included in the scope of the bid package. They have been issued with this Addendum #3.

6. **TA-103 and TA 201 are listed on the drawing index, but were not included in the bid package downloaded.**

   Response: TA-103 and TA 201 have been removed from the title sheet index that is being issued with Addendum #3. They are not included in the bid package.

7. **There were a bunch of drawing sheets in the bid package that did not show up on the title sheet drawing index.**

   Response: The drawing index, issued with Addendum #3 has been revised to include all drawings included in the bid package.

8. **Drawing E5.1 shows up on the title sheet. Should the title sheet be changed in sheet label, E3.1?**

   Response: Yes, the title sheet issued with Addendum #3 reflects the change in sheet label, E3.1.

9. **Specification section 12200 and 12300 are missing from the spec book.**

   Response: These spec sections are not included in the scope of the bid package. No unit prices will be requested at time of bid (12200) and there are no alternates included in the bid package (12300).

10. **Specification section 11 61 43 appears to be referenced as an alternate, but the bid does not show any alternates. Please clarify.**

    Response: Scope included in 11 61 43 is included in base bid, strike any reference to alternates.

11. **There is a BEP section included in the bid package, but there doesn't appear to be a percentage requirement. Please clarify if BEP is required.**

    Response: This solicitation includes a specific BEP participation goal of 20% based on the availability of BEP certified vendors to perform or provide the anticipated services and/or supplies required by this solicitation. Vendor must submit Utilization Plans, subcontractor documents, and/or Letters of Intent that meet or exceed the published goal. If the vendor cannot meet the stated goal, Vendor must document and explain with the Utilization Plan the good faith efforts it undertook to meet the goal.

12. **Please confirm that the project is budgeted at less than $750,000.00. Our current bonding capacity is limited due to the current projects.**

    Response: The College budget for the work shown on the drawings is conservative, but higher than $750,000.00.

13. **Are low voltage conduits and cabling to be bid as running up and over then down, or down, then over, then up?**

    Response: Conduits and cables run up, over and down.

14. **Where are new electric panels fed from:**

    Response: New electric panels are fed from the floor below, just west of the freight elevator on the ground/loading dock level.

15. **Sheet TA 611-Should the patch panel be 16 by 16 instead of 12 by 12?**

    Response: No the patch panel is custom with 16 in and 8 out.

16. **Room Finish Schedule does not indicate finishes in control room.**

    Response: Control room flooring is plywood attached to existing grating system, no finish on plywood.

17. **Table of contents lists doors, hardware etc., but no such information is shown on the drawings.**

    Response: Addendum #3 drawings have been updated for doors and hardware, further information will be issued in future addendum.

18. **Please confirm pre-bid walk thru comment that existing door frames are to remain.**

    Response: Confirmed. Existing door frames are to remain.

19. **What is the height between the acoustic ceiling system and the roof deck above?**

    Response: See 1992 ceiling drawings A-13, A-31 and A-45 which have been included in this Addendum #3.

20. **Please provide structural framing sections/ as-builts for the light coffers, ceiling system, soffits, etc.**

    Response: See 1992 ceiling drawings A-13, A-31 and A-45 which have been included in this Addendum #3.

21. **Please provide as-built drawings that indicate chases or routing for conduits, sprinklers and mechanical systems.**

    Response: There will be no revisions to sprinkler or HVAC systems. 1992 drawings A-1, A-3 and A-24 are included in Addendum #3 to partially aid in understanding vertical chases and plenumn.

22. **Will wall panel as-built or shop drawings for the wall panel system that discloses fastener/mounting system be provided?**

    Response: No shop drawings will be provided for the panel wall system. Pre-bid walk thru of existing conditions is the best information available at this time.

23. **Will manufacturers other than Modernfold be considered for the fabric at the panel wall systems?**

    Response: Yes, Materials of equal quality and characteristics will be considered during the submittal phase of the project. The basis of design for the fabric is Total Weight 21.0 oz /30.0 oz Ply; Backing Osnaburg; Federal Spec CCC-W-408D Type II; WA Spec WA-101, Type II; Fire Testing NFPA 101 Life Safety Code, NFPA 255 (CAN S102M), Tunnel Test (ASTM E-84), Class A Rating NFPA 286 Corner Burn Test Meets requirements for Flame Spread, Smoke Development and Flashover. Indoor Air Quality California 01350-Meets emission requirements for schools and offices; CE Certification EU classification in accordance with EN 13501-1:2007 and EN 15102-2008. Basis of Design: Koroseal-Kashi-silver fan-vinyl wallcovering.

24. **Will a list of owner purchased items be provided?**

    Response: The College will purchase all theater light fixtures and projectors. Installation of and commissioning of these items are included in the bid package scope.

25. **Can Section 11, 26 or 27 be provided?**

    Response: Sections 11, 26 and are included in this addendum. Section 11 61 63, sections 27 00 XX series and 27 41 16 are new. The remaining 4 section 11 specifications and all section 26 specifications are the same as previously issued but are provided for those that could not download previously.

Section II. Notice of Revisions and Changes; Specifications & Drawings Index

The following tables is an index of revision to the specification and drawings located in Exhibit B and Exhibit C, respectively, of the Invitation for Bid. Please refer to Attachment A of this Addendum for detail information.

Revised Specifications Issued with Addendum 3

Section	Subtitle	Revisions	Comment
11 61 43	Stage Drapery	No Change	This spec provided as some firms indicated they couldn't download earlier
11 61 63	Stage Lighting Fixtures	**New issue Addendum #3**	Fixtures provided by Owner, Installed by Contractor
11 61 73	Theater Wiring Devices	No Change	This spec provided as some firms indicated they couldn't download earlier
11 61 83	Theater Dimming System	No Change	This spec provided as some firms indicated they couldn't download earlier
11 61 93	Stage Rigging System	No Change	This spec provided as some firms indicated they couldn't download earlier
26 05 19	Low Voltage Electrical Power Conductors and Cables	No Change	This spec provided as some firms indicated they couldn't download earlier
26 05 23	Control-Voltage Electrical Power Cables	No Change	This spec provided as some firms indicated they couldn't download earlier
26 05 26	Grounding and Bonding for Electrical Systems	No Change	This spec provided as some firms indicated they couldn't download earlier
26 05 29	Hangers and Supports for Electrical Systems	No Change	This spec provided as some firms indicated they couldn't download earlier
26 05 33	Raceways and Boxes for Electrical Systems	No Change	This spec provided as some firms indicated they couldn't download earlier
26 05 44	Sleeves and Sleeve Seals For Electrical Raceways and Cabling	No Change	This spec provided as some firms indicated they couldn't download earlier
26 05 53	Identification for Electrical Systems	No Change	This spec provided as some firms indicated they couldn't download earlier
26 27 26	Wiring Devices	No Change	This spec provided as some firms indicated they couldn't download earlier
26 28 16	Enclosed Switches and Circuit Breakers	No Change	This spec provided as some firms indicated they couldn't download earlier
26 36 00	Transfer witches	No Change	This spec provided as some firms indicated they couldn't download earlier
26 51 00	Interior Lighting	No Change	This spec provided as some firms indicated they couldn't download earlier

Section	Subtitle	Revisions	Comment
27 00 01	Communications General	**New issue Addendum #3**	Not provided in original bid package
27 00 03	Communications Terminations	**New issue Addendum #3**	Not provided in original bid package
27 00 02	Communications - Materials	**New issue Addendum #3**	Not provided in original bid package
27 00 04	Communications - Installation	**New issue Addendum #3**	Not provided in original bid package
27 00 05	Communications - Labeling	**New issue Addendum #3**	Not provided in original bid package
27 00 06	Communications - Testing	**New issue Addendum #3**	Not provided in original bid package
27 41 16	Integrated AudioVisual Systems	**New issue Addendum #3**	Not provided in original bid package

Revised Drawings Issued with Addendum 3

Section	Subtitle	Revisions	Comment
0.0	Cover Sheet	**Revised 0.0**	Corrected Index of Drawings
A 31	Soffit Details	**New issue Addendum #3**	Original SRC Construction Drawings Provided as as-built information
A1	First Level Floor Plan - West	**New issue Addendum #3**	Original SRC Construction Drawings Provided as as-built information
A1.1	Floor Plans and Door Schedule	**Revised A1.1**	Revised Door Schedule and Projection Screens
A13	Third Level Reflected Ceiling Plan - West	**New issue Addendum #3**	Original SRC Construction Drawings Provided as as-built information
A24	Wall Section and Details	**New issue Addendum #3**	Original SRC Construction Drawings Provided as as-built information
A3	Second Level Floor Plan - West	**New issue Addendum #3**	Original SRC Construction Drawings Provided as as-built information
A45	Interior Elevations	**New issue Addendum #3**	Original SRC Construction Drawings Provided as as-built information
QT - 001	Theater General Notes	**New issue Addendum #3**	Not provided in original bid package
QT - 100	Level 2 Stage Lighting Plan	**New issue Addendum #3**	Not provided in original bid package
QT - 101	Level 3 - Stage Lighting Plan	**New issue Addendum #3**	Not provided in original bid package
QT - 110	Level 2 - Stage Drapery Plan	**New issue Addendum #3**	Not provided in original bid package
QT - 120	Level 3 Stage Rigging Plan	**New issue Addendum #3**	Not provided in original bid package
QT - 320	Stage Rigging Sections	**New issue Addendum #3**	Not provided in original bid package
QT - 501	Lighting Details and Schedules	**New issue Addendum #3**	Not provided in original bid package
QT - 601	Lighting Controls Schedule and Riser	**New issue Addendum #3**	Not provided in original bid package

Section	Subtitle	Revisions	Comment
TA - 613	Control System Block Diagram	**Revised TA - 613**	Control Diagram Revisions
TA-212	RCP Equipment - Second Floor Plan	**Revised TA - 212**	Added Projection Screens

Attachment A – Revised Specifications and Drawings

SECTION 11 61 63 – STAGE LIGHTING FIXTURES AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes all labor, materials, equipment and services necessary to furnish and deliver to the job site, the Stage Lighting Fixture package specified herein, including but not limited to, the following:
   1. Stage lighting fixtures, lamps, and accessories.
   2. Hardware and jumper cables.
   3. Miscellaneous items.

1.3 SUBMITTALS WITH BID

A. Stage Lighting Fixture Supplier shall provide a list of all items with manufacturer's catalog numbers for each item.

B. Bid shall include a unit price for each item listed in the Stage Lighting Instrument and Accessories Schedule.
   1. Unit pricing may be used by the Owner to determine the value of any additions to or deletions from the equipment list.
   2. Failure to provide unit pricing may result in the disqualification of the bid.

C. Stage Lighting Fixture Supplier shall submit with bid the following time estimates
   1. Length of time required to supply all equipment.

1.4 SUBMITTALS

A. Stage Lighting Fixture Supplier shall submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

1.5 DELIVERY

A. Delivery shall be as required in the Contract Documents.
   1. Stage Lighting Fixture Supplier shall confirm the delivery dates with the Construction Manager and/or Owner a minimum of 30 days in advance of scheduled delivery.

B. Bid price shall include full freight and insurance charges for delivery of all of the equipment to the job site.

C. Deliver all material to the job site suitably crated, packed, and protected.
   1. Each crate or carton shall be clearly marked on the outside with the manufacturer's identification labels and the nomenclature of the product contained within.

1.6 WARRANTY

A. The Stage Lighting Fixture Supplier shall assure that this equipment is provided free of defects in materials and workmanship and shall provide a warranty under this contract agreeing to make all applicable repairs, including replacement of materials, at no cost to the Owner for a period of one (1) year from the date of final acceptance.

B. If, through no fault on the part of the Owner, the Stage Lighting Fixture Supplier is unable to meet the required delivery dates established at the time of the signing of an agreement, Fixture Supplier agrees to furnish substitute equipment of the same quantity and of comparable type and quality to the job site.
1. This equipment will be extended to the Owner at no additional cost until the delivery of the presentation area lighting fixtures list has been completed.

1.7 STAGE LIGHTING FIXTURE SUPPLIERS

A. Stage Lighting Fixture Suppliers for Work of this Section include the following:
1. Barbizon Lighting
2525 N. Elston Avenue, Suite D220
Chicago, IL 60647
Contact: Peter McNamee pmcnamee@barbizon.com
800-935-3920

2. Clearwing Productions
11101 W. Mitchell St.
Milwaukee, WI 53214
Contact: Kerry Miller kmiller@clearwing.com
414-258-633

3. Grand Stage
1319 W Grand Ave,
Chicago, IL 60642
Contact: Todd Koeppl tkoeppl@grandstage.com
312-332-1606

4. Mainstage Theatrical Supply
907 S First Street
Milwaukee, WI 53204
Contact: David Krajec dkrajec@clearwing.com
800-236-0878

5. Wenger Corporation
Contact: Jim Crooks Jim.Crooks@Wenger.com
507-774-8224

PART 2 - PRODUCTS

2.1 STAGE LIGHTING FIXTURES

A. LED stage lighting fixtures shall be supplied with all standard equipment including the following:
1. 20A PowerCon to Parallel Blade U-ground “Edison” adapter, minimum 36", SO or SJ cable.
2. Center pivot type "C" clamp.
3. One (1) safety cable.

B. The manufacturer for each fixture is included in this Specification. Substitutions may be submitted that either increase quality or substantially reduce cost while maintaining quality. All substitutions shall be subject to approval by the owner.

2.2 JUMPER CABLES

A. All 20A jumpers shall be made of black type "SO" (extra hard usage), three (3) conductor, #12 cable with specified colored tape at each end and installed 20A Edison parallel blade U ground.
   1. All jumpers shall be made with strict observance of polarity.

B. All PowerCON to PowerCON fixture to fixture Power Thru jumper cables shall be made of black type "SJ" (junior hard service), three (3) conductor, #12 cable with installed standard Neutrik PowerCON connectors.

2.3 LIGHTING FIXTURE SCHEDULE

THEATRICAL LIGHTING FIXTURES AND ACCESSORIES SCHEDULE

MANUFACTURER REFERENCE

"ALTMAN" - ALTMAN LIGHTING - YONKERS, NY
"APOLLO" - APOLLO DESIGN TECHNOLOGY, INC - FORT WAYNE, IN
"CHROMA-Q" - CHROMA Q - HIGH WYCOMBE, BUCKINGHAMSHIRE
"CITY" - CITY THEATRICAL - CARLSTADT, NJ
"COLOR KINETICS" - PHILLIPS COLOR KINETICS - ITASCA, IL
"DOUGHTY" = DOUGHTY ENGINEERING USA - MOUNT JULIET, TN
"ETC" - ELECTRONIC THEATRE CONTROLS - MIDDLETON, WI
"HIGH END" - BARCO HIGH END SYSTEMS - AUSTIN, TX
"LEX" - LEX PRODUCTS CORPORATION - SHELTON, CT
"PHILIPS" - PHILIPS ENTERTAINMENT-LIGHTING - SUGAR LOAF, NY
"ROBE" - ROBE LIGHTING, INC NORTH AMERICA - COOPER CITY, FL
"STRAND" - STRAND LIGHTING - DALLAS, TX
"TLS" - THE LIGHT SOURCE - CHARLOTTE, NC
"TMB" - TMB - SAN FERNANDO, CA

ITEM	QTY. TO FURNISH ALT1A-2	DESCRIPTION	MANUFACTURER & MODEL	EQUAL MFR.	CONNECTOR	LAMP	ACCESSORIES
LX-9	6	7.5" WASH LIGHT, 7-COLOR LED (RED, WHITE, AMBER, GREEN, CYAN, BLUE, INDIGO), THEATRICAL DIMMING CURVE, FAN-FREE, POWER	ETC SELD40LI		NEMA 5-15P TO POWERCON	N/A	
LX-10	20	ELLIPSOIDAL SPOTLIGHT, 4-COLOR LED (RED, GREEN, AMBER, GREEN, CYAN, BLUE, INDIGO), THEATRICAL DIMMING CURVE, FAN-FREE, POWER	ALTMAN PHX1-RGBA-**-B WITH PCL-PBG-12-B		NEMA 5-15P TO POWERCON	N/A	**SUPPLY LENS BA SCHEDULED
LENS-19	6	SPARE LENS BARREL, 19 DEGREE FOR LX1 THRU LX6; MAY BE USED WITH LX10			N/A	N/A	
LENS-26	6	SPARE LENS BARREL, 26 DEGREE FOR LX1 THRU LX6; MAY BE USED WITH LX10			N/A	N/A	
LENS-36	10	SPARE LENS BARREL, 36 DEGREE FOR LX1 THRU LX6; MAY BE USED WITH LX10			N/A	N/A	
LENS-50	10	SPARE LENS BARREL, 50 DEGREE FOR LX1 THRU LX6; MAY BE USED WITH LX10			N/A	N/A	
LENS-N	6	OBLONG FIELD LENS, NARROW DISTRIBUTION, MAY BE USED WITH LX-9	ETC SELON-7.5		N/A	N/A	
LENS-M	6	OBLONG FIELD LENS, MEDIUM DISTRIBUTION, MAY BE USED WITH LX-9	ETC SELOM-7.5		N/A	N/A	
LENS-W	6	OBLONG FIELD LENS, WIDE DISTRIBUTION, MAY BE USED WITH LX-9	ETC SELOW-7.5		N/A	N/A	
SOW-5	10	STAGE CABLE, 12/3 SOW, 5'-0" - PARALLEL BLADE U-GROUND 'EDISON' CONNECTORS	LEX	TMB	N/A	N/A	
PCON-5	22	POWERCON TO POWERCON JUMPER, 5'	LEX	TMB	N/A	N/A	
PCON-10	5	POWERCON TO POWERCON JUMPER, 10'	LEX	TMB	N/A	N/A	
PCON-15		POWERCON TO POWERCON JUMPER, 15'	LEX	TMB	N/A	N/A	
CAT6-6	24	RJ-45 CAT-6 PATCH CABLE, 6'-0"	LEX	TMB	N/A	N/A	
CAT6-12	6	RJ-45 CAT-6 PATCH CABLE, 12'-0"	LEX	TMB	N/A	N/A	
CAT6-20	6	RJ-45 CAT-6 PATCH CABLE, 20'-0"	LEX	TMB	N/A	N/A	
CAT6-50	6	RJ-45 CAT-6 PATCH CABLE, 50'-0"	LEX	TMB	N/A	N/A	
DMX-5	26	DMX CABLE, 5-PIN XLR 5'-0"	LEX	TMB	N/A	N/A	
DMX-10	5	DMX CABLE, 5-PIN XLR 10'-0"	LEX	TMB	N/A	N/A	
DMX-25	10	DMX CABLE, 5-PIN XLR 25'-0"	LEX	TMB	N/A	N/A	
DMX-T	8	DMX TERMINATOR INSERT	LEX	TMB	N/A	N/A	

NOTES:
1) EACH LUMINAIRE FURNISHED WITH SAFETY CABLE, PATTERN HOLDER (IF APPLICABLE), AND C-CLAMP UNLESS OTHERWISE NOTED.
2) ALL C-CLAMPS SHALL BE BLACK ANODIZED ALUMINUM WITH PAN LOCKING BOLT UNLESS OTHERWISE NOTED. BASIS OF DESIGN: THE LIGHT SOURCE, PART NU 'MVB'.

END OF SECTION

SECTION 116143 – STAGE DRAPERY

PART 1 GENERAL

1.1 WORK INCLUDED

A. This section includes all labor, materials, equipment, and services necessary to manufacture and deliver to job site and install the stage drapery as shown on the drawings and/or specified herein, including, but not limited to, the following:
   1. Sound and light lock panels on curved walk-along track.
   2. G area background panel on straight walk-along track.

B. It shall be the responsibility of the Stage Drapery Manufacturer to furnish equipment complete in all respects and to provide any additional equipment required to fulfill the intent of these drawings and specifications regardless of whether or not such items are herein specified or indicated.

1.2 GENERAL

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

B. Related work in other Sections
   1. Division 11: Theatrical Rigging Systems.

C. Site Conditions: Contractor shall be responsible for verifying that the job conditions are ready to receive work in this section. Contractor must bring forth any existing conditions that may adversely affect execution of work, so that resolution may be reached before commencement of installation.

1.3 SUBMITTALS

A. Submittals shall be according to the Conditions of the Contract and Division Specification Sections.

B. Prior to fabrication, Stage Drapery Manufacturer shall submit for review a 1/2 yard x full width minimum size sample of each color of each fabric type.
   1. Each sample shall be provided with labels listing Manufacturer and Manufacturer's identification numbers.
   2. Work shall not commence on fabrication until review of samples has been transmitted to the Stage Drapery Manufacturer.
   3. Submit Manufacturer's color line samples to the Specifier to verify color selections.
      a. Dye lot to be guaranteed by Manufacturer.
   4. For custom color drapery, submit Manufacturer’s lab dip sample matching control sample furnished by Architect.
      a. Lab dip dye lot to be guaranteed and maintained by Manufacturer after approval.

C. Prior to providing shop drawings and fabrication, dimensions shall be verified by field measurements.
   1. After field measurements are taken, Stage Drapery Manufacturer shall provide information as to exact dimensions of drapery items and areas affecting drapery sizes.
   2. This information will be used to coordinate work with other trades and to verify that all drapery items have been accounted for.
   3. No extras will be allowed due to the Stage Drapery Manufacturer's misunderstanding as to the amount of work involved or lack of knowledge of any field conditions based on neglect or failure to make field measurements or thorough investigation of the job site.

D. Shop Drawings shall be submitted for review before fabrication can begin. Such review does not relieve the Stage Drapery Manufacturer of the responsibility of providing equipment in accordance with this Specification.
   1. Shop Drawings shall show each type of curtain track plus the method and equipment to be used in hanging the curtain track.
   2. Where items must fit and coordinate with finished surfaces and/or constructed spaces, take measurements at site and not from drawings.
   3. Where welded connections or concrete or masonry inserts are required to receive work, shop drawings shall show exact locations required and all such drawings shall be furnished to the trades responsible for installing the connectors or inserts.
   4. Catalog work sheets showing illustrated cuts of items may be submitted for standard manufactured items.

E. Furnish Operations and Maintenance manuals containing "record" shop drawings, operation instructions and recommended maintenance procedures for all equipment, in quantity outlined in Division 01.

1.4 WARRANTY

A. Manufacturer agrees to make all repairs, including replacement of materials, made necessary due to defects in workmanship and materials without additional cost to the Owner for a period of two (2) years from the date of acceptance.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Refer to Division 01 – Work-Related Requirements for transporting, handling, storing, and protecting products.

B. Bid price shall include full freight and insurance charges for the delivery of all drapery items to the job site.

C. If, through no fault of the Owner, the timely completion of the work of this section is imperiled, the Drapery Manufacturer shall prevent or minimize any delay by shipping the required products by airfreight, at no additional cost to the Owner.
   1. This requirement covers initial delivery of fabrics to the Drapery Manufacturer, and delivery of finished drapery to the job site.

D. Each drapery item shall be carefully wrapped and sealed tight for shipment in rigid and waterproof wrapping material to insure against impact and water damage during shipment.

1.6 MANUFACTURERS

A. Manufacturers for work in this section shall include the following:
   1. Beck Studios, Inc – Milford, OH
   2. BellaTEX Stage Curtains – Jackson, TN
   3. iWeiss, Inc. – Fairview, NJ
   4. Rose Brand East – Secaucus, NJ
   5. Stage Decoration and Supplies – Greensboro, NC
   6. Texas Scenic Co. – San Antonio, TX

1.7 INSTALLATION CONTRACTORS

A. Approved Contractors include:
   1. Barbizon Capitol – Alexandria, VA
   2. Beck Studios – Milford, OH

3. Chicago Fly House – Chicago, IL
4. Grand Stage – Chicago, IL
5. InterAmerica Stage, Inc. – Sanford, FL
6. iWeiss – Fairview, NJ
7. Janson Industries Stage Equipment – Canton, OH
8. Mainstage Theatrical Supply – Milwaukee, WI
9. Texas Scenic/Pook, Diemont & Ohl, Inc. – Bronx, NY
10. Tiffin Scenic Studios, Inc. – Tiffin, OH

B. The drapery installation Contractor shall be the same Contractor that furnishes and installs the following related Division 11 theatrical systems specified on this project:
1. 11 61 33 – Theatrical Rigging Systems

PART 2 - PRODUCTS

2.1 FABRICS

A. All fabrics shall be inherently flame retardant and shall meet all requirements set forth in NFPA #701, Large and Small Scale.
1. All finished goods shall be furnished by the Stage Drapery Manufacturer to the Owner with proper affidavit of flame proofing in the form acceptable to local authorities.

B. The following fabrics are approved for drapery use:
2. All drapery in this spec shall be TBD color from manufacturer swatches as chosen by the specifier, using following fabric:
a. *Encore*, 22 oz. Trevira CS, 54" wide, IFR, supplied by KM Fabrics, Greenville, SC.

2.2 GROMMETS, TIE LINE, AND WEBBING

A. Grommets shall be #2 or #3 brass type.

B. Tie lines shall be #4 braided masonry line, 36" long and black in color, unless otherwise noted.

C. Webbing shall be 3” wide, polypropylene type.

2.3 DRAPERY

A. General:
1. All velour shall be stitched with nylon thread and shall be without flaws, with each width of cloth continuous for the full height of the drapery with no horizontal seams or piercing.

B. Velour Panels:
1. Each panel shall be sewn with vertical seams and fullness as noted on drapery schedule.
2. Sew on to webbing 12” o.c. with snap hooks attached with nylon straps and two (2) rivets per hook.
3. Bottom hem shall be chain pocket: Provide a 6” deep hem at bottom wrapping an internal nylon pocket lined with #8 jack chain. Whip-stitch chain to pocket at 12” intervals to prevent shifting.

2.4 DRAPERY SCHEDULES

A. Refer to QT series drawings for drapery panel schedule indicating quantity, width, height, and type.

B. Drapery Manufacturer shall field verify all dimensions prior to fabrication. Any errors in finished size due to failure to properly verify field conditions will result in re-manufacture of any draperies not in compliance, at sole expense of the Manufacturer.

C. Labeling of each drapery panel shall be by means of a cotton or synthetic duck tag sewn securely to the webbing at top right hand corner of each finished piece. Each tag shall contain the following, marked using indelible black ink:
1. Panel Location (ex: Area C)
2. Panel dimensions (ex: 8’-0”w x 24’-0”h)
3. Material type and weight (ex: 22oz IFR Velour)

2.5 CURTAIN TRACKS

B. Walk Along Curtain Tracks:
1. Furnish and install all hardware required for walk along ADC #140 or H&H #301W curtain track system in lengths and locations as shown on the drawings.
2. System shall be suspended from structure as indicated on drawings, in a manner that is permanent and requires little maintenance.
3. Track shall be in continuous lengths, with minimum number of segments joined to complete the lengths indicated. Provide curves as shown on drawings.
4. Support tracks from building structure at manufacturers recommend spacing as required. Additional supports required at each track bend and switch location.
   a. Track to be hung with B7 or Grade 5 threaded rod to structural joists.
   b. Additional steel required to span between structural members to be provided by the stage drapery manufacturer.
5. System shall be furnished complete with all necessary accessories (CWANA), including factory curves (trim to adjust as required), hanging clamps, track splices, master carriers, single carriers, rubber bumpers, and end stops.
   a. Furnish adequate carriers to serve number of drapery grommets indicated for drapery scheduled at each track system, plus 10% spare carriers.

C. Verify all track lengths in the field before fabrication.

PART 3 EXECUTION

3.1 GENERAL

A. Examine all conditions under which all items in the section shall be installed and notify the Construction Manager in writing of any condition detrimental to the proper and timely completion of the installation.

B. Responsibility for the satisfactory completion of the work in this section shall rest solely and exclusively with the Stage Drapery Manufacturer.

C. Field verify condition of delivered goods, and repair or replace any components not in factory new condition. All materials shall remain covered or protected from debris, dust, paint, and other site hazards throughout the period between delivery to site and Owner training.

D. Manufacturer shall be responsible for repairing any damage to jobsite surroundings during installation.

E. Installation and training shall be supervised by the Stage Drapery Manufacturer’s experienced supervisor, who shall have extensive installation experience with systems similar to those specified herein. This same

supervisor shall remain in charge throughout the entire installation and training process, with exception only for circumstances completely beyond the control of the Manufacturer.

F. All components shall be installed plumb, straight, and true, and shall function as designed. Anchors, connecting members, brackets, and associated fastening means and methods for properly supporting and bracing equipment shall be furnished and installed following best suitable practice for each condition.

G. Prior to the completion of the installation, the Stage Drapery Manufacturer shall notify the Construction Manager to arrange on a date for inspection of the system.
   1. At the time of the inspection, the Stage Drapery Manufacturer shall furnish sufficient personnel to operate all equipment and to perform adjustments and tests as may be required by the Owner's representatives.
   2. Any equipment that fails to meet with the Specifications shall be repaired or replaced with new equipment, and the inspection shall be re-scheduled under the same conditions listed previously.
   3. Final review will be withheld until all systems have been thoroughly tested and found to be in first class operating condition in every circumstance.

3.2 OWNER TRAINING

A. Manufacturer’s installation Supervisor shall perform Owner training as outlined in Division 01 specifications to include the following:
   1. Operation of curtain tracks.
   2. Installation, dismantling, and storage of draperies.
   3. Care and maintenance.
   4. Warranty review.

B. Documentation of Owner training shall be furnished as outlined in Division 01 specifications.

END OF SECTION 116143

SECTION 11 61 73 – THEATRICAL WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK OF THIS SECTION

A. This Section includes all labor, materials, equipment and services necessary to manufacture and deliver to job site, for installation by Electrical Contractor, theatrical wiring devices, including back boxes, as shown on the QT drawings and/or specified herein, including but not limited to the following:
   1. Recessed receptacle boxes

B. It shall be the responsibility of the Theatrical Wiring Device Manufacturer to furnish equipment complete in all respects and to provide any additional equipment required to fulfill the intent of these drawings and specifications regardless of whether or not such items are herein specified or indicated.

C. Theatrical Wiring Device Manufacturer shall furnish and deliver to job site all items in this Specification under a direct contract let by the Owner.
   1. Theatrical Wiring Device Manufacturer shall coordinate delivery with the Electrical Contractor.

1.3 SUBMITTALS

A. Theatrical Wiring Device Manufacturer shall prepare and submit complete shop drawings according to requirements set forth in the Contract Documents.

B. Shop drawings shall show bussing for each outlet box and shall utilize the exact circuit numbering method detailed on the drawings.

C. Furnish catalog cuts, drawings, and/or descriptive material of catalog items as requested by the Architect.

D. Furnish all of the above for review by the Architect prior to commencing any work.
   1. Such review does not relieve the Wiring Device Manufacturer of the responsibility of providing equipment in accordance with this Specification.

E. Any deviation from this Specification is to be "starred" and noted in letters a minimum 1/4" high.
   1. In order for a deviation to be considered it shall upgrade the quality of the equipment or respond to a field condition.

F. It is the responsibility of the Wiring Device Manufacturer to submit shop drawings on a schedule that allows for adequate time for review. Proposals for contract time extensions due to delayed shop drawing submittals shall not be allowed.

1.4 MANUFACTURING STANDARDS

A. All work shall be manufactured in accordance with the latest editions of applicable publications and standards of the following organizations:
   1. National Electric Code (NEC) and all prevailing local and state regulations
   2. National Electrical Manufacturers Association (NEMA)

3. Occupational Safety & Health Act (OSHA)

B. All applicable products shall bear label of Underwriters Laboratories (UL).

C. All equipment shall be thoroughly tested in Manufacturer's shop prior to shipment to insure mechanical and electrical integrity.

1.5 LABELING

A. All theatrical wiring devices shall be permanently identified with means and methods as noted on the drawings and elsewhere in this specification.

B. Each faceplate and back box shall be tagged with a removable label identifying the WD box number.

1.6 DELIVERY, STORAGE AND HANDLING

A. Delivery shall be as required in Construction Documents.

B. The Theatrical Wiring Device Manufacturer shall coordinate delivery of all equipment with the Construction Manager and/or Electrical Contractor.

C. Theatrical Wiring Device Manufacturer shall, if requested by the Construction Manager and/or Electrical Contractor, deliver theatrical wiring devices items in the following two (2) separate shipments:
1. Shipment #1: Shipment shall include back boxes for all theatrical wiring device items so that the Electrical Contractor may terminate all conduit.
2. Shipment #2: Shipment shall include faceplates for all theatrical wiring device items.
3. Theatrical Wiring Device Manufacturer shall notify the Construction Manager and/or Electrical Contractor 24 hours prior to delivery of equipment.

D. Deliver all material to the job site suitably crated, packed, and protected.
1. Each crate or carton shall be clearly marked on the outside with the Manufacturer's identification label and the nomenclature of the product contained within.

E. Bid price shall include full freight and insurance charges for all items to the job site.

F. If, through no fault of the Owner, the timely completion of the work of this section is imperiled, the Wiring Device Manufacturer shall prevent or minimize any delay by shipping the required products to the job site by air freight at no additional cost to the Owner.

1.7 WARRANTY

A. The Wiring Device Manufacturer shall assure that this equipment is provided free of defects in materials and workmanship and shall provide a warranty under this contract for a period of two (2) years from the date of final acceptance.

B. During the warranty period, repair or replacement of defective materials and/or repair of faulty workmanship shall be provided, at no cost to the Owner, within ten (10) days written notice of the defect(s).

1.8 THEATRICAL WIRING DEVICE MANUFACTURERS

A. Theatrical Wiring Device Manufacturers for work of this section shall include:

1. Altman Lighting
   57 Alexander St.
   Yonkers, NY 10701
   Contact: Nick Champion nchampion@altmanltg.com
   800-425-8626

2. Electronic Theatre Controls (ETC)
   3031 Pleasant View Road
   Middleton, WI 53562
   Contact: Randy Pybas randy.pybas@etcconnect.com
   Joe DiNardo joe.dinardo@etcconnect.com
   Heidi Bowers heidi.bowers@etcconnect.com
   Rob Raff rob.raff@etcconnect.com
   Sylvia Sinclair sylvia.sinclair@etcconnect.com
   800-688-41163

3. Lex Products
   15 Progress Dr.
   Shelton, CT 06484
   Contact: Tom Siko tsiko@lexproducts.com
   800-643-4460

4. Performance Electric Inc.
   126A McDougall Ct.
   Greenville, SC 29607
   Contact: Larry Easterday save@performancedistro.com
   864-288-2021

5. SSRC
   170 Fortis Dr.
   Duncan, SC 29334
   Contact: Aaron Clark aclark@ssrconline.com
   864-848-9770

6. Stagecraft Industries Inc.
   5051 N. Lagoon Ave.
   Portland, OR 97217
   Contact: Kevin Shetterly kevins@stagecraftindustries.com
   503-286-1600

PART 2 - PRODUCTS

2.1 RECESSED AND SURFACE MOUNT RECEPTACLE BOXES

A. Provide recessed and surface mount receptacle boxes as listed herein and shown on the drawings.

B. Steel face plates with receptacles shall be constructed of minimum 18-gauge steel, painted black.
   1. Provide mounting holes on faceplate.
   2. White circuit numbers, 1/4" in height, shall be engraved directly into a black lamicoid or plastic laminate label plate attached with non-corroding screw fasteners or rivets.

C. Provide solid copper buss bars for each receptacle plate as follows:
   1. Adjacent neutral pairs for each circuit.
   2. Adjacent hot leg pairs for each circuit.
   3. Grounds for each receptacle plate.

D. Boxes shall be prewired with 125° Celsius high temperature wire to molded barrier terminal blocks.

E. Connectors shall be standard 20A standard Edison parallel blade U ground connectors flush type as shown on the drawings.

F. Back boxes for surface and recessed mounted receptacle boxes shall be constructed of minimum 18-gauge steel, painted black.

END OF SECTION

SECTION 11 61 83 – THEATRICAL INTEGRATED LIGHTING CONTROL SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section includes all labor, materials, equipment and services necessary to manufacturer and deliver to job site, for installation by Electrical Contractor, a complete electronic control and dimming system as shown on the drawings and/or specified herein, including but not limited to the following:
   1. Two (2) permanent relay panels, mains fed for stage and house lighting.
   2. Ethernet control system equipment rack, Ethernet taps, DMX splitters, and associated equipment.
   3. Computerized stage lighting control computer interface and associated software.
   4. Occupancy sensors.

B. It shall be the responsibility of the Dimming System Manufacturer to furnish equipment complete in all respects and to provide any additional equipment required to fulfill the intent of these drawings and specifications regardless of whether or not such items are herein specified or indicated.

1.2 SUBMITTALS

A. Dimming System Manufacturer shall prepare and submit complete shop drawings according to the requirements set forth in the Contract Documents.

B. Shop drawings shall be reviewed by the Architect before fabrication shall begin.
   1. Such review does not relieve the Dimming System Manufacturer of the responsibility of providing equipment in accordance with this Specification.

C. Shop drawings shall show optical or transformer isolation of all control data lines from dimmer rack to dimmer rack and dimmer rack to control equipment.

D. Shop drawings shall show materials, finishes, metal gauges, overall and detail dimensions, sizes, electrical and mechanical connections, fasteners, welds, provisions for the work of others, and similar information.

E. Shop drawings shall indicate complete details of equipment, including manufacturer's catalog numbers for components, and shall include complete wiring diagrams.

F. Any deviation from this Specification shall be "starred" and noted in letters a minimum 1/4" high.
   1. In order for a deviation to be considered, it shall upgrade the quality of the equipment or respond to a field condition.

G. The reviewed shop drawings shall be updated to show any changes made during manufacturing and assembly and shall be sent to the Architect before the equipment is delivered.

H. Dimming System Manufacturer shall provide installation instructions for all equipment. These instructions shall include connection diagrams, termination designations, etc.

I. After the installation is complete, the Dimming System Manufacturer shall provide the Owner with Operations and Maintenance Manuals not more than fourteen (14) days after the checkout is completed.
   1. One (1) O&M manual shall be a printed “hard” copy and O&M manual shall also be provided in electronic format on two (2) flash drives.
   2. Each O&M manual shall include, but not be limited to, the following:
      a. Instruction manual for each control console type. Console instruction manuals may be requested by the Owner’s Representative at a date prior to the system checkout

b. Copies of all “record” shop drawings.
c. Catalog cuts of dimmers and control console.
d. Recommendations for periodic maintenance.
e. Catalog numbers and manufacturer's names and addresses for perishable items such as pilot lamps and fuses.
f. Diagnostic procedures.
g. World Wide Web address for on-line access to manuals, product literature, and troubleshooting guides.
h. Emergency and normal repair telephone contact sheet for 7-day, 24-hour service.

3. Dimming System Manufacturer shall provide the Owner with three (3) instruction manuals for each control console type.
   a. Instruction manual shall be supplied to the Owner’s Representative on the day of the dimming system checkout.
   b. Instruction manuals may be requested by the Owner’s Representative at a date prior to the system checkout.

1.3 LABELING

A. All dimming system items shall be permanently identified with means and methods as noted on the drawings and elsewhere in this specification.

B. Each faceplate and back box shall be tagged with a removable label identifying the device or box "number".

1.4 DELIVERY

A. Delivery shall be as required in Construction Documents.

B. The Dimming System Manufacturer shall coordinate delivery of all equipment with the Construction Manager and/or Electrical Contractor.

C. If required by the Construction Manager/General/Electrical Contractor, Dimming System equipment shall be delivered in a minimum of three (3) separate shipments that shall include:
   1. Shipment #1: All items in which conduit is terminated which includes dimmer racks, control station back boxes, etc.
   2. Shipment #2: All items in which wiring is terminated including control station faceplates, etc.
   3. Shipment #3: All items that are not required until system activation by the Dimming Manufacturer's field service representative. This shall include dimmer modules, electronics modules, control console, gateways, monitors, cables, etc.

D. Dimming System Manufacturer shall deliver all material to the job site suitably crated, packed, and protected, and bearing the manufacturer's identification label and the name of the product(s) found in each carton or crate.

1.5 JOB SUPERVISION

A. When Contractor wiring is complete, the Dimming System Manufacturer shall send an engineering representative or a field service technician to the job site and prior to energizing the system to test and adjust the system.

B. Engineering representative or other manufacturer designated person shall instruct designated Owner's representatives in operation and maintenance of the dimming system, particularly the control console and light manager editing software.
   1. Instruction shall be two (2) days or a total of eight (8) hours in length.
   2. Dimming System Manufacturer shall schedule this instruction with the Construction Manager or Owner's designated representatives.
   3. Instruction shall not necessarily follow immediately after the system check-out and activation.
   4. Instruction shall be independent of the system check-out and activation. Length of engineering check-out and activation shall not affect the length of instruction time.

1.6 WARRANTY

A. Dimming System Manufacturer agrees to make all repairs, including replacement of components and parts, made necessary due to defects in design, workmanship, and materials without additional cost to the Owner for a period of two (2) years from the date of acceptance of the completed system.

B. In the event of a system failure during the warranty period, manufacturer agrees to send to the job the necessary field service technician(s) within twenty-four (24) hours of notification.
   1. Technician(s) shall remain on the job until all necessary repairs have been made and the system is operational to the satisfaction of the Owner.

1.7 OWNER TRAINING

A. Manufacturer’s authorized technician shall perform Owner training to include the following:
   1. Minimum of two (2) separate training sessions with Owner, as follows:
      a. First session shall occur at conclusion of startup and system commissioning, and shall include four (4) hours training time with Owner representatives. This session shall include the following general subjects, but shall be tailored to Owner’s preference at time of training:
         1) General system overview.
         2) Routine care and maintenance.
         3) Operation of basic panel functions, including presets, overrides, module types.
         4) Console introduction and basic programming.
         5) Configuration, programming and operation of the LED stage lighting fixtures. Fixtures provided by the owner.
      b. Second session shall occur no less than two weeks following substantial completion, but within one month of initial training. This session shall include up to an additional four (4) hours training time with Owner representatives. This session shall include the following general subjects, but shall be tailored to Owner’s preference at time of training:
         1) In-depth console operation and programming.
         2) Other review as requested by Owner.

1.8 DIMMING SYSTEM MANUFACTURER

A. The basis of design manufacturer for the work of this section shall be the following:
   1. Subject to compliance with Specifications, the basis of design manufacturer for the equipment in this section is:
      a. Electronic Theatre Controls (ETC)
         3031 Pleasant View Rd.
         Middleton, WI 53562
         Contact: Heidi Bowers heidi.bowers@etcconnect.com
         800-688-4116

B. Equal Manufacturers:
1. Subject to compliance with Specifications, the following Manufacturers are also approved to submit on this project:
a. Philips Strand Lighting
Contact: Charlie Hulme Charlie.hulme@philips.com
702-845-0830

2. Subject to Division 01 Specifications, other manufacturers may submit for consideration must show conformance to project Specifications and system design requirements.
3. Final determination of suitability shall be determined at the discretion of the Specifier.

PART 2 PRODUCTS

2.1 LIGHTING CONTROL RELAY PANELS (LCP)

A. General:
1. Each relay panel shall consist of 24 module spaces. System shall be UL listed and labeled.

B. Physical:
1. Cabinets and Enclosures: NEMA 1 enclosure sized to accept required relays. Surface mounted cover as required with captive screws in a hinged, lockable configuration.
2. Interior: Interiors shall be provided with installed and tested relays or dimming and interface modules.
3. Panel shall be provided with expansion space for ease of installation of other system components (ex. time clock and/or photocell controller). Terminals shall be included in the interior to accept a communication line for the connection of communication line switches to the system, or to allow a communication line to be run between multiple panels for network communications.
4. Furnish voltage barrier separation between line and control wiring.

C. Electrical:
1. Power Supply: Transformer assembly include internal overcurrent protection with automatic reset and metal oxide varistor protection against power line spikes.
2. Relays: Momentary-pulsed mechanically latching contactors with plug in connector. Relays shall have mechanically latching contacts with single moving part design for improved reliability. Relays will have the following characteristics:
a. Coil:
1) Magnetically held, momentary coil activation (50 milliseconds)
2) 2.2 VA max per relay to allow up to 20 relays to be controlled in parallel using class 2 wiring.
3) Split coil - ½ for ON, ½ for OFF.
b. Power Contacts:
1) 20-amp tungsten and NEMA electronic ballast rated.
2) Rated for 50,000 ON/OFF cycles at full load.
3) Support #10 - #14 AWG solid or stranded wire.
4) 120 and 277 volt rated.
5) 30 VAC Isolated contacts for status feedback and pilot light indication.
6) FCC approved for commercial and residential use.

D. Control Electronics:
1. Control electronics shall be integral to the panel, providing network and user interface to discrete relays in the panel.
2. User interface shall be by means of an LCD display and keypad located on the face of the module. This interface shall permit rack configuration, preset control, status, error indications, and diagnostic functions. Status LEDs shall indicate presence of Power, Network connection, and DMX signal.

3. Control and communication signals shall be accommodated by means of system network and DMX512 interfaces.
   a. The system network interface shall serve as primary integrating means between the rack electronics and the lighting control network, and shall also support remote configuration, file storage, playback, and monitoring capabilities from other devices on the network.
   b. There shall be at least one (1) optically isolated DMX512 input and one (1) optically isolated DMX512 output per panel.
4. Furnish ride-through power supply to permit electronics to remain energized during short duration loss of power.
5. Furnish a power monitoring device and tap kit to sense voltage on the three-phase input.
6. Furnish one (1) 24 circuit 0-10v control option card for control of house lighting.

2.2 LIGHTING CONTROL NETWORK AND INTERFACE:

A. General:
   1. Furnish and install a complete lighting control network system, capable of supporting the specified dimming and relay racks, stage lighting control console, architectural control stations, occupancy sensors, time and calendar schedules, and related network devices indicated on the drawings and in this Specification.
   2. The network shall use category 5E, category 6 or Manufacturer approved STP control wiring distribution to communicate between control consoles, dimmer racks and DMX devices.
   3. Manufacturer specified wiring and topology shall be used to communicate with control stations, sensor devices and relay panels.

B. Network Components:
   1. Control Processors:
      a. Furnish an architectural processor as required to interface dimmer rack, lighting control relay panels, control stations, sensors, system I/O contacts, and any appurtenant devices or equipment required for system to function fully as intended. Processor shall provide necessary programming interface for setup and configuration of system and system components.
   2. Ethernet switches:
      a. All Ethernet signal cables terminating at the switch location shall be outfitted with RJ45 connectors as necessary to permit user patching where required. This includes signals to Ethernet Tap receptacles, dimmers, and relay panels.
   3. DMX signal splitters:
      a. ANSI/USITT E1.1-2008 compliant DMX512 opto-isolating splitters, in quantity and configuration of inputs and outputs as required for system.
      b. All DMX signal cables terminating at the splitter location shall be outfitted with 5-pin XLR connectors as necessary to permit user patching where required. This includes signals to DMX node receptacles, dimmers, and relay panels.
   4. Equipment Racks:
      a. Wall mounted 19” equipment rack with mounting rails, hinged locking door, and sized to accommodate all required processing equipment including that indicated above. Furnish in quantities shown on drawings plus any additional required for complete system.
      b. Each rack shall have minimum of one four-space contiguous blank section with cover plate for future equipment addition.
      c. Each rack shall be furnished with a three-space pull out drawer for storage of manuals, patch cabling, and user notes.
      d. Racks shall be Middle Atlantic EWR series or equal.
      e. Coordinate electrical power connections for rack contents.
   5. Ethernet cabling:

a. Ethernet cabling used in theatrical lighting control network shall have the following properties:
   1) Comply with NEMA WC-63.1 Category 5e, UL verified.
   2) Comply with TIA 568.C.2.

6. DMX Network Cabling:
   a. Furnish and install 5-pin XLR M/F DMX jumper patch cables as necessary to fully patch between all DMX-512 splitter ports and DMX patch points, racks, or other DMX devices at equipment racks.
   b. Furnish additional 5-pin XLR M/F DMX jumper cables to allow connection of DMX node devices to portable dimmer bars, luminaires, and other devices in the performance spaces. Refer to Theatrical Lighting Fixtures and Accessories Schedule on drawings for lengths and quantities to be furnished.
7. Input/Output devices for communication with other systems:
   a. Furnish RS-232 communication interface for connection with audio-visual network.
   b. Furnish minimum four (4) dry contact closures configurable as input or output signals, to connect with fire alarm system, effects controls, shading systems, and future interfaces.
8. Wireless Access Port
   a. Furnish a wireless access port configured to allow remote control of the system from an owner-furnished portable device, such as an iPad or iPhone.
9. Occupancy/vacancy sensors
   a. Furnish occupancy sensors to interface with architectural control processor.
   b. Each sensor shall have adequate range to sense movement at 4’ above the finished floor for the entire area (A-G) in which the sensor is located.

2.3 CONTROL INTERFACE

A. Provide software and one (1) control interface from computer-based software to DMX system:
   1. Minimum 500 control channels and minimum 1024 DMX outputs.
   2. Provide one dongle for control software.
   3. Computer to be provided by owner.

2.4 CONTROL STATIONS

A. General
   1. Control stations shall be touch screen and/or preset type with pushbuttons acting as ON/OFF controls.
      a. Control station shall have an LED constantly illuminated when the system is powered.
      b. When circuit is activated, LED shall be illuminated on every control station capable of controlling that circuit.
   2. Control station faceplates shall be in color shown on the drawings with engravings as noted.
   3. Control faceplate pushbutton labels shall be as scheduled on the drawings and verified in shop drawings.
   4. All control station back boxes and associated hardware shall be provided by the Dimming System Manufacturer and painted black.
   5. A label identifying the control station "number" shall be provided inside each control station back box and on the back of each control station faceplate.

END OF SECTION

SECTION 11 61 93 – STAGE RIGGING SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK OF THIS SECTION

A. This Section includes all labor, materials, equipment, and services necessary to furnish and install the Stage Rigging System as shown on the QT drawings and/or specified herein, including but not limited to the following:
   1. Eight (8) straight dead-hung lighting positions
   2. Miscellaneous equipment listed herein, for installation by others.

B. It shall be the responsibility of the Rigging System Contractor to furnish equipment complete in all respects and to provide any additional equipment required to fulfill the intent of these drawings and specifications regardless of whether or not such items are herein specified or indicated.

1.3 PROJECT CONDITIONS

A. All dimensions shall be verified in the field prior to fabrication by the Stage Rigging Contractor, who shall make at least one (1) visit to the job site prior to preparation of shop drawings.

B. No extras will be allowed due to the Stage Rigging Contractor's misunderstanding of the work involved or its lack of knowledge of any field conditions due to failure to make accurate field measurements or a thorough investigation of the job site.

1.4 SUBMITTALS

A. Stage Rigging Contractor shall prepare and submit complete shop drawings according to the requirements set forth in the Contract Documents.

B. Shop Drawings shall be submitted for review by the Architect before fabrication can begin. Such review does not relieve the Stage Rigging Contractor of the responsibility of providing equipment in accordance with this Specification.

C. Shop Drawings:
   1. Shop Drawings shall show dimensions, sizes, gauges, thicknesses, finishes, joining, attachments and relationship of work to adjoining construction.
   2. Shop Drawings shall clearly show power, wire, and conduit requirements for all work to be provided by the Stage Rigging Contractor.
   3. Where items must fit and coordinate with finished surfaces and/or constructed spaces, take measurements at site and not from drawings.
   4. Where other materials must be set to exact locations to receive rigging, furnish assistance and directions necessary to permit other trades to locate their work.
   5. Where welded connections, concrete or masonry inserts are required to receive work, shop drawings shall show exact locations required and all such drawings shall be furnished to the trades responsible for installing the connectors or inserts.

6. Show locations of all lubrication points.
7. Shop drawings for motorized equipment shall include engineering and load calculations as well as stamp and seal of a registered professional engineer.
8. Catalog work sheets showing illustrated cuts of items may be submitted for standard manufactured items.
9. Shop drawings shall include a copy of the installation superintendent's ETCP Certified Rigger - Theatre certification. A copy of the installation superintendent's ETCP certification shall be available on the job site for the length of the installation.

D. Any deviation from this Specification shall be "starred" and noted in letters a minimum 1/4" high.
   1. In order for a deviation to be considered, it must upgrade the quality of the equipment or respond to a field condition.

E. The Stage Rigging Contractor shall, if requested by the Owner or Architect, furnish satisfactory evidence as to the kind and quality of materials he proposes to furnish by submission of exact samples of hardware to be used in this contract.
   1. The samples shall be retained by the Owner until such time that this contract has been completed and accepted.

F. Upon completion of installation, Stage Rigging Contractor shall provide Operation and Maintenance manuals that shall include "record" shop drawings, parts lists, operational instruction, service/maintenance recommendations, component working load limits, etc.
   1. One (1) O&M manual shall be a printed "hard" copy.
   2. O&M manual shall also be provided in electronic format on two (2) flash drives.

1.5 WARRANTY

A. The Stage Rigging Contractor shall assure that the rigging is properly installed, free of defects in materials and workmanship and shall provide a warranty on all equipment and workmanship provided under this contract for a period of two (2) years from the date of the final acceptance.

B. During the warranty period, repair or replacement of defective materials and faulty workmanship shall be provided, at no cost to the Owner, within ten (10) days of written notification of defects(s).

C. Post Installation Safety Inspection:
   1. One year after the date of final acceptance by the Owner, the Stage Rigging Contractor shall return to the job site to conduct a thorough inspection of the rigging installation.
      a. All bolts shall be checked and tightened as required, cables and all cable connections inspected and all items given a thorough safety inspection.
      b. All damage not caused by negligence on the part of the Owner shall be repaired and/or replaced.
   2. All materials, superintendent labor, transportation and living expenses for this work shall be furnished by the Stage Rigging Contractor at no additional cost to the Owner.
      a. The inspection and repair work shall be conducted during normal working hours at a time mutually agreed upon by the Owner and the Stage Rigging Contractor.
   3. Within two (2) weeks of the completion of the inspection, the Stage Rigging Contractor shall provide the Owner and Architect with a written report stating the findings of the inspection.

1.6 STAGE RIGGING MANUFACTURERS / STAGE RIGGING CONTRACTORS

A. The Stage Rigging Contractor shall have been continuously engaged in the production of theatrical stage rigging equipment for at least fifteen (15) years.

B. The Stage Rigging Contractor shall have installed a total of not less than five (5) installations of equal or greater scope to system specified herein, which have been in service for a minimum of one (1) year and a maximum of ten (10) years.
   1. Each of the listed stage rigging installations shall be in service in fully professional commercial theatres being operated by professional technicians.

C. Stage Rigging Manufacturers for work of this section shall include:
   1. H&H Specialties Inc.
      14850 Don Julian Road, Suite B
      City of Industry, CA 91746
      Contact: Reid Neslage reid@hhspecialties.com
      800-221-9995

   2. I. Weiss
      815 Fairview Avenue, Unit 10
      Fairview, NJ 07022
      Contact: Jennifer Tankleff JenniferT@iweiss.com
      888-325-7192

   3. J.R. Clancy, Inc.
      7041 Interstate Island Rd.
      Syracuse, NY 13209
      Contact: Mike Murphy mikemurphy@jrclancy.com
      800-836-1885

   4. PROTECH Theatrical Services
      3431 North Bruce Street
      North Las Vegas, NV 89030
      Contact: Will Brants wbrants@protechlv.com
      800-232-9336

   5. Stagecraft Industries Inc.
      5051 N. Lagoon Ave.
      Portland, OR 97217
      Contact: Kevin Shetterly kevins@stagecraftindustries.com
      503-286-1600

   6. Texas Scenic Co.
      5423 Jackwood Dr.
      San Antonio, TX 78238
      Contact: Roy Harline r.harline@texasscenic.com
      800-292-7490

   7. Thern Stage Equipment
      5712 Industrial Park Road
      Winona, MN 55987
      Contact: Sam Michael smichael@thernstage.com
      800-553-2204

   8. Tiffin Scenic Studios
      P.O. Box 39
      Tiffin, OH 44883
      Contact: Steve Everhart severhart@tiffinscenic.com
      800-445-1546

D. Stage Rigging Contractors for work of this section shall include:

1. Chicago Flyhouse
   2925 W. Carroll Ave.
   Chicago, IL 60612
   Contact: Ed Leahy eleahy@clearwing.com
   773-533-1590

2. Clearwing Productions
   11101 W. Mitchell St.
   Milwaukee, WI 53214
   Contact: Kerry Miller kmiller@clearwing.com
   414-258-6333

3. Grand Stage
   1319 W Grand Ave,
   Chicago, IL 60642
   Contact: Ted Jones tjones@grandstage.com
   312-332-1606

4. I. Weiss
   815 Fairview Avenue, Unit 10
   Fairview, NJ 07022
   Contact: Jennifer Tankleff JenniferT@iweiss.com
   888-325-7192

5. J.R. Clancy, Inc.
   7041 Interstate Island Rd.
   Syracuse, NY 13209
   Contact: Mike Murphy mikemurphy@jrclancy.com
   800-836-1885

PART 2 PRODUCTS

2.1 MATERIALS

A. Ferrous materials and accessories shall conform to the following ASTM and ANSI standard specifications:

1. Standard structural steel shapes and plates: ASTM A-36.
2. Miscellaneous steel items: ASTM A-283, grade optional.
3. Steel pipe: ASTM A-120
4. Gray iron castings: ASTM A-48, Class 30 unless otherwise specified.
5. Malleable iron castings: ASTM A-47
6. Bolts and nuts: B18.2.1&2
7. Welding electrodes shall be as permitted by AWS Code D1.0.

B. Finishes for Items Without Factory Finish

1. Welds, burrs and rough surfaces on all interior ferrous metals shall be ground smooth and the completed assembly cleaned and all metal surfaces shall be given a minimum one coat of finish paint.
2. No painted finish shall be required on aluminum finishes.
3. All exposed fastenings shall match color and finish of adjacent material.

2.2 SAFETY STANDARDS

A. In order to establish minimum standards of safety, the following factors shall be used:

1.	Cables and fittings	8:1 Safety Factor
2.	Terminating hardware:	5:1, or not exceeding WLL, whichever is more restrictive.
3.	Purchase lines:	Minimum tensile strength of 4,860# when new.
4.	Trim chain assembly:	5:1, or not exceeding WLL, whichever is more restrictive.
5.	Batten clamps:	5:1, or not exceeding WLL, whichever is more restrictive.
6.	Fiber rope lifting lines:	10:1, min. 5/8” diameter.
7.	Motors:	1.0 Service factor
8.	Gearboxes:	1.25 Mechanical Strength Service Factor
9.	Cable bending ratio:	Sheave diameter is 30 times diameter of cable
10.	Tread pressures:	500# for cast iron, 900# for Nylatron ,1000# for steel
11.	Maximum fleet angle:	1-1/2 degrees
12.	Steel:	1/5 of yield
13.	Bearings:	L10 life of 2000 hours at two times required load at full speed
14.	Bolts:	Grade 5 or better, plated

2.3 STRAIGHT DEAD-HUNG LIGHTING POSITIONS

A. Pipe shall be constructed of 1-1/2” NPS schedule 40 steel pipe as shown on the drawings. Pipe and all mounting hardware shall be painted black.

B. All joints shall be sleeve spliced with 18” long sleeves with 9” extending into each pipe and held by two hex bolts and lock nuts on each side of the joint.

C. The pipes shall be hung from building structure at locations shown on the drawings using grade 5 or B7 threaded rod to a rated pipe hanger.
   1. At each point, the rod assembly shall attach to the overhead steel.
      a. Where additional steel is required to span between existing structural members, the rigging manufacturer will provide and install this steel. Additional steel and connections shall be detailed in the shop drawings.
      b. Verify all dimensions in field.
   2. Secure pipe to hanger such that pipe cannot spin in the hanger or slide out of the hanger.
   3. Provide circular plate to cover penetration in ceiling.
   4. Each pipe hanger shall have a minimum working load limit of minimum 700 pounds.

D. Pipe and pipe hangers shall hang plumb and level in all directions.

PART 3 - EXECUTION

3.1 GENERAL

A. Examine all conditions under which all presentation area rigging items shall be installed and notify the Construction Manager in writing of any condition detrimental to the proper and timely completion of the work.

B. Responsibility for the satisfactory completion of this rigging system shall rest solely and exclusively with the Stage Rigging Contractor.

C. The Stage Rigging Contractor shall be responsible for storage of all equipment and tools during the period of installation and shall be responsible for collecting and removing from the job site all packing materials, trash, scrap materials, etc.

D. The Stage Rigging Contractor shall be responsible for the protection of equipment and/or finished materials provided by other Contractors.

E. Prior to the completion of the installation, the Stage Rigging Contractor shall notify the Construction Manager and Architect to schedule an inspection of the system.
   1. At the time of the inspection, the Stage Rigging Contractor shall furnish sufficient personnel to operate all equipment and to perform adjustments and tests as may be required by the Architect and/or the Owner's representatives.
   2. Any equipment that fails to meet with the Specifications shall be repaired or replaced with new equipment, and the inspection shall be re-scheduled under the same conditions listed previously.
   3. All temporary equipment shall be removed to permit full operation and access to all equipment.
   4. Final review will be withheld until all systems have been thoroughly tested and found to be in first class operating condition in every circumstance.

3.2 INSTALLATION SUPERVISION

A. Installation of the rigging systems shall be supervised by the Rigging System Contractor's own experienced superintendent having extensive experience in installing work of this kind.
   1. Superintendent shall be an Entertainment Technician Certification Program (ETCP) Certified Rigger - Theatre.
      a. Rigging System Contractor shall provide the Architect with a copy of the superintendent’s ETCP certification and shall make a copy of this certification available on the job site for the length of the installation.
   2. An ETCP Certified Rigger - Theatre shall be present at all times during the rigging system installation.

B. The same individual shall remain in charge of the work throughout the installation of the rigging system until work is completed excepting only the intervention of circumstances completely beyond the control of the Stage Rigging Contractor.

C. The superintendent shall represent the Rigging System Contractor and all directions given to him shall be binding as if given to the Rigging System Contractor.
   1. The Rigging System Contractor may require the Owner to confirm such directions in writing.

3.3 FIELD QUALITY CONTROL

A. Rigging System shall be installed in accordance with OSHA Safety and Health Standards and all local codes. All welding shall be in full compliance with the most recent edition of the Structural Welding Code (ANSI / AWS D1.1).

B. All equipment shall be installed in locations shown on Construction Drawings and shall be installed plumb, straight and true and shall function as designed.

C. The Stage Rigging Contractor shall perform all drilling and fitting required in the setting of materials and all cutting and fitting required in the fitting of materials to the adjoining work of other Contractors.

END OF SECTION

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

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. Section Includes:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AFC Cable Systems
2. Alpha Wire.
3. Belden Inc.
4. Encore Wire Corporation.
5. General Cable Technologies Corporation.
6. Southwire Incorporated.

B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2-THWN-2 Type XHHW-2 and Type SO.

D. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for metal-clad cable, Type MC Type SO with ground wire.

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AFC Cable Systems, Inc.
2. Gardner Bender.

3. Hubbell Power Systems, Inc.
4. Ideal Industries, Inc.
5. Ilsco; a branch of Bardes Corporation.
6. NSi Industries LLC.
7. O-Z/Gedney; a brand of the EGS Electrical Group.
8. 3M; Electrical Markets Division.
9. Tyco Electronics.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders & Branch Circuits: Copper. Solid for No. 14AWG and smaller; stranded for No. 12 AWG and larger.

B. Minimum wire size shall be No. 12AWG, except No. 14AWG shall be permitted as follows:

1. Signal and pilot control circuits.
2. Fixture Whips.

C. Mechanical Equipment: Feeders and branch circuits feeding mechanical equipment shall be copper.

D. At contractor's option, provide Alcan Stabiloy Compact Stranded Aluminum conductor or approved equal for feeders larger than #3 AWG.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type XHHW-2, single conductors in raceway.

B. Feeders: Type THHN-2-THWN-2, single conductors in raceway.

C. Branch Circuits: Type THHN-2-THWN-2, single conductors in raceway.

D. Branch Circuits Other: Metal clad cable, Type MC (with insulated grounding conductor), shall only be allowed where specifically noted below:

1. Fixture Whips: In lengths less than 10’
2. Branch Circuits concealed in accessible ceilings, and gypsum board walls and partitions. Homeruns shall remain in conduit.

E. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

F. All wiring in exposed areas: run in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install all wiring methods parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

G. Use 10 AWG minimum conductor size in lieu of #12 AWG minimum for 20 ampere, 120 volt branch circuits where home runs are longer than 75 feet and for 20 ampere, 277 volt branch circuits where homeruns are longer than 175 feet. Increase in size as required for a minimum of 3 percent voltage drop from panel to load.

H. Three phase wiring: Homeruns shall be limited to 3 phase conductors with corresponding neutral(s) and ground wire per conduit. Unless indicated otherwise, a shared neutral is not permitted for 3-phase homeruns for branch circuits.

I. Aluminum Conductors

1. Increase the size of the conduit, wire gutter, or enclosure as necessary to accommodate the aluminum conductors, and to meet allowable code requirements. Sizes shown on plans are based on copper unless noted otherwise.
2. Increase the size of the aluminum conductor to match the ampacity of the copper conductor circuit shown on the Drawings.

3. Submit a feeder schedule to the Engineer for all conductor substitutions, indicating both the aluminum conductor wire and the conduit sizes.
4. Installation to begin only after Engineer’s approval.

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Conductor Splices: Keep to a minimum. Obtain Engineer’s approval before splicing any feeder more than once.

C. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

D. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

E. Aluminum Conductor Connections:

1. Terminate on a compression lug. Apply oxide-inhibiting joint compound during termination.
2. Follow manufacturer’s instructions and recommendations for compression connector installation.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

END OF SECTION 260519

SECTION 260523 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES

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. Section Includes:
   1. RS-485 cabling.
   2. Low-voltage control cabling.
   3. Control-circuit conductors.
   4. Identification products.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 BACKBOARDS

A. Description: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches. Comply with requirements for plywood backing panels in Section 061000 "Rough Carpentry."

B. Painting: Paint plywood on all sides and edges with flat gray latex paint. Comply with requirements in Section 099123 "Interior Painting."

2.3 RS-485 CABLE

A. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. Flame Resistance: NFPA 262.

2.4 LOW-VOLTAGE CONTROL CABLE

A. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

1. Multi-pair, twisted, No. 18 AWG, stranded (19x30) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with NFPA 262.

2.5 CONTROL-CIRCUIT CONDUCTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Class 1 Control Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway, complying with UL 83.

C. Class 2 & 3 Control Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway where run in exposed or inaccessible areas, otherwise power-limited cable, concealed in accessible building finishes, complying with UL 83. Install in cable tray where present.

D. Class 2 Control Circuits and Class 3 Remote-Control and Signal Circuits That Supply Critical Circuits: Circuit Integrity (CI) cable.

1. Smoke control signaling and control circuits.

PART 3 - EXECUTION

3.1 INSTALLATION OF RACEWAYS AND BOXES

A. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for raceway selection and installation requirements for boxes, conduits, and wireways as supplemented or modified in this Section.

1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.

2. Flexible metal conduit shall not be used.

B. Comply with TIA-569-B for pull-box sizing and length of conduit and number of bends between pull points.

C. Install manufactured conduit sweeps and long-radius elbows if possible.

D. Raceway Installation in Equipment Rooms:

1. Position conduit ends adjacent to a corner on backboard if a single piece of plywood is installed, or in the corner of the room if multiple sheets of plywood are installed around perimeter walls of the room.
2. Install cable trays to route cables if conduits cannot be located in these positions.
3. Secure conduits to backboard if entering the room from overhead.
4. Extend conduits 3 inches above finished floor.
5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

E. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly and form smooth gap-free corners and joints.

3.2 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1 and NFPA 70.

B. General Requirements for Cabling:
1. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
2. Cables may not be spliced.
3. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
4. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii.
5. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
6. Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.
7. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems".
8. Support: Do not allow cables to lay on removable ceiling tiles.
9. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.

C. Installation of Control-Circuit Conductors:

1. Install wiring in raceways. Comply with requirements specified in Section 260533 "Raceways and Boxes for Electrical Systems."

D. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 30 inches apart.
3. Cable shall not be run through or on structural members or in contact with pipes, ducts, or other potentially damaging items. Do not run cables between structural members and corrugated panels.

E. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-B recommendations for separating unshielded copper voice and data communications cable from potential EMI sources including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment or Circuit Rating Less Than 2 kVA: A minimum of 5 inches.
    b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 12 inches.
    c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 24 inches.

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

    a. Electrical Equipment or Circuit Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
    b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 6 inches.
    c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 12 inches.

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

    a. Electrical Equipment or Circuit Rating Less Than 2 kVA: No requirement.
    b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 3 inches.
    c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 6 inches.

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or 5 HP and Larger: A minimum of 48 inches.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.3 REMOVAL OF CONDUCTORS AND CABLES

A. Remove abandoned conductors and cables. Abandoned conductors and cables are those installed that are not terminated at equipment and are not identified for future use with a tag.

3.4 CONTROL-CIRCUIT CONDUCTORS

A. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits; No 14 AWG.
2. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG.

3.5 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569-B, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping" Chapter.

3.6 GROUNDING

A. For low-voltage control wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.7 IDENTIFICATION

A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Identify data and communications system components, wiring, and cabling according to TIA-606-A; label printers shall use label stocks, laminating adhesives, and inks complying with UL 969.

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
1. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

END OF SECTION 260523

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL 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. Section includes grounding and bonding systems and equipment.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Burndy; Part of Hubbell Electrical Systems.
2. Dossert; AFL Telecommunications LLC.
3. ERICO International Corporation.
4. Fushi Copperweld Inc.
5. Galvan Industries, Inc.; Electrical Products Division, LLC.
6. Harger Lightning and Grounding.
7. ILSCO.
8. O-Z/Gedney; A Brand of the EGS Electrical Group.
9. Robbins Lightning, Inc.
10. Siemens Power Transmission & Distribution, Inc.

2.2 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

A. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 5/8 by 96 inches.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install barecopper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches below grade.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

E. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.

6. Flexible raceway runs.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

D. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

E. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

F. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.4 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.

G. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; using electrically conductive coated steel reinforcing bars or rods, at least 20 feet long. If reinforcing is in multiple pieces, connect together by the usual steel tie wires or exothermic welding to create the required length.

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural

drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.

b. Perform tests by fall-of-potential method according to IEEE 81.

B. Grounding system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

D. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.

E. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL 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 the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of three times the applied force.

1.5 QUALITY ASSURANCE

A. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077200 "Roof Accessories."

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Allied Tube & Conduit.
      b. Cooper B-Line, Inc.
      c. ERICO International Corporation.
      d. GS Metals Corp.
      e. Thomas & Betts Corporation.
      f. Unistrut; Atkore International.
      g. Wesanco, Inc.
   2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
   3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
   4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
   5. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
   1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Hilti, Inc.
2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
3) MKT Fastening, LLC.
4) Simpson Strong-Tie Co., Inc.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      1) Cooper B-Line, Inc.
      2) Empire Tool and Manufacturing Co., Inc.
      3) Hilti, Inc.
      4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
      5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with single-bolt conduit clamps using spring friction action for retention in support channel.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceways shall not be supported solely by openings in structural members.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 033000 "Cast-in-Place Concrete" or Section 033053 "Miscellaneous Cast-in-Place Concrete."

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Comply with requirements in Painting specification sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL 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. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.

1.3 ACTION SUBMITTALS

A. Product Data: For surface raceways, ~~wireways and fittings,~~ floor boxes, hinged-cover enclosures, and cabinets.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit.
3. Anamet Electrical, Inc.
4. Electri-Flex Company.
5. O-Z/Gedney.
6. Picoma Industries.
7. Republic Conduit.
8. Robroy Industries.
9. Southwire Company.
10. Thomas & Betts Corporation.
11. Western Tube and Conduit Corporation.

12. Wheatland Tube Company.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch, minimum.

E. EMT: Comply with ANSI C80.3 and UL 797.

F. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
2. Fittings for EMT:

a. Material: Steel.

b. Type: Setscrew.

3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

G. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.
3. Arnco Corporation.
4. CANTEX Inc.
5. CertainTeed Corporation.
6. Condux International, Inc.
7. Electri-Flex Company.
8. Kraloy.

9. Lamson & Sessions; Carlon Electrical Products.
10. Niedax-Kleinhuis USA, Inc.
11. RACO; Hubbell.
12. Thomas & Betts Corporation.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. LFNC: Comply with UL 1660.

~~Retain one or more of three HDPE paragraphs below. See Evaluations for a discussion of the three types.~~

E. Rigid HDPE: Comply with UL 651A.

F. Continuous HDPE: Comply with UL 651B.

~~G. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.~~

H. RTRC: Comply with UL 1684A and NEMA TC 14.

I. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

J. Fittings for LFNC: Comply with UL 514B.

~~Retain first paragraph below if required for LEED-NC, LEED-CI, or LEED-CS Credit IEQ 4.1. VOC limit is that for PVC welding compounds and adhesive primers for plastic.~~

K. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

~~Retain paragraph below if required for LEED for Schools Credit IEQ 4.~~

L. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

~~Retain "Manufacturers" Paragraph and list of manufacturers below to require products from manufacturers listed or a comparable product from other manufacturers.~~

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.
2. Hoffman.
3. Mono-Systems, Inc.
4. Square D.
5. ~~<**Insert manufacturer's name**>.~~

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

~~Retain one or more options in "Wireway Covers" Paragraph below. If retaining more than one type, indicate locations of each type on Drawings.~~

D. Wireway Covers: Hinged type where over 3' in length, otherwise screw-cover type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.4 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

~~Retain "Manufacturers" Paragraph and list of manufacturers below to require products from manufacturers listed or a comparable product from other manufacturers.~~

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Allied Moulded Products, Inc.
2. Hoffman.
3. Lamson & Sessions; Carlon Electrical Products.
4. Niedax-Kleinhuis USA, Inc.
5. ~~<**Insert manufacturer's name**>.~~

B. Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

~~Retain one of two "Description" paragraphs below.~~

~~C. Description: Fiberglass polyester, extruded and fabricated to required size and shape, without holes or knockouts. Cover shall be gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections shall be flanged and have stainless-steel screws and oil-resistant gaskets.~~

D. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.

E. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.

~~Retain first paragraph below if required for LEED-NC, LEED-CI, or LEED-CS Credit IEQ 4.1. VOC limit is that for PVC welding compounds and adhesive primers for plastic.~~

F. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

~~Retain paragraph below if required for LEED for Schools Credit IEQ 4.~~

G. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.5 SURFACE RACEWAYS

~~Insert requirements for finish-coat paint color, if applicable, in "Surface Metal Raceways" Paragraph below. See painting Sections for optional field-finish coats.~~

A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect.

~~Retain "Manufacturers" Subparagraph and list of manufacturers below to require products from manufacturers listed or a comparable product from other manufacturers.~~

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Mono-Systems, Inc.
   b. Panduit Corp.
   c. Wiremold / Legrand.
   ~~d. <**Insert manufacturer's name**>.~~

2. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

   a. Single Channel for Power Locations: One-piece latching raceway with matching device boxes, fittings and all components necessary for a complete raceway system. Wiremold V500 or V700 series or equal to meet fill requirements.

b. Sing Channel, for Data / Phone Locations: Two-piece latching raceway with matching devices boxes, fittings and all components necessary for a complete raceway system. Wiremold 2000 series or equal.

~~c. Mini-Dual Channel, for Power and Data Outlet Locations: 2-piece construction, manufactured of steel. Raceway device brackets shall be provided for mounting standard devices in-line with the raceway. Devices shall have low profile mounting. Provide all components necessary for complete raceway system. Wiremold V2400D series or equal.~~

d. Dual Channel, for Power and Data Outlet Locations: 2-piece construction, manufactured of steel, black finish. Raceway device brackets shall be provided for mounting standard devices in-line with the raceway. Devices shall have low profile mounting. Provide all components necessary for complete raceway system. Wiremold 4000 series or engineer approved equal.

C. Surface Nonmetallic Raceways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors. Product shall comply with UL 94 V-0 requirements for self-extinguishing characteristics.

~~Retain "Manufacturers" Subparagraph and list of manufacturers below to require products from manufacturers listed or a comparable product from other manufacturers.~~

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Hubbell Incorporated.
   b. Mono-Systems, Inc.
   c. Panduit Corp.
   d. Wiremold / Legrand.
   ~~e. <Insert manufacturer's name>.~~

2. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

   a. Two Compartment for Power and Data Outlet Locations: 2-piece construction, manufactured of rigid PVC compound with matte texture. Raceway device brackets shall be provided for mounting standard devices in-line with the raceway. Devices shall have low profile mounting. Provide all components necessary for complete raceway system. Wiremold 5400 series or equal.

      1) Base: Wiremold 5400TB
      2) Cover: Wiremold 5400TC
      3) Device Bracket: Wiremold 5450T
      4) End Cap: Wiremold 5410
      5) Entrance End fitting: Wiremold 5410D
      6) Elbow: Wiremold 5411FO, 5417FO, 5418FO
      7) Tee: Wiremold 5415FO
      8) Angled Raceway Adapter for Data Devices: CM-ARA

2.6 BOXES, ENCLOSURES, AND CABINETS

~~Retain "Manufacturers" Paragraph and list of manufacturers below to require products from manufacturers listed or a comparable product from other manufacturers.~~

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ~~Adalet.~~
2. Cooper Technologies Company; Cooper Crouse-Hinds.
3. EGS/Appleton Electric.
4. Erickson Electrical Equipment Company.
5. FSR Inc.
6. Hoffman.
7. Hubbell Incorporated.
8. Kraloy.
9. Milbank Manufacturing Co.
10. Mono-Systems, Inc.
11. O-Z/Gedney.
12. RACO; Hubbell.
13. ~~Robroy Industries.~~
14. ~~Spring City Electrical Manufacturing Company.~~
15. ~~Stahlin Non-Metallic Enclosures.~~
16. Thomas & Betts Corporation.
17. Wiremold / Legrand.
18. ~~<**Insert manufacturer's name**>.~~

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.

I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

J. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

K. Device boxes for Audio/Video outlets (AV) (unless noted on drawings): Provide (2) gang 4 11/16" square by 2 1/8" deep with (2) 1 1/4" K.O.'s on each side and end. Steel City 72171 11/4 or equal. Provide with single or 2 gang mud ring as indicated on drawings.

L. Gangable boxes are prohibited.

M. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic.
3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

N. Cabinets:

1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.7 FLOOR BOXES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Thomas & Betts Corporation.
2. Walker Systems, Inc.; Wiremold Company (The).
3. FSR Inc.
4. loor Boxes, Slab-on-Grade, Multi-service, Extra Large Capacity: Provide extra large capacity multi-service cast iron recessed floor box, fully adjustable and device brackets for power, data, and A/V devices. FSR FL-600P-SLP-6 with pour pan FL-GRD4 or equal.

B. Floor Boxes, concrete toppings greater than 2.5" non slab on grade applications: Provide multi-service shallow stamped steel recessed floor box, fully adjustable with tunnels and device brackets for both power and data devices. Walker RFB4-SS or equal.

1. Activation Cover: S38BBTCAL ~~(Aluminum) S38BBTCBS (brass) S38BBTCBK (black)~~flush without carpet insert. Assembly meets UL scrub water exclusion requirement.
2. Receptacle Device Bracket: RFB-GFI-SS & RFB-RB-SS as applicable (provide 2 at each box).
3. Communications Bracket: RFB-2AB-SS with two bezels (provide 2 at each box)

C. Floor Boxes, concrete toppings less than 2.5": Provide multi-service poke-through assembly with four 20 amp receptacles and 4 data activations. Provide with slide covers for dead front protection. Flip lids are not allowed. Provide Walker RC4ATCBK ~~(BK = black, GY= gray, BZ-bronze, NK-nickel, BS=brass)~~ or equal. Assembly meets UL scrub water exclusion requirement.

D. Floor Boxes, concrete toppings less than 2.5", furniture feed: Provide multi-service poke-through assembly with (1) 3/4" trade size screw plug opening and one concentric 2"-11/4" trade size screw plug opening. Provide Walker 6ATCFFBK ~~(BK = black, GY= gray, BZ-bronze, NK-nickel, BS=brass)~~ or equal. Assembly meets UL scrub water exclusion requirement.

E. Floor Boxes, Kitchen, single service locations: Cast iron, fully adjustable recessed floor box, single service, with solid brass activation plate appropriate for use. Walker 880CS1-1 series or equal.

1. Activation Cover: 817B. Assembly meets UL scrub water exclusion requirement.
2. Cover Plate: 828GFITC, 829CK or similar to meet device requirements.

F. Floor Boxes, Kitchen, dual service locations: Cast iron, fully adjustable recessed floor box, single service, with solid brass activation plate appropriate for use. Walker 880CS2-1 series or equal.

1. Activation Cover: 827B. Assembly meets UL scrub water exclusion requirement.
2. Cover Plate: 828GFITC, 829CK or similar to meet device requirements.
3. Communications Bezel: At communications portion of box, provide CM-MAB communications bezel.

G. Floor Boxes, Gymnasium, multi-service locations: Stamped steel, multi-service, with solid brass activation plate appropriate for use. Walker 880W1, 880W2 and 880W3 as appropriate for device requirements indicated (may require more than one box).

1. Activation Cover: 817B, 827B and 837B. Assembly meets UL scrub water exclusion requirement.
2. Cover Plate: 828GFITC or similar to meet device requirements.
3. Communications Bezel: At communications portions of box, provide CM-MAB communications bezel for each gang serving communications devices.
4.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

~~Retain this article to specify type of raceway to be installed. Coordinate with conductor and cable wiring methods specified in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and in other electrical, communications, and security Sections. See "Writing Guide" Article in the Evaluations for instructions on editing this article.~~

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: EMT.
3. Underground Conduit: RNC, Type EPC-40-PVC, concrete encased for service entrance conductors.

~~Retain first option in first subparagraph below if raceway may be exposed to physical damage.~~

4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:

    a. Loading dock.
    b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    ~~c. Mechanical rooms.~~
    ~~d. Gymnasiums.~~
    ~~e. <**Insert designations of applicable spaces or locations**>.~~

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: IMC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations. Type 4, nonmetallic in pool environments.

C. Minimum Raceway Size: 1/2-inch trade size. Homeruns shall be installed in a minimum ¾ inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use setscrew or compression, steel fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

~~Retain first paragraph below for high-frequency installation.~~

~~E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.~~

~~F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.~~

~~Coordinate first paragraph below with Drawings.~~

G. Install surface raceways only where indicated on Drawings.

H. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

G. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.

1. Run parallel or banked raceways together on common supports.
2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

H. Support conduit within 12 inches of enclosures to which attached.

I. Stub-ups to Above Recessed Ceilings:

1. Use EMT~~, IMC, or RMC~~ for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

J. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

K. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

L. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

M. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

N. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

O. Surface Raceways:

1. Install surface raceway with a minimum 2-inchradius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

P. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

~~See Evaluations for discussion of types of and locations for raceway seals.~~

Q. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where conduits pass from interior to exterior locations above grade.
4. Where otherwise required by NFPA 70.

R. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

~~Retain "Expansion-Joint Fittings" Paragraph below unless locations for expansion fittings for RNC are indicated on Drawings. See Evaluations.~~

~~1.~~ .

S. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

~~T. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.~~

U. Device / Outlet Box Installation:

1. Outlet boxes shall not be mounted back-to-back; provide 6” minimum separation.
2. Where device/outlet box symbols are shown adjacent to each other, separation of boxes shall not exceed 6”. Provide additional backbox support as required.
3. Locate device boxes such that cover or device faceplate does not span different wall finishes either vertically or horizontally.
4. Exposed boxes, such as those in mechanical rooms, shall be cast metal boxes. Exposed sheet metal boxes are not allowed.
5. Provide joint sealant around raceways and boxes in areas of above average sound levels (gymnasiums, music areas, locker areas, etc.) or in sound sensitive areas (media centers, auditoriums, sound recording spaces, etc.).

V. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

W. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

X. Set metal floor boxes level and flush with finished floor surface.

Y. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

Z. See drawings for conduit sizing requirements for data, voice, and television outlet locations.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.4 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Grout.
4. Silicone sealants.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

1. Product Data for Credit EQ 4.1: For sealants, documentation including printed statement of VOC content.
2. Laboratory Test Reports for Credit EQ 4: For sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

2.2 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

2.3 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.4 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
2. Sealant shall have VOC lower content when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 260544

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL 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. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Warning labels and signs.
5. Instruction signs.
6. Equipment identification labels.
7. Miscellaneous identification products.

1.3 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.4 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Self-Adhesive, Self-Laminating Polyester Labels: Write-on, 3-mil- thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the conductor diameter such that the clear shield overlaps the entire printed legend.

C. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

D. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.2 FLOOR MARKING TAPE

A. 2-inch- wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

B. Construction:

1. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Overall Thickness: 5 mils.
3. Foil Core Thickness: 0.35 mil.
4. Weight: 28 lb/1000 sq. ft..
5. 3-Inch Tensile According to ASTM D 882: 70 lbf, and 4600 psi.

2.3 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Metal-Backed, Butyrate Warning Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 10 by 14 inches.

D. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES." Add the following to the associated service disconnect:
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."
3. Warning at Service Disconnects: "ELECTRIC SERVICE DISCONNECT" and "DANGER – ELECTRIC SHOCK HAZARD!"
4. The following arc-flash warning label shall be affixed to the front of all switchboards, meter socket enclosures, ~~motor control centers,~~ distribution panels, and panelboards:

WARNING!
Potential Arc Flash Hazard
Appropriate PPE and tools are required
when working on energized equipment

If panelboard is located in a finished space, affix the warning label behind the hinged door.

2.4 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.5 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black.

C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
5. Color: Black.

2.6 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

G. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

H. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.

a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
b. Colors for 208/120-V Circuits:

1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.

c. Colors for 480/277-V Circuits:

1) Phase A: Brown.
2) Phase B: Orange.
3) Phase C: Yellow.

d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

B. Branch-Circuit Conductor Identification: Label boxes in permanent marker with circuit number and source panel.

C. Device Circuit Identification: Label inside of each device faceplate in permanent marker with circuit number and source panel.

D. Control-Circuit Conductor Identification: For conductors and cables in pull ~~and junction~~ boxes, manholes, and handholes, use write-on tags with the conductor or cable designation, origin, and destination.

E. Control-Circuit Conductor Termination Identification: For identification at terminations provide self-adhesive vinyl labels with the conductor designation.

F. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.

G. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

H. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
1. Install underground-line warning tape for both direct-buried cables and cables in raceway.

I. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

J. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

a. Power transfer switches.
b. Controls with external control power connections.

K. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
1. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment used for power transfer and load shedding, or other emergency equipment.

L. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

   a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.
   b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
   c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
   d. Fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

   a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
   b. Enclosures and electrical cabinets.
   c. Access doors and panels for concealed electrical items.
   d. Switchgear.
   e. Switchboards.
   f. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
   g. Emergency system boxes and enclosures.
   h. Enclosed switches.
   i. Enclosed circuit breakers.
   j. Enclosed controllers.
   k. Variable-speed controllers.
   l. Push-button stations.
   m. Contactors.
   n. Remote-controlled switches, dimmer modules, and control devices.
   o. Battery-inverter units.
   p. Battery racks.
   q. Power-generating units.
   r. Monitoring and control equipment.
   s. UPS equipment.

END OF SECTION 260553

SECTION 262726 - WIRING DEVICES

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. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Twist-locking receptacles.
3. Tamper-resistant receptacles.
4. Weather-resistant receptacles.
5. Snap switches and wall-box dimmers.
6. Pendant cord-connector devices.
7. Cord and plug sets.
8. Company Switch

1.3 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

B. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
2. Cord and Plug Sets: Match equipment requirements.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

1.6 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand (Pass & Seymour).

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596. Heavy Duty industrial specification grade, 3 wire grounding with one piece brass mounting strap and integral ground contacts. Push- or speed-wired devices are unacceptable.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; 5351 (single), CR5362 (duplex).
b. Hubbell; HBL5351 (single), HBL5352 (duplex).
c. Leviton; 5891 (single), 5352 (duplex).
d. Pass & Seymour; 5361 (single), 5362 (duplex).

B. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; TR8300.
b. Hubbell; HBL8300SGA.
c. Leviton; 8300-SGG.
d. Pass & Seymour; TR63H.

2.4 GFCI RECEPTACLES

A. General Description:

1. Straight blade, feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
4. GFCI receptacles may feed other receptacles from the load side only if they are in the same room and within sight of each other.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; VGF20.
b. Hubbell; GFR5352L.
c. Pass & Seymour; 2095.
d. Leviton; 7590.

C. Tamper-Resistant GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Hubbell; GFTR20.
b. Pass & Seymour; 2095TR.

2. Description:

a. Straight blade, 125 V, 20 A; NEMA WD 6 Configuration 5-20R.

b. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.5 TWIST-LOCKING RECEPTACLES

A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; CWL520R.
b. Hubbell; HBL2310.
c. Leviton; 2310.
d. Pass & Seymour; L520-R.

B. Isolated-Ground, Single Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; IGL520R.
b. Hubbell; IG2310.
c. Leviton; 2310-IG.
d. Pass & Seymour; IG4700.

2. Description:

a. Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
b. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.6 PENDANT CORD-CONNECTOR DEVICES

A. Description:

1. Matching, locking-type plug and receptacle body connector.
2. NEMA WD 6 Configurations L5-20P and L5-20R, heavy-duty grade, and FS W-C-596.
3. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
4. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.7 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

1) Single Pole:

2) Cooper; AH1221.
3) Hubbell; HBL1221.
4) Leviton; 1221-2.
5) Pass & Seymour; CSB20AC1.

2.8 WALL-BOX DIMMERS

A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.

B. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.

C. LED Dimmers: 120V or 277V; control shall be 0-10V type dimmer with integral on-off switch. Ensure dimmer type is compatible with fixtures installed on the project.

2.9 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.035-inch- thick, satin-finished, Type 302 stainless steel.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

2.10 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: Match existing conditions.
2. Wiring Devices Connected to Emergency Power System: Red.

2.11 Company Switch

A. General

1. Switch shall be 120/208V: 100A, or 100A; 3-phase, 4-wire.

2. Switch shall be UL and cUL listed and shall meet all applicable NEC standards.

3. Enclosure shall be NEMA 1 rated.

B. Mechanical

1. Switch shall be fabricated of 16 gauge steel and finished with fine-textured scratch resistant epoxy paint.

2. The door which provides access to output connections shall be lockable with shunt trip interlock.

3. Enclosure size shall be approximately 25” high by 15.5” wide and 6” deep.

4. Switch shall protect against access to power connections while the cabinet is energized so it can be guaranteed that output is in a “power off” state while connecting or disconnecting portable output cabling.

5. Switch shall protect the user from unsecured access to output terminals and connectors in the following methods:

6. Door brackets shall lock swing hinged covers in place until the front door is opened. These brackets shall prevent insertion of connections under power.

Electrical

1. Six, single pole, CAM style connectors shall be supported for each phase, neutral, and ground. Standard order connector genders shall be females for each phase, with male ground and neutral connectors. Other connector gender combinations shall be available on request.

2. The enclosure shall accept up to 100A copper or aluminum to the full name plate rating of the enclosure at 100% of the rated main breaker with a minimum AIC rating of 65,000A.

3. System rating of Company Switch shall be 65,000 amps symmetrical Short Circuit Current Ratting (SCCR). Company Switch products that rely only on breaker AIC rating as a short circuit safety factor shall be deemed unacceptable. Company Switch products that have not proven this safety rating through high current short circuit testing with UL shall not be deemed safe for use under UL SCCR requirements and therefore are not acceptable.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, Reference drawings for mounting height schedule.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

    a. Cut back and pigtail, or replace all damaged conductors.
    b. Straighten conductors that remain and remove corrosion and foreign matter.
    c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.
    d. WACO or similar speed wire splice devices are prohibited.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Use a torque screwdriver when a torque is recommended or required by manufacturer.
5. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
6. Tighten unused terminal screws on the device.
7. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the left, so the neutral terminal is at the top.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical. Group adjacent switches under single, multigang wall plates.

I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

A. Comply with Section 260553 "Identification for Electrical Systems."

B. Identify each receptacle with panelboard identification and circuit number. On inside of faceplate, use permanent marker to identify circuit.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Test wiring devices for proper polarity and ground continuity.
3. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
4. Using the test plug, verify that the device and its outlet box are securely mounted.

C. Wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 262726

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

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:

1. Fusible switches.
2. Nonfusible switches.
3. Shunt trip switches.
4. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

1.7 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
2. Altitude: Not exceeding 6600 feet.

B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Architect no fewer than seven days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Architect's written permission.
4. Comply with NFPA 70E.

1.9 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate disconnect sizes with equipment ratings. Sizes indicated on the drawings are based on “basis-of-design” of equipment. In the case where the equipment provided requires a disconnect of different ratings, provide the proper rated disconnect at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
4. Lugs: Mechanical type, suitable for number, size, and conductor material.
5. Service-Rated Switches: Labeled for use as service equipment.
6. Accessory Control Power Voltage: Remote mounted and powered; Voltage as required.

2.2 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.3 SHUNT TRIP SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Bussmann, Inc.
2. Ferraz Shawmut, Inc.
3. Littelfuse, Inc.

B. General Requirements: Comply with ASME A17.1, UL 50, and UL 98, with 200-kA interrupting and short-circuit current rating when fitted with Class J fuses.

C. Switches: Three-pole, horsepower rated, with integral shunt trip mechanism and Class J fuse block; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.

D. Control Circuit: 120-V ac; obtained from integral control power transformer, with primary and secondary fuses, with a control power transformer of enough capacity to operate shunt trip, connected pilot, and indicating and control devices.

E. Accessories:
1. Mechanically interlocked auxiliary contacts that change state when switch is opened and closed.
2. Form C alarm contacts that change state when switch is tripped.
3. Three-pole, double-throw, fire-alarm voltage monitoring relay complying with NFPA 72.

2.4 \ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Install fuses in fusible devices.

D. Comply with NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION 262816

SECTION 263600 - TRANSFER SWITCHES

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. Section includes transfer switches rated 600 V and less, including the following:

1. Automatic transfer switches.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Features and operating sequences, both automatic and manual.
2. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintain a service center capable of providing training, parts, and emergency maintenance repairs within a response period of less than eight hours from time of notification.

B. Source Limitations: Obtain automatic transfer switches through one source from a single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NEMA ICS 1.

E. Comply with NFPA 70.

F. Comply with NFPA 110.

G. Comply with UL 1008 unless requirements of these Specifications are stricter.

1.7 FIELD CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service:

1. Notify Architect no fewer than two days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Architect's written permission.

1.8 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-in-Place Concrete."

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Contactor Transfer Switches:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Emerson; ASCO Power Technologies, LP.

2.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

C. Solid-State Controls: Repetitive accuracy of all settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

D. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

E. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.

F. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.
   1. Switch Action: Double throw; mechanically held in both directions.
   2. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 225 A and higher, shall have separate arcing contacts.

G. Neutral Switching. Provide neutral pole switched simultaneously with phase poles.

H. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color-code or by numbered or lettered wire and cable tape markers at terminations. Color-coding and wire and cable tape markers are specified in Section 260553 "Identification for Electrical Systems."

   1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
   2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
   3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.

I. Enclosures: General-purpose NEMA 250, Type 1, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.3 AUTOMATIC TRANSFER SWITCHES

A. Comply with Level 1 equipment according to NFPA 110.

B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.

C. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.

D. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.

E. Automatic Closed-Transition Transfer Switches: Include the following functions and characteristics:

1. Fully automatic make-before-break operation.
2. Load transfer without interruption, through momentary interconnection of both power sources not exceeding 100 ms.
3. Initiation of No-Interruption Transfer: Controlled by in-phase monitor and sensors confirming both sources are present and acceptable.

    a. Initiation occurs without active control of generator.
    b. Controls ensure that closed-transition load transfer closure occurs only when the 2 sources are within plus or minus 5 electrical degrees maximum, and plus or minus 5 percent maximum voltage difference.

4. Failure of power source serving load initiates automatic break-before-make transfer.

F. In-Phase Monitor: Factory-wired, internal relay controls transfer so it occurs only when the two sources are synchronized in phase. Relay compares phase relationship and frequency difference between normal and emergency sources and initiates transfer when both sources are within 15 electrical degrees, and only if transfer can be completed within 60 electrical degrees. Transfer is initiated only if both sources are within 2 Hz of nominal frequency and 70 percent or more of nominal voltage.

G. Automatic Transfer-Switch Features:

1. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
2. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.
3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
4. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes to automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.

5. Test Switch: Simulate normal-source failure.
6. Switch-Position Pilot Lights: Indicate source to which load is connected.
7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

    a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
    b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
9. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
11. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
12. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

    a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
    b. Push-button programming control with digital display of settings.
    c. Integral battery operation of time switch when normal control power is not available.

2.4 SOURCE QUALITY CONTROL

A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Identify components according to Section 260553 "Identification for Electrical Systems."

B. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

3.2 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

C. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

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

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

    a. Check for electrical continuity of circuits and for short circuits.
    b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
    c. Verify that manual transfer warnings are properly placed.
    d. Perform manual transfer operation.

4. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

    a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
    b. Simulate loss of phase-to-ground voltage for each phase of normal source.
    c. Verify time-delay settings.
    d. Verify pickup and dropout voltages by data readout or inspection of control settings.

e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.

C. Coordinate tests with tests of generator and run them concurrently.

D. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

E. Remove and replace malfunctioning units and retest as specified above.

F. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment as specified below. Refer to Section 017900 "Demonstration and Training."
   1. Video record training and turn over to Owner after training is complete.

B. Coordinate this training with that for generator equipment.

END OF SECTION 263600

SECTION 26 51 00 – INTERIOR LIGHTING

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. Interior luminaires and accessories.
   2. Lamps and light engines.
   3. Ballasts, drivers and lighting power supplies.
   4. Emergency lighting units.
   5. Exit signs.
   6. Lighting fixture supports.

B. Related Sections include the following:
   1. Division 26 Section "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multi-pole lighting relays and contactors.
   2. Division 26 Section "Wiring Devices" for manual wall-box dimmers for incandescent lamps.
   3. Division 26 Section "Network Lighting Controls" for manual or programmable control systems with low-voltage control wiring or data communication circuits.

1.3 REFERENCES

A. ANSI C78.377 – Specifications for the Chromaticity of Solid State Lighting Products

B. ANSI C82.1 – High Frequency Fluorescent Lamp Ballasts

C. ANSI C82.77 – Harmonic Emission Limits – Related Power Quality Requirements for Lighting

D. IEEE C2 – National Electrical Safety Code

E. IES LM-79-08 – Electrical and Photometric Measurements of Solid State Lighting Products

F. IES LM-80-08 – Measuring Lumen Maintenance of LED Light Sources

G. NEMA SSL-3-2010 – High-Power White LED Binning for General Illumination

H. NFPA 70 – National Electrical Code

I. UL 935 – Standard for Fluorescent Lamp Ballasts

J. UL 1598 - Luminaires

K. UL 8750 – LED Equipment for Use in Lighting Products

1.4 DEFINITIONS

A. BF: Ballast factor.

B. CRI: Color-rendering index.

C. CU: Coefficient of utilization.

D. LER: Luminaire efficacy rating.

E. Luminaire: Complete lighting fixture, including ballast housing if provided.

F. RCR: Room cavity ratio.

1.5 SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
1. Physical description of lighting fixture including dimensions.
2. Emergency lighting units including battery and charger.
3. Ballast and driver.
4. Energy-efficiency data.
5. Life, output, and energy-efficiency data for lamps.
6. Photometric data, in IESNA format, based on laboratory tests of each lighting fixture type, outfitted with lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.
a. Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program (NVLAP) for Energy Efficient Lighting Products.

B. Shop Drawings: Shop drawings of all special or modified standard lighting equipment shall be submitted in reproducible form. Fixture fabrication details shall be drawn at either full size or half size scale. Fixture fabrication details shall illustrate a minimum of three (3) critical views indicating all fabrication, and assembly methods, materials, material gauges and finishes to be employed.
1. Wiring Diagrams: Power and control wiring.
2. Mounting Details and coordination with surroundings.
3. Wiring connectors and harness assembly components.

C. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
1. Lighting fixtures.
2. Suspended or shaped ceiling components, coves, columns, niches.
3. Structural members to which suspension systems for lighting fixtures will be attached.
4. Other items in area, including the following:
a. Air outlets and inlets.
b. Speakers.
c. Sprinklers.
d. Smoke and fire detectors.
e. Occupancy sensors.
f. Access panels.
g. Piping, ductwork, conduit.
5. Moldings, decorations, mosaics.

D. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, signed by product manufacturer.

E. Submittals required prior to project closeout shall include:
   1. Field quality-control test reports.
   2. Operation and Maintenance Data: For lighting equipment and luminaires to include in emergency, operation, and maintenance manuals.
   3. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7.

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.

E. All lighting fixtures shall be manufactured, furnished, and installed in compliance with all government agencies having jurisdiction. All fixtures shall bear the appropriate UL (or ETL) and IBEW identifications.

F. Manufacturers: Provide products of firms regularly engaged in the manufacture of interior and exterior lighting equipment of the types and ratings whose products have been in satisfactory use in similar service for not less than 5 years.

G. National Electrical Manufacturers Association (NEMA): Comply with applicable requirements of NEMA LE 4, "Recessed Luminaires, Ceiling Compatibility" pertaining to recessed luminaires.

H. Underwriters Laboratories, Inc. (UL): Comply with applicable UL standards pertaining to interior lighting equipment.

I. Materials and equipment, as well as workmanship shall conform to the highest commercial standards and shall be as specified and/or as indicated on the drawings. Parts not specifically identified shall be made of materials most appropriate for their intended use.

J. Manufacturers: manufacturers listed as "prime spec" or approved equal in the lighting equipment schedule shall be assumed capable of supplying the listed fixtures unless clearly written exceptions are set forth in their quotations. Any such exceptions shall immediately be brought to the attention of the Architect/Engineer and the Lighting Designer. Manufacturers not listed (as prime or approved equal) must comply with the following:
   1. Experience: Manufacturers shall have not less than five years experience in design and manufacturing of lighting fixtures of the type and quality shown. Submission must include a list of completed projects and dated catalogue pages or drawings indicating length of experience.
   2. Samples: Manufacturers shall submit a prototype sample of each fixture for review by the Lighting Designer. Prototype samples shall be sufficiently detailed and operational to allow evaluation of compliance with the salient features of the specification. Preliminary design or shop drawings shall not be accepted in place of prototype samples.

1.7 COORDINATION

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

1.8 DELIVERY, STORAGE AND HANDLING

A. Lighting fixtures shall be wrapped for protection during delivery, storage, and handling. Wet or damp wrapping shall be removed, and disposed of, to prevent staining finish.

B. Deliver materials in manufacturer's original, unopened, protective packaging.

C. Store materials in original packaging in a manner to prevent soiling and physical damage, prior to installation.

D. Handle in a manner to prevent damage to finished surfaces.

E. Where possible, maintain protective covering until installation is complete and remove such coverings as part of final cleanup.

1.9 WARRANTY

A. All ballasts / drivers shall carry a minimum three (3) year warranty.

B. All LED lighting fixtures (unless noted otherwise) and accessories shall carry a minimum five year (5) warranty after final written acceptance by the Owner.

1.10 TECHNICAL AND ADMINISTRATIVE REQUIREMENTS

A. All information identified in the following Schedules, Details, Layouts and Specifications [Section 265100 and 265600] shall be considered to form a complete and integrated Specification for Lighting Fixtures and Control Systems in the agreed upon Scope Areas. The Contractor shall be responsible for contacting the Architect/Engineer regarding the proper interpretation of all information indicated on the Lighting Fixture Schedules, Fixture Cuts, Details and Specifications.

B. The submission of a proposal by the Contractor will be construed as evidence that a careful, complete and thorough examination of the premises, existing job conditions and Contract Documents has been made and later claims for labor, materials or equipment required or for difficulties encountered, which could have been foreseen had such an examination been made, will not be recognized. It shall also constitute a representation that the Contractor has checked and verified all quantities, work and materials involved and shall take complete responsibility for any deficiencies encountered thereafter.

C. The Contractor shall be solely responsible for verifying all fixture quantities, lengths and clearances required and shall inform the Architect/Engineer of job conditions at variance with fixtures as specified or detailed which affect installation or location at the time bid submission is made.

D. The Contractor shall insure that the lighting fixture manufacturer shall keep on file and make available for review by the Architect/Engineer and the Owner complete Quality Control and Quality Assurance records for all phases of production for all lighting fixtures to be supplied under this project.

E. Upon request the Contractor shall submit for review by the Architect/Engineer and the Owner verification that he has solicited pricing from all manufacturers which have been listed as "prime spec" and "approved equal." Upon request the Contractor shall submit for review itemized (line item) unit equipment costs for all fixtures to be provided under the Scope of this Contract.

F. Under multiple phase / separate contracts, same fixture type shall be provided by single manufacturer with exact same specifications. Later phase contractor shall submit specification to match earlier phase.

G. The Contractor shall be solely responsible for coordinating and expediting the timely procurement and delivery for all lighting equipment, lamps, ballasts and related components for the project.

H. Specifications and drawings are intended to convey the salient features, function and character of the fixtures only, and do not undertake to illustrate or set forth every item or detail necessary for the work. Minor details not usually indicated on the drawings nor specified, but that are necessary or normally required for the proper execution, completion, installation and operation of the fixtures, shall be included, the same as if they were herein specified or indicated on the drawings.

I. Omissions: The Owner shall not be held responsible for the omission or absence of any detail, construction feature, etc. which may be normally required in the production of the lighting fixtures. The full and complete responsibility for accurately purchasing, fabricating and installing the lighting fixtures described herein to the fulfillment of those specifications including compliance with all regulatory bodies (i.e.: UL) shall rest solely with the Contractor.

1.11 SPARES

As part of this contract, the Contractor shall furnish the following:

A. Lamps / LED modules: 1 for each 10 [10%] of each type and rating installed. Furnish at least 40’-0” of fixture type C1, and furnish at least 10 of fixture type C2 series.

B. Louvers/Lenses : 1 for each 20 [5%] of each type and rating installed. Furnish at least 10 of fixture type C2 series.

C. Ballasts/ Drivers: 1 for each 10 [10%] of each type and rating installed. Furnish at least 10 of fixture type C2 series.

1.12 SAMPLES

A. Upon request, the contractor shall submit for review one representative sample for each or any lighting fixture required under this Contract. After sample acceptance, the fixture shall be sent to the project for use as a standard. In the event the submission is rejected, the fixture will be returned to the manufacturer who shall immediately make a new submission which meets the contract requirements.

B. Shipping: The samples must be actual working unit of fixtures to be supplied and shall be submitted complete with specified lamp(s), 120 volt ballast/transformer complete with cord and plug set and ready for hanging, energizing and examining sample shall be shipped (prepaid) by Contractor to the Lighting Designer or as otherwise specified or directed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers listed on the Luminaire Schedule as the basis of design are the approved Manufacturers for each luminaire type. Those listed as approved equal Manufacturers are permitted to submit products meeting this specification and the performance criteria as scheduled. Listing as an approved equal manufacturer does not guarantee that products submitted by said equal manufacturer will be accepted for this project.

B. Luminaires shall be specification grade and listed by an approved agency for intended use and location.

C. Primary lighting sources shall be LED.

Approved lamp manufacturers for types listed on the Luminaire Schedule shall include the following:
1. Halogen Incandescent: Philips, Osram Sylvania, GE, Ushio
2. Linear Fluorescent: Philips, Osram Sylvania, GE
3. Compact Fluorescent: Philips, Osram Sylvania, GE
4. HID: Philips, Osram Sylvania, Venture, GE, Ushio

D. Approved chip engine manufacturers for solid state luminaires listed on the Luminaire Schedule shall include the following:
1. CREE
2. GE
3. Nichia
4. Osram Sylvania
5. Philips
6. Seoul Semiconductor
7. Soraa
8. Toshiba
9. Xicato.

2.2 LUMINAIRE SCHEDULE

A. Refer to Electrical drawing for schedule of luminaire types specified for this project.

2.3 LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

A. Lighting fixtures shall be of rigid construction, dimensionally stable, and shall be assembled with secure fastenings. Ferrous parts shall be protected from corrosion by plating or shall be finished with high reflectance enamel with non-yellowing binder and high pigment to binder ratio, with semi-gloss finish. Ferrous parts shall be prepared for finish by industry standard finishing process (see Finishes). Non ferrous metals (i.e. aluminum) unless otherwise noted be treated with a semi-gloss polyester powder coat enamel finish.

B. Provide each fixture with lamps as indicated in the lighting fixture schedule. Where/or if lamps are not indicated, contact the Architect/Engineer for clarification.

C. Hinged door closure frames shall operate smoothly without binding. Where possible fabricate frames to allow lamp installation/removal without tools. Hinge mechanism shall be designed to preclude accidental falling of hinged door closure frames during relamping operations and while secured in operating position.

D. Recessed, surface or pendant lighting fixtures shall be suspended from structural members or ceiling structure members of minimum 1-1/2" channels, by standard bar hangers, or other approved means. Fixture locations shall be coordinated with ceiling patterns. Refer to architectural reflected ceiling plan for exact location of fixtures and architectural rooms finish schedule for ceiling construction details and mounting heights. The installing contractor shall provide all structural steel and related supports as required or necessary to properly and safely install and support the fixtures.

E. Fixture wiring shall be suitable for the temperature rating of the fixture; wiring through fluorescent channels shall be done with Type SFF2 wire. Where a junction box is required, to change from branch circuit to fixture wiring, use approved feed through, pre-wired fixture wiring, and install a separate junction box. The junction box shall be fully accessible after installation of covering materials. Where flexible conduit or portable cord is used, a grounding jumper shall be installed. All fixtures shall be grounded. Housings shall be so constructed that all electrical components are easily accessible and replaceable without removing fixtures from their mountings, or disassembling adjacent construction.

F. All recessed, pendant and surface mounted lighting fixtures unless otherwise noted or directed shall be UL listed for through-wiring and shall be furnished complete with all required integral wiring and all required flexible conditions, pigtails and related accessories necessary for suitable operation and installation.

G. All recessed fixtures, which are to be installed in insulated ceilings, shall be provided with UL listed thermocouple protection.

H. All materials, accessories, and other related fixture parts shall be new and free from defects which in any manner may impair their character, appearance, strength, durability and function, and be effectively protected from any damage or injury from the time of fabrication to the time of delivery and until final written acceptance of the work by the Owner.

I. Enclosures: Fabricate fixture enclosures with a minimum No. 20 gauge (0.0359 inch) thick cold rolled sheet steel. Enclosures may be constructed of other metals, provided they are equivalent in mechanical strength, durability and in compliance with local codes and acceptable for the purpose.

J. Sheet metal work: All sheet metal work shall be free from tool marks and dents, and shall have accurate angles bent as sharp as compatible with the gauges of the required metal. All intersections and joints shall be formed true of adequate strength and structural rigidity to prevent any distortion after assembly.

K. Castings: All aluminum, iron or composite castings shall be exact replicas of the approved patterns and shall be free of sand pits, blemishes, scales and rust, and shall be smoothly furnished. Tolerance shall be provided for any shrinkage of the metal castings in order that the finished castings will accurately fit in their designated locations. Unless otherwise noted for cast aluminum components use copper free 319 or 443 aluminum alloy only. For cast iron components use ASTM Spec A48-83 Class 30 gray iron.

L. Mounting frames and rings: If ceiling system requires, each recessed fixture shall be furnished with a mounting frame or ring compatible with the ceiling in which they are to be installed. The frames and rings shall be one piece or constructed with electrically welded butt joints and of sufficient size and strength to sustain the weight of the fixture.

M. Yokes, brackets and supplementary supporting members needed to mount lighting fixtures to carrier channels, suitable ceiling members or other structure shall be furnished and installed by the Contractor.

N. For steel and aluminum fixtures all screws, bolts, nuts and other fastening and latching hardware shall be cadmium or equivalent plated. For stainless steel fixtures, all hardware shall be stainless steel. Whenever possible all fasteners shall be captive type. Where indicated provide tamper resistant fasteners.

O. Welding shall be in accordance with recommendations of the American Welding Society and shall be done with electrodes and/or methods recommended by the manufacturers of the metals being welded. Welds shall be continuous, except where spot welding is specifically permitted. Welds exposed to view shall be ground flush and dressed smooth. All welds on or behind surfaces which will be exposed to view shall be done so that finished surfaces will be free of imperfections such as pits, runs, splatter, cracks, warping, dimpling, depressions or other forms of distortion or discoloration. All welded surfaces shall be free of weld splatter and welding oxides.

P. Extruded aluminum frame and trim shall be rigid and manufactured from 6063-T3 aluminum alloy without blemish or warpage in the installed product. Miter cuts shall be accurate. Joints shall be flush and without burrs. Cuts shall maintain alignment with the light fixture located in its final position.

Q. All extruded aluminum fixtures shall be fabricated of 6063-T3 alloy (min. wall thickness .120) and in all cases shall be provided with heavy gauge internal alignment brackets in order to assure tight joints and a clean level and continuous appearance after installation. Unless otherwise noted, all end plates shall be continuously welded, filled and ground prior to application of final paint finishes so as to present a clean, seamless and monolithic appearance. Exposed fasteners on end plates shall be absolutely prohibited.

R. All fixtures with removable louvers, lenses, reflectors, refractors, cones or other shielding devices shall be supplied with integral safety chains. Contractor shall be responsible for insuring that all safety chains are securely fastened to shielding device and fixture housing.

S. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

T. Metal Parts: Free of burrs and sharp corners and edges.

U. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

V. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

W. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.
4. Laminated Silver Metallized Film: 90 percent.

X. Adjustable Luminaires:
1. Recessed Luminaires shall be aimable using pan/tilt adjustment accessible through the aperture, either by means of worm drive screws or thumbwheels. Removal of trim or optic shall not be required.
2. Surface or Pendant Luminaires shall have mounts that permit maximum range of motion for aiming. Moving elements shall have set screw locking or otherwise suitable friction fittings to ensure that luminaire does not shift after aiming.
3. During installation, aim each luminaire in general target area as scheduled, so that luminaires may be visible during testing prior to commissioning.
4. Where applicable, allow slack at fixture whips to permit aiming without causing strain on conductors. After aiming, neatly dress remaining slack tight to fixture yoke or mounts.

Y. Luminaire Accessories:
1. Extra lenses, louvers, snoots, and other scheduled accessories shall be installed as directed by Specifier during system aiming and commissioning. All unused accessories shall be turned over to Owner after commissioning for attic stock.

2.4 EXIT SIGNS

A. Description: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:
1. Lamps for AC Operation: LEDs, 70,000 hours minimum rated lamp life.
   a. Battery: Sealed, maintenance-free, nickel-cadmium type.
   b. Charger: Fully automatic, solid-state type with sealed transfer relay.
   c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
   d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
   e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

f. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and flashing red LED.

2.5 EMERGENCY LIGHTING UNITS

A. Description: Self-contained units complying with UL 924.
1. Battery: Sealed, maintenance-free, lead-acid type.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns lamp on when power supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

2.6 SOLID STATE (LED) LUMINAIRE SYSTEMS

A. Light emitting diodes used for interior applications shall have CRI as scheduled, with a minimum CRI of 80 if not identified. CRI of LEDs shall also have a CQS value matching the CRI, following the NIST color quality scale. CCT shall be as scheduled.

B. LED luminaires shall have integral light engine, heat sink, driver, and optic package. Minimum LM-80 depreciation to L70 at 50,000 hours under installed conditions. Minimum CRI of 85 with less than 50K CCT shift over mean life, binning to 2-step McAdams ellipse.

C. LED light engines shall be thermally fixed to heat sinks sized to appropriately dissipate gate heat under design load in the installed conditions. Lumen maintenance calculations shall be based upon the average ambient temperature at the luminaire housing or cavity area.
1. All interior LED luminaires shall be designed to meet an L70 mean life of at least 50,000 hours with scheduled drive currents.
2. All exterior LED luminaires shall be designed to meet an L70 mean life of at least 60,000 hours with scheduled drive currents.

D. LED drivers:
1. Drivers shall be solid state with integral heat sink. Driver shall have overload and short circuit protection, with a power factor of 0.9 to 1.0 and maximum THD of 20%.
2. Remote drivers shall be enclosed in NEMA enclosures.
3. Drivers shall be dimmable as scheduled.
4. Drivers shall have minimum mean life of 50,000 hours, with unlimited switching.

E. LED dimming and color control:
1. Verify that all scheduled LED luminaire drivers are compatible with the means of control indicated, either DMX-512, 0-10VDC, or low voltage dimmer.
2. Compatibility: Certified by manufacturer for use with individually specified luminaire and individually specified power supplies and/or drivers.

2.7 FINISHES

A. Painted surfaces shall be synthetic enamel with acrylic, alkyd, epoxy, polyester or polyurethane base, light stabilized, baked on at 350 degrees Fahrenheit minimum, catalytically or photochemically polymerized after application.

B. White finishes minimum 90% reflectance (semi-gloss).

C. Selection: Unless otherwise indicated, all external fixture finishes shall be as selected by the Architect/Engineer. Unless otherwise indicated, all fixture finishes shall be semi-gloss polyester powder coat enamel (color to be selected by Architect).

D. Undercoat: Except for stainless steel all ferrous metal surfaces shall be given a five stage phosphate treatment or other acceptable base bonding treatment before final painting and after fabrication.

E. Unpainted non-reflecting surfaces shall be satin finished and coated with a baked-on clear lacquer to preserve the finish. Where aluminum surfaces are treated with an anodic process, the clear lacquer coating may be omitted.

F. Unpainted aluminum surfaces: Finish interior aluminum trims with an anodized coating of not less than 7 mg. per square inch, of a color and surface finish as selected by the Architect/Engineer. Finish exterior aluminum and aluminum trims with an anodized coating of not less than 35 mg. per square inch of a color and surface finish as selected by the Architect/Engineer.

G. Metal finishes: Provide finishes of the color and type indicated and having the following properties:
   1. Protection of metal from corrosion: 5-year warranty against perforation of erosion of the finish from weathering.
   2. Color retention: 5-year warranty against fading, staining, or chalking from weathering including solar radiation.

2.8 REFLECTORS

A. Reflectors, cones or baffles shall be absolutely free of spinning lines, stains, ripples or any marks or indentations caused by riveting to other assembly techniques. No rivets, springs or other hardware shall be visible after installation.

B. Downlight reflectors shall provide minimum 45 degree lamp and lamp image cut-off unless otherwise specified.

C. Cone flanges shall be formed as an integral part of the cone and shall have identical color and finish as the cone, except as shown. The flange's major surface shall be perpendicular to the cone axis.

D. The reflecting surface of the cone or reflector shall be tested for proper sealing. Test per ASTM B136-63T. If any stain is visible, the specimen shall not be considered to have been properly sealed. Reflector cones shall be free of manufactured defects. The reflector inner surface shall be free of water spotting and shall maintain a reflectivity ratio of not less than 83% on clear specular finish.

E. All alzak parabolic cones shall be guaranteed by the manufacturer against discoloration for a minimum of ten years and in the event of premature discoloration shall be replaced by the manufacturer (including both materials and the cost of labor) at no cost to the Owner.

F. Where modification of standard fixtures are specified, fixtures shall be modified as required with lamp sockets positioned to provide desired photometric performance.

G. Where or if a "specular black alzak insert" is specified, high gloss baked black enamel applied to the reflector shall be considered an acceptable alternate.

H. Specular clear alzak reflector cones and parabolic louvers specified with the use of compact fluorescent lamps or triphosphor fluorescent lamps shall be provided with clear non-iridescent coating.

I. All fixtures with removable reflectors, louvers or baffles shall be supplied with safety chains. Contractor shall be responsible for insuring that all safety chains are securely fastened to reflector and housing.

2.9 STEMS

A. Each stem shall have a brass or steel swivel, hang straight, or other self-aligning device.

B. Stems shall be made of rigid metallic (steel) pipe only, minimum wall thickness of 0.062".

C. Wherever a fixture or its hanger canopy is applied to a surface mounted outlet box a finishing ring shall be utilized to conceal the box.

D. Unless otherwise indicated, all stems shall match in color and finish the color of the fixture which they support. Where no color is indicated, stems shall be semi-gloss baked white enamel.

E. Stems shall at the completion of installation and all other work be free of clamp marks, scratches and all other visual imperfections.

F. Unless otherwise indicated, stems shall be provided in order to adequately mount and level each fixture run with proper structural support per manufacturer's recommendations.

G. Pendant Fixtures: Install pendant lighting fixtures plumb and at a height from the floor as specified on the drawings. In cases where conditions make this impractical, refer to the Architect/Engineer for direction. Use ball aligners and canopies on pendant fixtures unless otherwise noted.

H. Pendant stems shall be equally spaced along every fixture run. If field conditions or fixture construction do not allow for this condition, the installing Contractor shall immediately notify the Architect/Engineer prior to commencement of the work.

2.10 LENSES, LOUVERS AND DIFFUSERS

A. Lenses/Louvers: General:
1. All lenses, diffusers, and shielding media shall be properly and securely mounted within fixture assemblies. Lay in type lenses and louvers shall not be acceptable. All shielding materials shall be tightly fitted with no loose panels or parts and shall show no visible light leaks of unintentional or unscheduled light.
2. All fixtures with removable cones, louvers or other shielding devices shall be supplied with safety chains. Contractor shall be responsible for insuring that all safety chains are securely fastened to housing and shielding device.

B. Lenses: Plastic
1. Unless otherwise indicated or otherwise authorized, all plastic shielding, lenses and diffusers shall be white opal clear 100% UV stabilized virgin acrylic or in special cases high impact polycarbonate (lexan). Use of polycarbonate lenses shall be restricted to those areas outlined in the National Electric Code (latest Bulletin). Use of polystyrene components is absolutely prohibited.
2. Plastic for lenses and diffusers shall be formed of colorless 100% virgin acrylic as manufactured by Rohm & Haas, DuPont, G.E. or equally acceptable manufacturers. The quality of the raw material must meet American Society of Testing Materials (ASTM) standards, as tested by an independent test laboratory. Acrylic plastic lenses and diffusers shall be properly cast, molded or extruded as specified and shall remain free of any dimensional instability, discoloration, embrittlement or loss of light transmittance for at least 15 years.

C. Lenses: Glass
1. Unless otherwise indicated or authorized all glass shielding, diffusers or lenses shall be clear tempered borosilicate glass. Soda lime glass material shall not be acceptable. Submit samples of glass elements upon request.
2. Glass used for lenses, refractors and diffusers in incandescent and tungsten halogen lighting fixtures shall be tempered for high impact and heat resistance; the glass shall be crystal clear in quality with a transmittance of not less than 92%. For exterior fixtures use tempered borosilicate glass, Corning No. 7740 or equal. For fixtures directly exposed to the elements and aimed above the horizontal with a radiant energy of 4.16 watts per square inch or greater, use Corning Vycor glass or equal.
3. Where optical lenses are used, they shall be free from spherical or chromatic aberrations and other imperfections, which may hinder the functional performance of the lenses.
4. Mechanical: All lenses, louvers or other light diffusing elements shall be removable but positively held so that hinging or other normal motion will not cause them to drop out.

2.11 MISCELLANEOUS

A. Comply with Division 26 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm)

C. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

D. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

E. Where (or if) indicated all remote step-down transformers and ballasts shall be properly wired to fixtures to insure that voltage drop does not exceed 5%, regardless of transformer's or ballast's location.

F. All remote step down transformers and ballasts shall be mounted in approved NEMA type enclosures and only located in areas previously deemed to be readily accessible by the Owner’s maintenance personnel.

G. Where indicated, all uplight or wallwash coves utilizing fluorescent equipment shall be installed so as to produce a continuous and unbroken band of light free of visual imperfections, socket shadows, light gaps, etc. The inability to provide this appearance shall be brought immediately to the Architect's/Engineer's attention prior to installation.

H. All fixture lengths whether straight or curvilinear shall be fabricated based upon the fixture manufacturer's or contractor's field verified dimensions only.

I. Fixture manufacturer shall coordinate conduit entry locations with installing contractor.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Contractor shall furnish and install lighting fixtures as noted on the drawings. Fixtures shall be completely wired and lamps installed and shall be in perfect operating condition at the time of completion.

B. Setting and Securing: The Contractor shall set lighting fixtures plumb, square, and level with ceiling and walls, in alignment with adjacent lighting fixtures, and secure in accordance with manufacturers' directions and approved shop drawings. Conform to the requirements of NFPA 70.

C. Mounting: Mounting heights specified or indicated are to bottom of fixture for suspended and ceiling mounted fixtures and to center of fixture for wall mounted fixtures. Obtain approval of the exact mounting for lighting fixtures on the job before installation is commenced and, where applicable, after coordinating with the type, style, and pattern of the ceiling being installed.

D. Coordination: The installing Contractor shall communicate with other trades as appropriate to properly interface, schedule and coordinate installation of lighting fixtures with other work.

E. Grounding: The Contractor shall ground non current carrying parts of electrical equipment. Where the copper grounding conductor is connected to a metal other than copper, provide specially treated or lined connectors suitable for this purpose.

F. Installation of fixture locations shall be in strict accordance with the intent of the contract drawings and approved shop, specifications and drawings.

G. Fixture locations: Do not scale electrical drawings for exact location of the lighting fixtures. In general, the architectural reflected ceiling plans indicate the proper locations of lighting fixtures, unless otherwise noted on architectural plans.

H. Unless otherwise shown on the Contract Drawings, lighting fixtures and/or fixture outlet boxes shall be provided with hangers to adequately support the complete weight of the lighting fixture. The design of hangers and the method of fastening other than what is shown on the Contract Drawings, or herein specified, shall be submitted to the Architect/Engineer for approval.

I. The Contractor shall provide all hangers, rods, mounting brackets, supports, frames, earthquake clips and other equipment normally required for the proper, safe and distortion-free installation in the various surfaces in which they appear. Determine surface types from the architectural drawings.

J. Instructions: Each lighting fixture shall be packaged with complete illustration and instructions showing how to install. Install lighting fixtures in strict conformance with manufacturer's recommendations and instructions.

K. The Contractor shall rigidly align continuous rows of lighting fixtures for true aligned appearance.

L. The Contractor shall support all lighting fixtures independently of ductwork or piping.

M. Splices in internal wiring shall be made with approved insulated "wire nut" type mechanical connectors, suitable for the temperature and voltage conditions to which they are subjected.

N. All wire utilized for connections to or between individual lamp sockets and lamp auxiliaries (i.e., wires which do not constitute "through circuit" wiring) shall be suitable for temperature, current, and voltage conditions to which it is subjected.

O. The Contractor shall install reflector cones, baffles, aperture plates, light controlling elements for air handling fixtures and decorative elements after completion of ceiling tiles, painting and general cleanup.

P. The Contractor shall replace blemished, damaged, or unsatisfactory fixtures as directed by the Owners' representative.

Q. All pendant mounted lighting fixtures within the same room or area shall be installed plumb, and at a uniform height from the finished floor. Adjustment of desired height (if required) shall be made during the installation phase. Unless otherwise shown on the Contract Drawings, stems and canopies shall be matched to the associated lighting fixtures.

R. Support for Lighting Fixtures in or on Grid-Type Suspended Ceilings: Use grid as a support element.

1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches (150 mm) from lighting fixture corners.
2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.

S. Suspended Lighting Fixture Support:
1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.

T. Embedded luminaires: In-grade or floor-embedded luminaires shall be set flush to surrounding surface.

U. Remote power supplies, drivers, ballasts, and controllers shall be located in accessible areas, out of view of occupants. Coordinate locations with Architect and other trades.

V. Adjust aimable lighting fixtures to provide required light intensities.

W. Connect power and control wiring in accordance with Division 26 specifications and Manufacturer instructions.

X. Lamp Seasoning:
1. Operate all solid state luminaires for 50 hours at full output prior to request for checkout. Contractor shall identify and replace any luminaire observed to have changes in output or color exceeding the specified range during the seasoning period.

Y. Addressable Luminaires:
1. Configure digitally addressable luminaires so that their control address aligns with schedules and control system drawings. Follow Manufacturer instructions for configuration of address at each luminaire.

Z. Fixture types [U1, U1A, U1B, U11, U16, U17, U18 and U18A] for gypsum board (including acoustical gyp) ceiling shall be installed for trimless spackle mud-in installation. Acoustic plaster ceiling back of panel shall be cut-out to install recessed mounting lighting fixture properly.

AA. All perimeter wall wash luminaires shall run wall-to-wall. Submittal shall include exact run length plan drawings for all locations based on field verified dimensions.

3.2 FIELD QUALITY CONTROL

A. Tests: Upon completion of installation of lighting fixtures, and after building circuits have been energized, apply electrical energy to demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.

B. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

C. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.3 AIMING AD ADJUSTMENT

A. All adjustable lighting units shall be aimed, focused, locked, etc., by the Contractor under the supervision of the Lighting Designer. The Lighting Designer shall indicate the number of crews (foreman and apprentice) required. All aiming and adjusting shall be carried out after the entire installation is complete. All ladders, scaffolds, lift equipment, safety belts, flashlights, walkie talkie equipment, etc. required shall be furnished by the Contractor at the direction of the Lighting Designer. As aiming and adjusting is completed, locking set screws and bolts and nuts shall be tightened securely.

B. Night work: Where possible, units shall be focused during the normal working day. However, where daylight interferes with seeing, aiming shall be accomplished at night.

C. Prior to final inspection, relamp all fixtures which have failed lamps, or lamps where visible color shift has occurred, and leave all lighting fixtures, equipment, and accessories in good, uniform operating condition. The Contractor shall replace any burned-out lamp during the first 100 days after the completion of the Contract.

END OF SECTION 26 51 00

SECTION 27 4116 – INTEGRATED AUDIOVISUAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract including instructions to Bidders, General and Supplementary Conditions and Division 1 Specifications Sections apply to the work of this Section.

B. ANSI-Infocomm standards (1M :2009, 2M :2010, 3M :2011, 4 :2012, 10:2013, F501.01:2015)

C. AES 67-2015

D. 2010 ADA Standards for Accessible Design

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Power, and all conduits for both power and low voltage, shall be furnished and installed by Electrical Contractor. All back boxes to be furnished and installed by Electrical Contractor as indicated in the Schedule of Responsibility on drawing TA-001 unless otherwise noted.

B. Coordination with the Electrical Contractor is required to assure correct audiovisual conduit routing, audiovisual back box locations, and technical power circuit locations as specified in Division 26 – Electrical.

C. Requirements and materials that apply to the work of others related to audiovisual systems are listed here to define and establish audiovisual system requirements. Coordinate the work of this section with the work of other sections as required in order to maintain satisfactory progress of the work of other sections. Refer to schedule of responsibility on TA-001, UON.

1.3 WORK OF THIS SECTION

A. This section covers all audiovisual (AV) systems as described for ***SCR2000 Renovation/ 425 Fawell Blvd, Glen Ellyn, IL 60137***. The objective is to provide professional systems, installed, acceptance tested, and ready to use.

B. This written specification and the large format TA series drawings shall be collectively referred to herein as the Contract Documents. System features that show up in one part may not be shown in others. In the case of conflict between written specifications and drawings, Contractor must seek written clarification from the Architect. In the event the Contractor fails to obtain such written clarification, the interpretation of the Architect will prevail. Where conflict exists with other specifications concerning such work or materials, this specification takes precedence unless otherwise approved in writing by the owner.

C. This section includes all labor, materials, equipment, and services necessary to furnish and install the Audiovisual System in College of DuPage ***SRC2000 Renovation, Fawell Blvd, Ellyn Illinois*** as shown on the drawings, including but not limited to the following:
   1. Ceiling Mounted Speakers
   2. Amplifiers
   3. Audiovisual Networking Equipment
   4. Digital Signal Processor
   5. Control Processor
   6. Control Touch panels
   7. Projectors
   8. Projection Screens
   9. Video Matrix Routers
   10. Video Signal Transmitters & Receivers
   11. Video Signal Converters
   12. Equipment Racks
   13. Patch Panels

1.4 PROJECT CONDITIONS

A. All dimensions and equipment locations shall be verified in the field prior to fabrication by the Audiovisual Contractor, who shall make at least one (1) visit to the job site prior to preparation of shop drawings.

B. Coordinate conduit placement, routing, and separation with the Electrical Contractor to ensure proper installation.

C. No claims for additional compensation shall be allowed due to the Audiovisual Contractor's misunderstanding of the work involved or lack of a thorough investigation of the job site.

1.5 CONTRACTOR RESPONSIBILITY

A. It shall be the responsibility of the Audiovisual Contractor to furnish and install equipment complete in all respects and to furnish and install any additional equipment required to fulfill the intent of the Contract Documents regardless of whether or not such items are herein specified or indicated without claim for additional payment or costs.

B. The work specified herein shall be accomplished by a single Audiovisual Contractor who has complete responsibility for the systems described. The Audiovisual Contractor is required to have five (5) years' experience with systems of similar size and scope in Event Facilities and Higher Education.

C. The Audiovisual Contractor shall be responsible for coordinating with other trades a complete and suitable installation of electrical isolation equipment to meet the intent of this specification.

D. No electrical equipment (except approved equipment) shall be located within the Acoustically Sensitive Spaces or installed on walls common to Acoustically Sensitive Spaces (Refer to Part 1 Paragraph 10). The Audiovisual Contractor shall report all discrepancies between this requirement and the Contract Documents to the Architect and Electrical Engineer prior to installation of such equipment.

1.6 DESIGN INTENT

A. The Audiovisual Contractor shall furnish and install Infrastructure and Major Equipment for system including but not limited to wire, cable, equipment racks, wiring devices, and listed Major Equipment. Infrastructure, Major Equipment, and installation of Infrastructure and Major Equipment shall be bid as one portion of the project.

B. The Audiovisual Contractor shall furnish line item pricing for Infrastructure and Major Equipment List written in this specification.

1.7 FUNCTIONAL REQUIREMENTS

A. SRC2000
   1. AUDIO
      a. The main audio reinforcement system of the space shall be ceiling mounted loudspeakers. Amplifiers for all speakers shall live in the control booth and be connected to the digital audio network for ease of routing and management. Having the speakers on the digital audio network will allow interface with simple systems for basic control as well as advance mixing capabilities with the digital console for large productions.
      b. Production wall panels shall be located throughout the space. These production wall panels shall house the analog and digital patch points specified for the project.
      c. Analog patch points shall be located throughout the space for signal transmission of wired microphones and audio sources which shall be interfaced with DSP device for audio management.
      d. Ethernet patch points shall be located around the space in production panels to allow for networked digital audio devices to be connected to expand input and output capabilities in key locations around the room.
      e. For ADA compliance, a portable infrared assisted listening system, hereinafter ALS, shall be provided. The ALS transmitter shall be capable of accepting either a head worn microphone in cases where voice lift is not being used, or a microphone input coming from a digital mixing console in cases where voice list is being used.
   2. VIDEO
      a. Three (3) permanently owner finished projectors shall be installed. These projectors shall be used to project video content onto a permanently mounted projection screen. Coordinate the installation of these projectors with the owner's representative.
      b. Seven (7) motorized, ceiling-recessed, tab-tensioned screens shall be installed.
      c. A video matrix frame shall be installed in the control room for routing of various video sources to video display devices in the system. Sources shall include a PTZ camera, local and remote computers/laptops with HDMI connection ports, video cameras with 3G-SDI connection ports and a production video switcher via HD-SDI ports. There shall be a minimum of one (1) input card slot available for late a comer input card. Remote computer connections shall utilize signal transmission over twisted pair. Outputs shall include the all locations where a projector is or can be permanently ceiling mounted. There shall be a 3G-SDI and single mode fiber optic patch panels to allow the Video Engineer to physically patch video signal to multiple locations throughout the space.
      d. 3G-SDI patch points shall be located around the space in production panels to allow for digital video devices to be connected to expand input and output capabilities.

e. Single mode fiber optic patch points shall be located around the space in production panels to allow for digital video devices to be connected to expand input and output capabilities. These patch points shall have a LC termination and include a panel mounted dust cover to protect against debris and other unwanted material from interfering with the connection.

3. CONTROL
   a. A control processor shall be installed in the system to monitor and control equipment in the system. This shall include video matrix switcher, all displays permanently connected to the video switcher, permanently mounted screens, audio DSP device and architectural and theatrical lighting devices.
   b. Eight (8) seven-inch (7") touch panel control shall be permanently wall mounted in key locations throughout the space.
   c. One (1) ten-inch (10") table top touch panel controller shall be provided. This control device shall have expanded control options for advanced use and room configuration. It shall have a minimum cable length of twenty-five feet (25').
   d. Several patch bays shall be provided to allow manual patching and routing of audio and video signals for various production needs. The contractor shall be responsible for furnishing patch cabling of appropriate length and assembly to meet the production needs as determined by the client. Confirm the exact quantity of patch cabling to be provided with the system with end users during training.

1.8 SCOPE OF WORK

A. Furnish shop drawings and receive approval, prior to fabrication and installation.

B. Furnish all materials and labor and any engineering services to supply a complete and professionally installed system in working order as described herein. Labor furnished shall be specialized and experienced in audiovisual system installation.

C. Furnish and install all wire and cable called out in the Contract Documents.

D. Coordinate all back box locations with the Electrical Contractor and appropriate general trades.

E. Furnish any additional items, not specifically mentioned herein, to meet system requirements as specified, without claim for additional payment. Such items may include but are not limited to hardware, transformers, line/distribution amplifiers and other devices for proper installation, interface, isolation, or gain structure.

F. Perform initial adjustments and verification tests. Submit verification test report to the Architect five days prior to commissioning.

G. Participate in acceptance testing and perform final adjustments utilizing Audiovisual contractor furnished test equipment and project engineers.

H. Furnish and participate in user training.

I. Furnish system documentation including copies of all relevant drawings and equipment manuals in compliance with the Contract Documents.

J. Furnish maintenance services for the specified period from the date of acceptance.

K. Guarantee all new equipment, software, hardware, components, and workmanship for the specified period from the date of acceptance.

L. Refer to drawing TA-001 Audiovisual General Notes for the Schedule of Responsibility.

1.9 SUBMITTALS

A. Pre-bid Submittals:
1. Contractors must pre-qualify in order to bid on this project. Contractors must provide proof of the following qualifications and certifications and evidence of experience in similar audio and/or video installations. Submit listed qualifications to Architect for review ten (10) days prior to submission of a bid. Late submittal will result in exclusion from bid.
a. Credential for project manager, project engineer, and lead installer which must include NICET, EST, and/or CTS-I certifications.
b. Proof of the AV Contractor's membership in NSCA or Infocomm International. Indicate current AVSP level.
c. Proof that the AV Contractor has been continuously engaged in the installation and service of AV equipment for at least five (5) years in systems of similar size, scope, and project type.
d. Proof that the AV Contractor is currently a Crestron Electronics Inc. Commercial Elite Partner in good standing, and holds the DMC-E certification.

B. Bid Submittals:
1. Contractors shall examine all drawings and read all divisions of this specification in order to avoid omissions and duplications and to ensure a complete job. No allowances shall be made for failure to read and understand the Contract Documents. Discrepancies between drawings and the specifications or obvious omissions shall be referred to the Architect prior to the bid date. Where discrepancies occur and pre-bid instructions have not been obtained, the Contractor agrees to abide by the Architect's decisions.
2. Bid proposals shall include all work and all equipment as specified, as well as any additional equipment and materials not listed here, to be used in assembling the system to fulfill the design intent.
3. The bid submittal shall include the following:
a. Infrastructure and Major Equipment List and installation bid.
b. Major Equipment List line item pricing.
1) Installation costs for General Equipment including hardware and labor shall be furnished.
2) Pricing shall include in-bound freight, shipping, and all delivery charges.

C. Shop Drawings Submittals:
1. Within thirty (30) days of contract award, submit four (4) copies of detailed shop drawings to the Architect for approval. All shop drawings shall be marked with the related drawing number when submitted.
2. System installation and fabrication shall not begin without written approval from the Architect.
3. Review of shop drawings shall not constitute final approval of system function. Said review does not in any way relieve the Contractor from the responsibility of furnishing material or performing work as required by the Contract Documents.

4. Failure of the Contractor to submit shop drawings in ample time for the evaluation shall not entitle the contractor to an extension of contract time, and no claim for extension by reason of such default will be allowed.
5. At a minimum, shop drawings shall include:
    a. Table of Contents
    b. Itemized list of all equipment and materials to be used in assembling the system.
    c. Catalog cut sheet or data sheet for each listed item.
    d. One line Signal Flow diagrams for all sound reinforcement systems, visual systems, and auxiliary systems showing point to point wiring interconnections of all equipment with wire run numbers and patch bay designations. Show all transformers, switches, relays, control circuits, and modifications to equipment. Show all equipment items which are required for realization of the functions described herein.
    e. Complete lists of all wire run numbers along with the termination location of each end of each wire run.
    f. Schematic diagrams for any custom circuitry and all typical connections between audio lines, patch bays, visual system lines and rack mounted equipment.
    g. Drawings of all items which are to be custom fabricated or modified. Drawing shall be in scale suitable for fabrication. They shall show materials, finishes, hardware, back boxes, connectors, and panel/control markings. Submit samples of lettering/label size and typeface to be employed on custom plates, panels, and other equipment.
    h. Submit samples of custom work, finishes, or other materials as required by the Architect to verify appearance and quality. All costs for shipping samples shall be the responsibility of the Contractor.
    i. Full size drawings illustrating the physical layout and labeling of patch bays.
    j. Mechanical drawings of all assemblies, major and sub-assemblies, racks, cabinets, and enclosures, indicating provisions for proper cable management, power management, and thermal management.
    k. Mechanical drawings showing all proposed mounting details of all major equipment (e.g. loudspeakers, cameras, projectors, video displays, projection screens), and associated rigging and interface with adjacent architecture.
    l. Vibration and noise control information shall be included and coordinated with the Electrical Contractor.
    m. Conduit Routing Plan, to be coordinated with electrical contractor prior to cable pull.
    n. Cabling schedule providing information as detailed in Infocomm Standard F501.01:2015 to be coordinated with the Architect and Owner prior to cable pull and termination.
6. The above listed drawings shall be produced on AutoCAD 2004 min. or similar computer drafting program. Scans or photocopies of the Contract Documents are not acceptable.
7. The use of electronic files from other sources (e.g. Architect's backgrounds, Architect's drawings, vendor-supplied panel drawings) shall not absolve the Contractor of the responsibility for ensuring that the Shop Drawings represent a completely engineered coordinated system. The Contractor has final responsibility for providing systems that conform to all requirements in the Contract Documents.
8. The Contractor shall review Electrical Contractor shop drawings for all vibration and noise control equipment and systems information.

9. Proposed Touchpanel Graphical User Interface (GUI) layouts shall be submitted for approval prior to the commencement of control system programming.

D. Substitutions:
1. Substitutions shall be submitted as per the General Conditions of the Contract Documents.
2. The proposed substitutes must be equivalent or superior to the specified products in quality, performance, construction, function, conformance to system objectives and not affect system functionality, signal type, distribution, and features.
3. All substitutions must receive the express written consent of the Architect and Owner.
4. The Architect reserves the right to substitute new products which become available subsequent to the issuance of the Contract Documents, provided that:
   a. The contractor has not yet purchased the originally specified equipment.
   b. The substitute equipment shall not materially increase the Contractor's cost.

1.10 JOB CONDITIONS

A. Keep the job adequately staffed at all times. Unless illness, loss of personnel, or other circumstances beyond the control of the Contractor intervene, keep the same individual charge throughout.

B. Cooperate with all appropriate parties in order to achieve well coordinated progress with overall construction completion schedule and satisfactory results.

C. Watch for conflicts with work of other contractors on the job and execute, without fair claim for extra payment, moderate moves or changes as are necessary to accommodate other equipment or to preserve acoustic or visual performance, symmetry, and pleasing appearance.

D. Immediately report to the Architect any design or installation irregularities, particularly architectural elements that interfere with the intended coverage angles of loudspeakers, camera, or projection equipment, so that appropriate action may be taken.

E. Perform any and all cutting, patching, and painting for proper and finished installation of the system and repair any damage done as a result of such installation.

F. Audiovisual System work areas are to be maintained in a clean and orderly condition. Clean up and dispose of trash from all audiovisual system work areas.

1.11 ACOUSTICALLY SENSITIVE SPACES

A. The following areas have been designated as "Acoustically Sensitive Spaces:
1. SRC2000
2. Control Rooms
3. Amplifier Rack Rooms
4. Electrical Equipment Spaces
5. Mechanical Equipment Spaces

B. An acoustically sensitive space is defined as a room or space, which requires special construction consideration to meet room acoustic, acoustic isolation, and noise control or vibration control requirements.

C. All conduit runs penetrating acoustically sensitive spaces shall have both ends sealed by means of removable closed cell neoprene foam after all cables have been run to prevent sound transmission from adjacent spaces.

D. All audiovisual wiring devices in acoustically sensitive spaces shall have a gasket sealing the faceplate to the back box to prevent sound transmission from adjacent spaces.

1.12 DELIVERY AND HANDLING

A. The Audiovisual Contractor shall be responsible for all deliveries of material to the construction site. The Owner will not accept deliveries.

B. The Audiovisual Contractor shall coordinate delivery and installation of all equipment with the Construction Manager and/or Electrical Contractor.

C. If required by the Construction Manager or Electrical Contractor, audiovisual equipment shall be delivered in a minimum of three (3) separate shipments that shall include:
   1. Shipment #1: All items in which conduit is terminated which includes backboxes, wiring device faceplates with receptacles, projection screen cases, etc.
   2. Shipment #2: All items which require structural backing such as rigging components, monitor and projector mounts, etc.
   3. Shipment #3: All items that are not required until the building/area of work is secure and ready for electronic equipment. This shall include equipment racks, wiring device face plates, portable equipment, etc.

D. Audiovisual Contractor shall deliver all material to the job site suitably crated, packed, and protected and bearing the label and the nomenclature of the product(s) found in each carton or crate.

E. Audiovisual equipment shall be stored according to manufacturer's recommendations at a minimum. Equipment must be stored in a location protected from vandalism and weather. Manufacturer’s storage specifications - in particular, those relating to temperature - shall be followed. All storage costs shall be included in Contract price.

1.13 QUALITY ASSURANCE

A. Parts listed shall be complete and equipment furnished shall conform to manufacturer’s specifications.

B. All materials shall be new and shall conform to the applicable provisions of Underwriter’s Laboratories (ULEQ) and American Standards Association (ASA).

C. Procure and pay for all permits, licenses, and inspections, and observe any requirements stipulated therein. Conform in all trades with all local regulations and codes.

D. Comply with federal, state, and local labor regulations and applicable union regulations.

E. Installation shall conform to the latest federal, state, and local electrical safety codes of authorities having jurisdiction. Where conflict exists, the most stringent code or regulation shall apply.

1.14 GUARANTEE AND SERVICE

A. The Audiovisual system shall conform to all applicable code requirements and shall be in conformance with industry standards of operation and practice.

B. All new systems and components shall be guaranteed free of defects in materials and workmanship for a period of one (1) year from the date of acceptance and shall be repaired or replaced within forty-eight (48) hours following report of such defects by the owner.

C. Installation of relocated existing equipment shall be guaranteed free of defects in materials and workmanship for a period of one (1) year from the date of acceptance and shall be repaired or replaced within forty-eight (48) hours following report of such defects by the owner.

D. All audiovisual system software updates shall be automatically issued to the Owner free of charge during the warranty period.

E. The Contractor shall be available on call and on eight (8) hour notice during the first month following acceptance of the system, to assist the Owner's representatives in any problems which may arise during the initial period of operation.

F. The Contractor shall provide same day response to service requests, via 24/7 phone support.

G. If during guarantee period any component is out of service for more than seven (7) consecutive days due to unavailability of parts or service, the contractor shall furnish and install identical new component. If an identical component is not available, the contractor will substitute equivalent equipment with written approval of the owner.

H. During the course of the guarantee period, the Contractor shall provide a minimum of three (3) service visits to the site for inspection and adjustment of equipment and programming. Contractor shall submit proposed schedule for these visits and shall notify Owner and Architect in writing at least one (1) month in advance of each visit.

1.15 INSURANCE

A. All equipment and materials shall be fully insured against loss or damage up until acceptance of the system by the Owner or until the Owner relieves the Contractor in writing of this responsibility, whichever is earlier.

PART 2 - EQUIPMENT

2.1 GENERAL

A. Whenever any equipment is specified by manufacturer and model number, it is for the purposes of establishing a standard of quality, performance, construction, and function.

B. All materials and equipment shall be new and of the latest design or model offered for sale by the manufacturer.

C. Equipment models furnished shall operate at the required AC line voltage (i.e. 120 Volts) and frequency (i.e. 60 Hz)

D. Contractor shall furnish at minimum, quantities as indicated in the Contract Documents as required for complete installation.

E. Audiovisual Wire and Cable:
   1. Approved manufacturers:
      a. Belden
      b. Berk-Tek
      c. Liberty
      d. Crestron
      e. Extron
      f. West-Penn
      g. Panduit
   2. All wire numbers listed in the Contract Documents are Belden unless otherwise noted.
   3. Where required, install plenum rated cable listed and labeled for plenum installation.

F. Electrical Wire and Cable (including ground conductors)
   1. Where conflict exists with any codes or ordinances, such codes and ordinances shall take precedence.
   2. Where conflict exists with Electrical Specifications, the higher standard or more stringent requirement shall apply.

G. Wiring Devices:
   1. Specifications – Duplex Receptacles
      a. Grade: Specification, Hubbel IG5362 or equal
      b. Type: NEMA 5-20R
      c. Color: Orange
   2. Specifications – Plug Mold
      a. Grade: Wiremold V/G 2000 Series or equal
      b. Size: As specified or required.
   3. Specifications – Outlet Strips
      a. Grade: UL Listed, Wiremold or equal.
      b. Size: As specified or required.
   4. Approved Manufacturers:
      a. Waber
      b. Wiremold
      c. Hubbell
      d. Bryant
      e. GE
      f. Leviton

H. Electrical Plates and Panels:
   1. Specifications – Rack mount panels
      a. Material: 11 gauge steel or 1/8” aluminum, minimum thickness.
      b. Finish: Black or to match adjacent equipment.
      c. Size: 19” wide, standard EIA mounting hole spacing, height as specified or required.
   2. Specifications – Back Box Enclosures

a. Material: Code grade steel.
b. Finish: Black or Galvanized.
c. Size: As specified or required.

3. Specifications – Plug Box and Termination Panels
   a. Material: 11 gauge steel or 1/8" aluminum, minimum thickness.
   b. Finish: Black (unless otherwise noted by the Architect).
4. Any and all recessed face plates shall have a minimum ¾" reveal beyond the back box to hide the intersection between the wall material and the back box excluding standard decora-style plates.
5. Approved Manufacturers:
   a. Hoffman
   b. Whirlwind
   c. Pro-Co
   d. Wireworks.

I. Any equipment to be located outdoors or in damp locations must carry a NEMA 3R rating and be labeled accordingly.

J. Audio Transformers:
1. All transformers shall be selected for proper installation and load of the circuits as required by as-built conditions and per manufacturer's recommendations.

K. Control System Programming:
1. All control system programming, installation, testing, and debugging to be performed by a manufacturer certified programmer, supplied either directly by the AV Contractor staff or via a manufacturer authorized and certified independent programmer.
2. AV Contractor shall furnish complete control system programming, including all source code and on-site coordination, testing, and debugging.
3. AV Contractor shall furnish all programming of control system equipment including:
   a. Nightly system shut down.
   b. Janitorial/Off-hour maintenance control.
   c. Emergency Life/Safety override.
   d. Audiovisual source equipment selection (e.g. Audio Source, Video Source, Display Selection)
   e. Audiovisual source equipment transport control (e.g. play, pause, stop, forward, reverse).
   f. Master Volume control
4. Touchpanel interfaces shall have two (2) modes of operation:
   a. User Mode:
      1) Basic controls of all system components
      2) Streamlined user interface.
      3) Room modes available via single button presets
   b. Tech Mode:
      1) Advanced control and configuration of system components.
      2) Setup of presets
5. Pushbutton interfaces shall have the following control options:
   a. Presentation Mode:
      1) Display of presenter's computer through an audiovisual wiring device to the display

2) Presenter's microphone through the system to the loudspeakers.
3) Audio from the presenter's computer through the system to the loudspeakers.

b. Video Mode:
1) Display of a video source through the audiovisual system to the display.
2) Audio from the same video source through the audiovisual system through the system to the loudspeakers.

c. Aux Mode:
1) Display of a video source through the system via an auxiliary input.
2) Audio from the same video source though the system via and auxiliary input to the loudspeakers.

d. Source Selection Control, which provides the ability to:
1) Select any source equipment to be displayed on any video display in the system and routing audio from that source through the system to the loudspeakers.

e. Source Transport Control, which at minimum provides the ability to:
1) Play, pause, stop, forward, reverse and source equipment in the system.

f. Master Volume Control of the system.

6. In rooms where a volume control system and digital signal processor (DSP) exist, the control system shall be programmed such that:
a. The appropriate preset on the DSP system and display system shall be selected based on that activity taking place.
7. Provisions for control from a computer via web interface (e.g. XPanel) shall be included.
8. Control system programming shall accommodate future addition of touchpanels and mobile applications (e.g. Crestron Mobile Pro) for Apple iPhone/iPad and Android devices.
9. AV Contractor to schedule meeting with owner and Architect to review control system functionality and operational requirements prior to the commencement of work.

L. Audio DSP System:
1. Audio Inputs
a. All system audio inputs shall be programmed with limiters.
b. It shall be possible to matrix any input to any output within the system.
2. Audio Outputs:
a. All audio outputs shall be programmed with high pass filters, parametric equalization, delay, and limiters.
b. It shall be possible to matrix any input to any output within the system.
3. Assistive Listening or Hearing assistance System (HA):
a. HA shall receive the same signal as being heard via the loudspeakers.
b. HA shall be set up in accordance with ADA requirements.
4. The DSP software shall be installed on the digital audio work station (DAW) specified in the Major Equipment List.

M. Equipment furnished shall be that specified herein.

N. Detailed performance specifications shall be those published by the manufacture effective on the date of this document for all equipment specified herein.

O. The AV Contractor shall verify all projection screen dimensions, surface type, and frame style with the Contract Documents and submit the information with the required shop drawings for

approval by the architect prior to ordering any material. Failure to coordinate screen information shall not result in additional costs to the Owner.

P. The AV Contractor shall verify all projector lenses for appropriate focal length and intended image size with the Contract Documents, based on field measurements of actual throw distance. Failure to coordinate lens information shall not result in additional costs to the Owner.

Q. All miscellaneous materials including brackets, pole extensions, mounting hardware, electrical connectors, and other items to properly install the equipment specified shall be included as part of this project whether it is listed or not.

R. Existing structural mounting to be reused as conditions permit.

S. If required, Cost Reduction and/or Value Engineering shall be conducted by the Architect and Owner based on final bid amounts.

2.2 MAJOR EQUIPMENT

A. Vendor Quotes:
1. Contractor shall be responsible to coordinate with owner to verify if the project is eligible for specialty pricing do to, but not limited by quantities, project registration or specialty promotions from all equipment manufactures equipment for this project, as well as the associated soft costs and misc. hardware and cabling costs with those products in this project.
2.

B. Major Equipment List:
1. The major equipment list itemizes major system components and their quantities to provide the systems as shown in the contract documents. It is the responsibility of the contractor to provide any additional accessories, patch cabling, interfaces, and other miscellaneous equipment not described herein to provide a working system as called out in the functional requirements section of this specification (1.7), unless otherwise noted as owner furnished or future equipment. For items not given specific quantities in these documents, it is the responsibility of the contractor to verify those quantities with the owner and architect prior to system installation

Manufacturer	Model/Part#	Description	Qty	Notes
Blackmagic Design	HD optical mini converter	bi-directional fiber optic mini-converter	6	
Blackmagic Design	SDI D.A.	SDI mini-converter distribution amp	4	
Cisco	SG300-28P	28-Port Gigabit PoE Managed Switch	2	
corning	CCH-04U	Closet Connector Housing (CCH), Black, Empty, Four Rack Unit High (4 RMU), Holds Twelve CCH Connector Panels	1	
corning	CCH-CP08-A9	Closet Connector Housing (CCH) Panel, LC adapters, Duplex, UPC, 8 fiber, Single-mode (OS2)	12	

custom patch panels		See TA-550 thru TA-552	12	
Draper Inc.	143030	Ultimate Access V, matt white XT100V ceiling mounted tab tensioned 165" diagonal motorized screen (87.5”x140”)	6	KEYNOTE 1B
Draper Inc.	145003	Ultimate Access XL V, matt white XT100V ceiling mounted tab tensioned 226" diagonal motorized screen (120”x192")	3	KEYNOTE 1C
Extron	70-971-01	BB710M Back box for 720M	8	
Extron	60-1434-01	IPCP Pro 555 control processor	1	
Extron	60-1341-02	TLP Pro 1220TG 12" tabletop TouchLink Pro Touchpanel	1	
Extron	30-1394-03	TLP Pro 720M 7" touch panel	8	KEYNOTE 4D
Extron	60-1545-01	16x16 multi input Matrix Router XTP II CrossPoint 1600 Frame. Modular Digital Matrix Switchers from 4x4 to with SpeedSwitch® Technology	1	
Extron	70-1050-01	Four Input Board, 3G-SDI with Stereo Audio	1	
Extron	70-1113-01	Four Output Board, HDMI 4K/60 with Stereo Audio	1	
Extron	70-939-01	Blank Plate for XTP Matrix	8	
Extron	70-940-21	Four Input Board, XTP 4K with IR/RS-232 Insertion	2	
Extron	70-943-21	Four Output Board, XTP 4K with IR/RS-232 Insertion	2	
Extron	60-1304-01	DSC HD-3G A, HDMI to 3G-SDI Scaler with Audio Embedding	4	
Extron	60-1298-01	Four Port XTP Power Injector	6	
Extron	60-1199-01	XTP CATx Scaling Receiver for HDM	7	
Extron	60-1216-12	XTP T UWP 202, two Input XTP Transmitter for HDMI and VGA - Decorator-Style Wall plate Black	8	
Extron	60-1558-01	Sharelink 250	7	
Middle Atlantic	PDLT-815RV-RN	Rackmount power/lighting 8 outlet, 15A, 2-Stage surge	2	
Middle Atlantic	FD-44	Front door for equipment rack	2	
Middle Atlantic	WRK-44SA-32	44 RU equipment rack	2	KEYNOTE 6A
Yamaha	XMV8280-D	8 channels x 280 watts (4/8Ω) or 250 watts (70/100V). Dante digital audio network input	1	KEYNOTE 5A

Yamaha	MTX5-D	Digital signal processor with Dante	1	
Yamaha	VXC6	2-way, 6.5" woofer with 0.75" tweeter. 150W program at 8Ω. 60/30/15/7.5W 70V taps. Black grill. Priced AS SINGLE UNIT SOLD IN PAIRS	17	

PART 3 - EXECUTION

3.1 INSTALLATION OF SYSTEMS

A. Locate all apparatus requiring adjustments, cleaning, or similar attention so that it will be accessible for such attention. Equipment racks shall be positioned to permit full access for operation and service.

B. Furnish and install brackets, braces, and supports. Minimum fastening or support safety factor shall be at least five (5). Design shall be approved by the Architect.

C. All supporting structures supplied by the Contractor not having standard factory paint finish shall be painted. Paint specifications shall be supplied by the architect or indicated herein.

D. Provide custom color or finish for any equipment or materials supplied which are exposed to public view. Color and finish of all such equipment or materials shall be approved in writing by the Architect. This does not exclude equipment or materials where standard colors or finishes may be specified herein.

E. Finish of blank panels and custom assembly panels shall match adjacent equipment panels.

F. Switches, connectors, jacks, receptacles, outlets, cables, and cable terminations shall be logically and permanently marked. Custom panel nomenclature shall be engraved, etched, or screened. Markings for these items are detailed in the contract documents to ensure consistency and clarity. Verify any changes in working type size and/or placement with the Architect prior to marking.

G. The equipment specified herein is designed to operate in environments of normal humidity, dust, and temperature. Protect equipment and related wiring where extreme environmental conditions can occur.

H. Coordinate with millwork fabricator for installation of audiovisual equipment into credenzas, lecterns, etc..

I. XTP© System:
   1. The XTP System shall be installed and tested by an XTP Systems Design certified technician and/or engineer, in accordance with the guidelines set forth in the XTP System Design Certification Program.
   2. The College of DuPage shall provide an Extron Control Specialist to program and configure the XTP Matrix Router.

3.

J. AV Control System:
   1. The IPCP Control Processor and AV Control system shall be installed and tested by an Extron Certified technician and/or engineer, in accordance with the guidelines set forth in the Extron Control Specialist Certification Program.
   2. The College of DuPage shall provide an Extron Control Specialist to program and configure the IPCP Control Processor and AV Control system.
   3. The Audiovisual Contractor shall coordinate with College of DuPage to install and test emergency override setting in Yamaha MTX-5D digital signal processor.

3.2 CONDUIT

A. Review and coordinate audio installation with the Electrical Contractor to ensure proper operation of the audio system.

B. All wiring shall be in conduit unless authorized by the Architect, approved by the Architect in writing, and permitted by code. Exceptions are short runs at equipment terminations where there is no means of connecting conduit to the equipment.

C. Where installed exposed, conduits shall be parallel with or at right angles to walls or ceiling and /or follow surface contours and shall be supported from walls or ceilings by means of approved clamps or hangers. Conduit connections to equipment racks shall be insulated.

D. Minimum size conduit shall be trade size ¾". All conduits shall be sized for maximum 40% fill or less if required by code.

E. Conduits carrying high voltage or high amperage wiring serving equipment subject to abrupt start-up and possible slapping of wiring within conduit shall not pass through Acoustically Sensitive Spaces.

F. Conduits connected to dimmer racks or to transformers shall not pass directly into Acoustically Sensitive Spaces. Conduits connected to dimmer racks or transformers shall not penetrate walls, floors, or slabs of Acoustically Sensitive Spaces within thirty (30) feet of those equipment room walls or slabs. All penetrations in the path of conduits within thirty (30) feet of electrical rooms containing dimmer racks or transformers shall be resilient penetrations.

G. Large numbers of conduits penetrating walls of Acoustically Sensitive Spaces shall be individually sleeved and shall pass through walls, floors, slabs, and ceilings perpendicularly.

H. Conduits shall not be installed to connect or contact rigidly other non-electrical equipment or building systems which are vibration isolated.

I. Coordinate all conduit sizes, locations, and quantities with the Electrical Contractor to provide proper routing, signal separation, and wire group type. Failure to do so shall not allow for additional compensation. Provide a conduit routing plan for approval by the Architect prior to installation. Routing plan shall include intended sizes, separation, and cable fill chart.

J. Existing conduit and cabling infrastructure to be reused is to be done so to the maximum extent possible without compromising audiovisual system performance.

3.3 RESILIENT PENETRATIONS OF WALLS AND SLABS

A. All conduit and cable penetrations shall be sleeved, packed, and caulked airtight to form a resilient penetration at the following locations:
   1. Mechanical Equipment Rooms
   2. Electrical and Dimmer Equipment Rooms
   3. Acoustically Sensitive Spaces
   4. Rooms with Acoustically Isolated Construction.

B. Openings shall be oversized and sleeved to provide an inner diameter of one (1) to two (2) inches greater than the outside diameter of the duct or pipe. The conduit shall be centered in the opening and shall not rigidly contact the wall, floor, or ceiling. The resulting gap shall be packed with glass fiber packing material and foam rod. The gap shall be caulked to an airtight seal using permanently flexile acoustical sealant.

C. Acoustical sleeves may be used in lieu of resilient penetrations described above. Multiple conduit penetrations may be constructed following the detail for multiple penetrations identified in the Contract Documents.

3.4 ELECTRICAL POWER

A. Review and coordinate electrical power system installation including grounding with the Electrical Contractor to ensure proper operation of the audiovisual system.

B. Verify that All AC power circuits designated for audio equipment are wired with the correct polarity and ground. Report in writing any discrepancies found to the Architect for corrective action.
   1. Provide distribution of electrical power within the equipment racks with a minimum of one space AC receptacle for each four (4) in use per branch circuit.
   2. The Electrical Contractor shall ensure that all audio grounding does not intersect with any building ground except at earth.

3.5 STEEL SUPPORTS

A. Fabricate and install any supports so that the installation does not weaken or overload the building structure. Do not impose the weight of equipment or fixtures on supports provided for other trades or systems. No drilling or cutting of concrete beams, joists, or structural steel, nor welding to structural steel, shall be permitted except as authorized in writing by the Architect.

3.6 SEISMIC RESTRAINTS

A. All hanging or free-standing equipment and cabinets furnished, including but not limited to racks, loudspeakers, projection screens, and mounts shall be secured to substantial building structures. The equipment described herein shall resist seismic acceleration in any direction up to a limit of the greater of 1.0G or the limit prescribed by the local governing codes.

B. Loudspeaker hanging details, rack bracing, and other seismic restraints may not be shown on the Contract Documents. The Contractor is responsible for development of these drawings to be submitted and approved by the Structural Engineer.

3.7 BOXES

A. With the exception of portable equipment, all boxes, conduits, cabinets, equipment, and wiring shall be held in place and the mounting shall be plumb and square.

B. All boxes shall be securely mounted to building structure. All boxes shall be installed so that wiring contained in them is accessible. Install blanking devices or threaded plugs in all unused holes.

C. Wiring groups and circuits shall be isolated as indicated herein. Common pull or junction boxes are not permitted except as authorized in writing by the Architect.

D. Clean all box interiors prior to installing plates, panels, or covers.

3.8 WIRING METHODS AND PRACTICES

A. Furnish and install all audiovisual wire and cable ensuring proper pulling tension, bend radius, quantities, types, lengths, routing, wire group separation, and identification.

B. Spare wire runs of each group and type shall be pulled to each termination location. The number of spares shall be ten (10) percent of those in actual use or one, whichever is greater

C. Splicing of cables is not permitted between terminations of specified equipment.

D. Do not pull wire or cable through any box fitting or enclosures where change of raceway alignment or direction occurs; do not bend conductors to less than recommended radius. Employ temporary guides, sheaves, and rollers to protect cables from excess tension, abrasion, or damaging bending during installation.

E. Use wire pulling lubricants and pulling tensions in accordance with the wire and cable manufacturer's recommendations.

F. All wires shall be permanently identified at each wire end by marking with adhesive on crimp-on markers and a chart kept of each wire's function. This applies to wire within a rack assembly as well as wire running in conduit.

G. Wire ends shall be wrapped with appropriate heat shrink tubing. Each shield or drain wire shall be covered with heat shrink to avoid unintentional connections.

H. Use ring or tongue lugs on all barrier strip terminals. Do not exceed two (2) lugs per terminal. Use crimping tools that are designed for the application or solder. Do not cut strands from conductors to fit lug terminals. Spare terminal blocks, equivalent to ten percent (10%) of those in actual use shall be furnished.

I. Form in an orderly manner all conductors in enclosures and boxes, wire ways, and wiring troughs, furnishing circuit and conductor identification. Tie using tie wraps of appropriate size and type. Limit spacing between ties to twelve (12) inches and furnish and install circuit and conductor identification at least once in each enclosure.

J. When the audiovisual cables are pulled, leave a five foot (5') tail at each end to all field locations and a fifteen foot (15') tail at all equipment rack locations. Temporary labels shall be applied at both ends of each cable. Permanent labels shall be applied when the cables are cut back and terminated.

K. All labeling of audiovisual cables shall comply with Infocomm standard F501.01:2015. The numbering system used in compliance with this standard shall be verified with the owner prior to implementation. A schedule of all cabling and its labels shall be provided to the owner and Architect for review prior to pulling and termination of cables.

3.9 GROUNDING

A. Audiovisual system wiring shall conform to the following procedures:
1. Audio equipment AC ground pins shall connect to AC ground.
2. Audio equipment chassis shall connect to rack frames.
3. Audio rack frames shall connect to AC ground bus in panel board by means of #2 gauge (minimum) conductor
4. Audio shields between AC powered pieces of equipment shall be connected to ground at one end only. Terminate capacitance as required.
5. Audio signal paths between AC powered pieces of equipment shall be connected using balanced lines and/or transformer isolation as required.
6. No unbalanced signal paths may be connected to patch bays.
7. Isolate all audiovisual system wiring from racks, back boxes, and conduit.
8. Isolate all audiovisual system racks from conduit and other conductive surfaces. Use insulated bushings for conduit connections and a dielectric plinth between racks and conductive flooring.
9. AC isolated ground system shall be isolated from all other facility grounds.

B. All metallic conduit, boxes, and enclosures shall be grounded in accordance with the current National Electric Code (NEC).

C. Metallic enclosures containing active equipment shall be grounded with due regard for the minimization of electrical noise. This may include the provisions of grounding conductors separate from AC ground.

3.10 EQUIPMENT RACKS

A. The equipment racks shall be considered as custom assemblies and shall be assembled, wired, and tested in the Contractor's shop. Final assembly of racks shall take place on site after transportation but will conform to the same test results achieved in the shop.

B. Placement of equipment in equipment racks, as shown in the drawings, is for maximum operator convenience. The insertion of additional equipment not indicated herein or any changes of placement of the equipment must be indicated in writing to the architect before assembly.

C. Racks shall be installed plumb and square without twists in the frame or variations in level between adjacent racks.

D. All wire, cable, terminal blocks, rack mounted equipment, and active slots of card frame systems shall be clearly and logically labeled as to their function, circuit, or system. Labeling on manufactured equipment shall be by engraved plastic laminate or by thermal printer on adhesive tape, with white lettering on black background or dark background that is similar to panel finish.

E. Provide stiffeners to custom panels to prevent panel deformation during normal plugging or switching operations.

F. All field termination shall enter the rack via a bulkhead panel(s) mounted to the rear-rails of the equipment rack.

G. All wires and cable used in assembling custom panels and equipment racks shall be formed into harnesses which are tied and supported in accordance with accepted engineering practice.

H. Harnessed cables shall be combed straight, tie wrapped every eight (8) to twelve (12) inches, and attached to the structure as necessary. Each cable that breaks out from the harness for a termination shall be provided with ample service loop to permit equipment removal from the racks without disconnecting.

I. Harnessed cables shall be formed in either a vertical or horizontal relationship to equipment, controls components, or terminations.

J. Cables shields shall be connected to the isolated ground system with due regard for the ground loops.

K. All system components and related wiring shall be located with due regard from the minimization of induced electromagnetic and electrostatic noise, for the minimization of wiring length, for proper ventilation, and to provide reasonable safety and convenience of the operator.

L. All rack mounted equipment with front panel controls, shall be furnished with security covers to avoid tampering with preset levels. If specific security covers are not included in the equipment list, the Contractor will furnish the manufacturers suitable alternate.

M. Every device shall be installed with regard for proper polarity. Absolute polarity shall be maintained through the entire audio chain.

3.11 INITIAL ADJUSTMENT

A. Verify all circuits and extensions for correct connection, continuity, and polarity. Absolute polarity shall be maintained between all points in the system.

B. Connector polarity shall be maintained except for terminations at equipment manufactured to other standards. Verify that polarity connections are consistent throughout the system.

C. Verify that the audio system is operational and the system gain structure is within the recommendations of major component manufacturers.

D. Verify that the all video sources (cameras, players, etc.) and that all video destinations (Projectors, displays, recorders, etc.) are sending and receiving video signals. EDID parameters for all digital video devices shall be reviewed with the owner to verify resolution requirements at all video output devices. Confirm all equipment managed by the audiovisual control system can receive and send control signal as applicable, and that all control parameters and functionality as requested by the owner in the meeting prior to the beginning of work identified in section 2.1.K.9 of this specification have been implemented.

3.12 VERIFICATION TESTS

A. Confirm that each individual wire and cable run has been labeled and documented in compliance with Infocomm standard F501.01:2015.

B. Confirm that all system outputs are free of spurious signals including oscillations and radio frequency signals. Contractor shall furnish a wide band oscilloscope in order to verify this condition.

C. Confirm that the system is free of audible clicks, pops, hums, and other noises when any operating control is activated, with or without an input signal

D. For all audio and video lines, confirm:
   1. Proper circuits appear at each termination location.
   2. Proper circuits appear at each jack bay location.
   3. Continuity of all conductors.
   4. Proper polarity is maintained.
   5. Absence of shorts between conductors within each circuit.
   6. Absence of shorts between circuit conductors and conduit.

E. Confirm that the loudspeakers and mountings are free of buzzes and rattles when the speaker is swept with sine wave tones over its rated bandwidth at one-half (1/2) its maximum rated power.

F. For all permanently mounted loudspeaker terminations, furnish impedance measurement of each pair of loudspeaker lines with all loudspeakers connected and all amplifiers disconnected. These measurements shall be documented in a table listing impedance for each third octave from 20 Hz to 20 kHz and shall be accurate to the nearest 0.1Ω.

G. For each installed data network cable or fiber optic cable, verify that performance conforms to the relevant TIA/EIA specifications.

H. For all electronic devices mounted in racks and connected to patch bays confirm:
   1. Every audio input and output is balanced.
   2. Proper polarity is maintained throughout the entire audio signal path.

I. Confirm that there are no short circuits between the neutral and isolated ground conductors for each clean power circuit.

J. Confirm every input and output for video system including:
   1. Proper signal to displays.
   2. Proper sync to playback and recording equipment.

3.13 VERIFICATION TEST REPORT

A. Submit five (5) copies of a written report detailing the results of Initial Adjustments and Verification Test including all relevant drawings, charts, test instrument data and photographs. This report shall be completed and submitted to the Architect for review a minimum of five (5) days prior to Acceptance Testing and final tuning. With this report, submit written certification that the installation conforms to the requirements stated herein, is complete in all respects, and is ready for inspection, testing, and tuning.

3.14 ACCEPTANCE TESTING

A. Acceptance Testing shall be performed by the Architect during a period designated by the Architect. Contractor shall furnish a minimum of two (2) technicians for the acceptance testing period.

B. All systems shall be compliant with Infocomm standard 1M:2009 Uniform Distributed Audio Standard as applicable.

C. The minimum time required for Acceptance Testing is two (2) working days of dedicated quiet. Coordinate this time period so that free access, work lighting, and electrical power are available on site.

D. The AV Contractor shall bear any costs incurred for additional Architect's time and expenses due to failure to have the system functioning in accordance with specification requirements at the time scheduled for Architect's Acceptance Testing and Tuning.

E. Ensure that audiovisual areas are in a clean and orderly condition ready for Acceptance Testing.

F. At the time of Acceptance Testing, submit one (1) copy of the operation and maintenance manual to the Architect (refer to Paragraph 3.15).

G. Furnish test equipment meeting the following minimum specifications on site, at all times during the Acceptance Testing. Prior to Acceptance Testing, provide the Architect with a listing of the equipment model numbers and their software versions (if applicable) to be made available.
   1. Oscilloscope: 1GHz bandwidth sensitivity – 1mV/cm
   2. Digital Multi-meter: 1% accuracy
   3. Function Generator: 1GHz bandwidth, distortion <1%
   4. Real Time Analyzer: 1/3 octave with microphone.
   5. Pink Noise Source: 20 Hz – 20 kHz
   6. Impedance Sweep Meter: 20 Hz – 1 kHz range, 1Ω - 50Ω.
   7. Polarity Checker: Microphone level, Line Level, and Loudspeaker Level.
   8. NTSC bar graphs and other test patterns for video verification.
   9. Ultra High definition (4K60) Video test generator with VGA, DVI, HDMI 2.0, SDI, and 3G-HDSDI outputs

H. Be prepared to verify the performance of any portion of the system by demonstrations, listening, and viewing tests, and instrumented measurements.

I. Make additional mechanical and electrical adjustments within the scope of the work which may be deemed necessary by the Architect as a result of the Acceptance Test. This may include realigning and re-aiming of video or audio systems, changes in system gain structures, grounding, filtering, or interfaces.

J. Final acceptance will be contingent upon issuance by the Architect of a letter of acceptance stating that the work has been completed and is in accordance with the Contract Documents. The warranty period will begin upon issuance of said letter.

3.15 SYSTEM DOCUMENTATION

A. Within fifteen (15) days of the Acceptance Testing, prepare and submit five (5) neatly bound copies of the operations and maintenance manuals to the Owner. Manuals shall be placed in an orderly fashion into a three-ring binder with spine labels indicating contents. These copies are in addition to the one (1) copy furnished to the Architect during Acceptance Testing.

B. Manual shall include but not be limited to the following:
1. Table of contents
2. Written Guarantee and Service Policy
3. Basic power on/off and operational procedures.
4. All Available manufacturer's operation and service literature for each major system component
5. A one-line signal flow diagram with all cable runs and patch points identified by alphanumeric characters
6. A copy of the Verification Test Report
7. Two (2) copies of as-built conduit riser diagram obtained from the Electrical Contractor
8. A copy of the final tuning settings as furnished by the Architect
9. Electronic versions of all documents included in the manual and electronic back up of all software, firmware, and files to restore initial install presets for all applicable devices copied on to (2) USB storage devices.

C. Furnish a framed copy of the as-built signal flow diagram to be mounted in the control room, room 109 on TA documents**.** This diagram shall have all cable runs and patch points identified by alphanumeric characters.

3.16 TRAINING

A. The AV Contractor shall provide up to forty-eight (48) hours instruction in the safe and proper operation of the equipment, in particular the audio DSP, sound console, and control systems, to the owner's designated representatives.
1. AV Contractor shall schedule instruction with the Owner's designated representatives.
2. Instruction shall not necessarily follow immediately after the system commissioning.
3. Instruction shall be independent of the system check-out and activation. Duration of system commissioning shall not affect the length of instruction time.
4. Instruction, at Owners discretion, may occur in multiple time blocks of less than eight (8) hours each.
5. AV Contractor shall be responsible for making and furnishing video documentation of instruction for future viewing to the Owner. Video documentation can be requested by the owner up to the entire (48) hours of instruction as detailed in this section, and shall be

furnished to the owner as individual .mp4 files per training session. Files shall be labeled by the contractor indicating the date of training and a brief description of the content of the video. All files shall be furnished to the owner on a USB storage device provided by the contractor.

END OF SECTION 27 41 16

Division 27 – Communications

Section 27 0001 – Communications - General

System Description

The Owner has in place a state of the art cabling system that is supportive of the mission to provide voice, high speed data, video and multimedia services to the College of DuPage Main Campus and Satellite sites well into the future. The requirements for this cabling, its installation and termination equipment are very stringent to support these goals.

This document describes the product and execution requirements relating to new Telecommunications Cabling System for the College of DuPage and Regional Campus Locations. If exceptions or changes to these requirements are desired by A/E, A/E shall discuss proposed changes and exceptions with Owner's Information Department.

Qualifications/Personnel

A/E shall specify the following:

- The communications cabling system installation work detailed in these standards shall be carried out by a specialist installer, trained and certified by PANDUIT and capable of providing a system warranty as described herein.
- The Cabling Contractor shall have a Registered Communications Distribution Designer (RCDD) or equal as a permanent member of staff. The RCDD shall be in good standing with the Building Industry Consulting Service International (BICSI) and shall have a current registration.
- The Contractor shall hold a valid State Contractors License for the duration of the project. The installer shall be responsible for obtaining permits and other requirements for performing work on this project.
- The Cabling Contractor shall provide an on-site manager responsible for all Communication work. This individual shall be the single point of contact for the duration of the project.
- The Air Blown Fiber®, each bidder must submit current documentation signed by Sumitomo Electric Lightwave representative stating the Contractor is authorized and certified by Sumitomo Electric Lightwave to provide the FutureFLEX® Air Blown Fiber® cable products installation and warranty certification. Each bidder must also submit documentation with the bid, listing the names of employees that will be used on this project indicating their experience, level of expertise, and certificates of training signed by Sumitomo Electric Lightwave representatives.
- The Contractor shall furnish and install all Tube Cables, Tube Couplings, Tube Distribution Units (TDUs), Fiber Bundles, connectors, and equipment as shown on the drawings and per Sumitomo Recommended Procedures (SRP's).

Definitions

- Telecommunications Closet (TC): The generic term, this refers to the equipment rooms in which telecommunications cabling terminates. These rooms also house network, video and telephone electronics.
- Building Distribution Facility (BDF): The "Main wiring switching for the building
- Intermediate Distribution Facility (IDF): A secondary wiring switching room
- Horizontal Cabling: Cabling runs from Work Station to IDF or BDF.
- Backbone: Linkage from BDF to IDF.

- House Count: The Contractor shall cross-connect the first (BLUE) pair of each new workstation cable to the riser backbone to link the telecommunications closet to the next closet in the hierarchy. The cross connects wire of colors matching the color of the station cabling conductors (BLUE) shall be used for each cross connect.
- Backbone transmission media may be:
    - Traditional and Air Blown Optical fiber
    - Twisted-pair copper
    - Coaxial copper
    - A combination of the above
    - Miscellaneous support facilities
- Material needed for the proper termination and installation of the backbone cables:
    - Cable support hardware
    - Firestopping equipment and supplies
    - Grounding hardware (TIA/EIA-607)
    - Protection and security
- Inter-Building Cabling – First Level Backbone: provides the transmission path between adjacent buildings. Includes Fiber Optic and copper cabling.
- Intra-Building Cabling – Second Level Backbone: Provides the transmission path to join the main Telecommunications Closet (or BDF) with other TC's (or IDF) located within the building. Includes Fiber Optic and copper cabling.
- Horizontal cabling and Work Station Cabling: Provides the link from offices, classrooms and common areas to the Telecommunications Closet (TC) serving the area and includes the following transmission media:
    - 4-pair 100 Ohm Unshielded Twisted Pair (UTP) Category 6
    - Fiber Optic Cable (Multi-Mode and Single-Mode)
    - RG-6 Coax

Quality Assurance

A/E shall specify work in accordance with the following:

- Equipment and material shall be Underwriters Laboratories listed and labeled. The latest editions of the following codes, standards and guidelines are minimum requirements:
    - City, State, and Federal codes.
    - NFPA 70 National Fire Protection Agency
    - National Electric Code (NEC 1999)
    - Institute of Electrical and Electronic Engineers (IEEE)
    - TIA/EIA-568-B.1 Commercial Building Telecommunication Cabling Standard.
    - TIA/EIA-568-B.2 Commercial Building Telecommunication Cabling Standard.
    - TIA/EIA-568-B-2.1 Commercial Building Telecommunication Cabling Standard Category 6.
    - TIA/EIA-569 Commercial Building Standard for Telecommunications Pathways and Spaces.
    - TIA/EIA-606 the Administration Standard for Telecommunications Infrastructure of Commercial Buildings.
    - TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications.
    - TIA/EIA TSB-67 Transmission Performance specifications for Field Testing of Unshielded Twisted Pair Cabling Systems
    - TIA/EIA TSB-72 Centralized Optical Fiber Cabling Guidelines.
    - TIA/EIA TSB-75 Additional Horizontal Cabling Practices for Open Offices.
    - Telecommunications Distribution Methods Manual, (BICSI).
    - Manufacture's recommendations and installation guidelines.

Work Restrictions and Procedures

General Requirements

The A/E shall specify the following:

- The Cabling Contractor shall examine all drawings and specifications to familiarize themselves with the type of construction to be used, and the nature and extent of work provided by other trades.
- Beginning installation means Contractor accepts existing conditions.
- Contractor shall verify dimensions and the correct locations of hardware before proceeding with the installation of hardware, cabling and/or connections.
- The Cabling Contractor shall be responsible for identifying and reporting to the Owner any existing damage to walls, flooring, tiles and furnishings in the work area prior to start of work. All damage caused by the cable, raceway, or miscellaneous material to the interior surfaces during the communication installation shall be repaired by the Contractor. The repairs must match preexisting color and finish of walls, floors and ceilings. Any contractor damaged ceiling tiles are to be replaced to match color, size, style and texture and shall not be taken from Owner's attic stock.
- The Cabling Contractor shall be responsible for securing all Telecommunications Rooms and offices when not in use. At no time shall the Telecommunications Room be unattended if unsecured.
- Contractor should assume that all installation work including cable placement, termination and testing shall be performed between the hours of 7:00 a.m. to 5:00 p.m. Monday through Friday unless stated otherwise in the bid.
- Qualified personnel utilizing state-of-the-art equipment and techniques shall complete all installation work.
- The Cable system will be tested and documented upon completion of the installation as defined in the section below.
- Products selection, installation plans and termination layouts must be reviewed and approved by the Owner prior to construction. The review does not exempt the Contractor from meeting any of the requirements stated in this document.

Submittals

The A/E shall specify the following requirements

- At A/E option, Contractor shall submit a two-foot section of cable(s) of the type(s) to be sent to the site for final approval by the College. This two-foot section shall have the manufacturer's cable markings visible. Upon request, samples from every reel sent to the site shall be provided.
- At A/E option, Contractor shall submit if requested, a full mockup of the proposed Information Outlet and Jack configuration with appropriate cabling for each of the installation environments described below. A/E shall discuss full mockup requirements with Owner prior to specifying.
- Contractor shall submit house count table in spreadsheet/tabular format with shop drawing submittals. House count table shall include house count and location ID's.

Delivery, Storage and Handling

The A/E shall specify the following requirements:

- The Cabling Contractor shall be responsible for all deliveries of material construction site. The Owner will not accept deliveries.
- For purposes of bidding, it is to be assumed that the Owner will not provide storage facilities for material. Pending availability, however, this may be arranged subsequent to award.
- Cable shall be stored according to manufacturer's recommendations at a minimum. Cable must be stored in a location protected from vandalism and weather. If cable is stored outside, it must be covered with opaque plastic or canvas with provision for ventilation to prevent condensation and for protection from weather. Manufacturer's storage specifications - in particular, those relating to temperature - shall be followed. All storage costs shall be included in Contract price.
- Tools, materials and equipment shall be confined to area designated by the Owner. The Contractor shall clean up and dispose of all debris and rubbish resulting from work on a daily basis.
- The Contractor is responsible for the cleanup of the dust, debris, shipping and packaging material associated with their installation. The Owner's disposal containers, shall not to be utilized without written authorization.

BDF, IDF, MDF and TC Closet Layout and Requirements

The A/E shall specify and design based on the following requirements:

General Requirements:

- The assembly and installation of data racks, A/E shall confirm counts with Owner. These racks will be secured to the walls by a ladder rack to be provided and installed by the data contractor. This ladder will run across the racks from wall to wall and be attached to the data racks. There will also be a "t" section of this rack, running from the ladder rack to the wall behind the data racks to allow for the data cabling to be routed to the patch panels. The data racks will need to be fastened to the floor.
- Proper HVAC shall be provided in order to maintain operating temperature of 68 deg. F to 70 deg. F with humidity between 40-60 RH.
- Adequate lighting shall be provided in front and behind data racks and equipment.

Telecommunications Closets, IDF, BDF (General):

- The dimensions of this closet should be 8' X 10', minimum or larger per Owner and design requirements.
- The communications closet shall have walls sealed or covered to reduce dust development.
- Suspended acoustical ceiling is required.
- Floor shall be sealed or tiled.
- General building storage or plumbing fixtures (e.g. janitor sinks) shall not be permitted.
- Each data rack will need a dedicated 110 V quad circuit with an additional twist lock in parallel. The outlets should be installed near the bottom of the rack. The twist lock specification is L5-20R NEMA 20A 125V 1HP.
- Security System equipment may be installed in this space. If so, one dedicated 20A circuit shall be provided. Verify location of outlet with Owner.
- Security System shall be mounted on 4' x 4' x 3/4" plywood minimum.

- Telephone equipment may be installed in this space. If so, two dedicated 110 V circuits shall be provided. One circuit shall be used by the local PBX, one circuit shall be used by the service providers connecting equipment.
- Grounding bar shall be installed near the phone and data equipment.
- Wall phone jack is required. Verify location with Owner.
- Two data jacks and two voice jacks required. Verify location with Owner.
- 4’ x 8’ x 3/4” plywood shall be mounted horizontally at 6’-0” (to top of plywood) above finished floor for telephone and cabling equipment.
- Proximity reader controllers can be installed in this space.
- Room shall be secured with proximity card reader and electric lock.
- Adequate lighting shall be provided in front and behind data racks and equipment.

IDF Room:

- IDF: The dimensions of this room should be 8’ x 10’ minimum or larger per Owner and design requirements.
- Design requirements, at a minimum, similar to TC.

BDF Room:

- BDF: The dimensions of this room shall be determined by the A/E and will be dependent on equipment quantities and clearances. It shall be no smaller than 8’ x 10’.
- Design requirements, at a minimum, similar to TC.

Section 27 0003 – Communications - Terminations

Copper Termination Hardware at Telecommunications Closets

The A/E shall specify the following requirements:

- At the Telecommunications Closet(s), all Copper Cables shall be organized in a fashion compliant with established cabling standards at the College. Where adding to an existing installation, termination components shall be integrated into the existing plan and consider equipment positioning and labeling.
- The Contractor shall cross-connect the first 1st (BLUE) pair of each new workstation cable to the riser backbone to link the telecommunications closet to the next closet in the hierarchy. The cross-connects wire of colors matching the color of the station cabling conductors (BLUE) shall be used for each cross-connect.
- Each 4- or 5-pair group shall be positioned on the terminating hardware in numerical order based on Pair Count or Telecommunications Outlet I.D. with the lowest I.D. Number or Pair first.
- Termination hardware shall be suitable for mounting on walls, in racks, or in distribution frames. Wall mounted cross-connect fields and frames shall be arranged to allow for easy expansion.
- The Contractor shall provide house count to Owner.

Voice Copper Termination at TC (Backbone & Station)

The A/E shall specify the following requirements:

- At the Telecommunications Closet(s), each Voice "Backbone" Cable and 4-pair "Voice" Station cable and shall be terminated on high-density horizontal blocks. Each horizontal row of the cross-connect block must be capable of terminating one (1) twenty-five pair binder group (Tie Cables) or six (6) four pair groups (Station Cables). Where station cables are installed on 110 blocks, the 25th position of each horizontal voice block shall remain vacant.
- Backbone and Station blocks shall be segregated clearly identifying their function.
- The blocks shall be designed to maintain the cable's pair twists as closely as possible to the point of mechanical termination. The installer shall insure that the twists are preserved to within 1-inch if the termination.
- Blocks shall identify pair position by a color designation - Blue, Orange, Green, Brown and Slate (if applicable).
- The mechanical terminations shall:
    - Have the ability of terminating 22 - 26 AWG plastic insulated, solid and stranded copper conductors.
    - Provide a direct connection between the cable and jumper wires.
    - Insert less than 0.02 dB of attenuation @ 100 MHz
- Blocks shall be designed as to allow for cables to be fed from above or below.
- The Voice Termination Hardware shall be Panduit PAN-Punch 110 Cross Connect System. Wall mounted hardware shall be equipped with legs and shall consist of 300- (P110BW300-X) Wiring Blocks configured with P110CB4-X (4-pair) or P110CB5-X (5-pair) Connecting Blocks for Station and Backbone cabling, respectively.

Data Patch Panel

The A/E shall specify the following requirements:

- Copper Data Station Cables shall each be terminated at their designated TC to a Panduit patch panel.

- Category 6 performance per TIA/EIA T568B.2.1 must be maintained by the panel as a system and include this interface. All pair combinations must be considered, with the worst-case measurement being the basis for compliance.
- Jacks are to be pinned per TIA/EIA T568B with the pairing as follows:
    - Pair 1 - Pins 5&4
    - Pair 2 - Pins 1&2
    - Pair 3 - Pins 3&6
    - Pair 4 - Pins 7&8
- Panels shall incorporate cable support and/or strain relief mechanisms to secure the horizontal cables at the termination block and to insure that all manufacturers minimum bend radius specifications are adhered to.
- When multiple floors are being serviced in a closet, each floor should have separate patch panels. Each patch panel should start with lowest sequential number starting with one per each floor, per each closet and then increment by one until each panel is full or no more drops available on that floor with its closest closet. If possible the patch panel for each floor should be installed on a separate rack.
- Contractor shall discuss the use of 24 port patch panel with the owner before usage. Use of 24 port patch panel is discouraged.

Coaxial Patch Panel

The A/E shall specify the following requirements:

- All installed coaxial cables shall be terminated at both the TC and TO locations in a male "F"-Connector matched to the cable type. Connectors may be "Crimp" or "solder" type.
- Each terminated coaxial cable shall be then mated with a female "F" Connector coupling which is, in turn, mounted on a rack-mountable panel.
- Panels shall be of painted steel.
- Coaxial Patch Panels shall be Semtron "JP" Series" or equivalent.

Inter-building Cabling (Copper & Fiber)

The A/E shall specify the following requirements:

- Fiber optic backbone shall be terminated as SC in accordance with approved materials list.

Section 27 0002 – Communications - Materials

Data/Voice UTP Station Cable

The A/E shall specify the following requirements:

- Transmission characteristics of the cable shall meet full Category 6 performance as defined by TIA/EIA-568-B-2.1. Cable shall be UL and/or ETL verified Category 6.
- Cables shall be Underwriters Laboratory (UL) listed, comply with Article 800 (Communications Circuits) of the National Electrical Code and shall meet the specifications of NEMA (low loss), UL 444, and ICEA.
- The jacket color for Data Station Cables shall be BLUE.
- Data Station Cables shall meet a CMR (Riser) or CMP (Plenum) rating depending on the particulars of the installation and be suitable for installation in the environments defined including free-air, in conduit, in cable tray and in modular furniture.
- Cable shall be packaged in a way that minimizes tangling and kinking of the cable during installation. Examples are open reels or packages, which incorporate a rotating reel.
- Data UTP Station Cables shall be Panduit PUP6004BU-UY High Performance Category 6 plenum (CMP) Twisted 4-pair UTP copper cable or Panduit PUR6004BU-UY High Performance Category 6 riser (CMR) Twisted 4-pair UTP copper cable.

Coaxial Station Cable

The A/E shall specify the following requirements:

- Coaxial Station Cable shall be RG-6 coax.
- Cables shall incorporate a 20-AWG solid center conductor and a tinned copper double braid shield (98% coverage). Conductors shall be separated by polyethylene core insulation.
- Cables shall be suitable for installation "free-air" in COD building risers, above drop ceilings, in cable tray or in duct.
- Coaxial cable shall have the following nominal transmission characteristics:
    - 75-Ohm Characteristic Impedance
    - 66% Propagation Velocity
    - 1-pf/ft Capacitance
- Coaxial station cabling shall be continuous and splice free.
- Coaxial Station Cable shall be Belden p/n 8281A (CMR), CommScope Catalog # 2227K (CMP).

Telecommunications Outlet

The A/E shall specify the following requirements:

- At the workstation location, Station Cables shall each be secured in a housing, which shall also accommodate the termination assemblies for those cables. The combined assembly, referred to as the Telecommunications Outlet (TO), shall be modular in design and allow for flexibility in integrating the different configurations required at the site.
- There shall be one (1) basic Telecommunications Outlet configuration:
    - The "Copper-Only" Communication outlet that is capable of supporting only UTP and Coaxial Cabling.
- In addition, provision of a separate, "Voice Only" outlet that is installed to accommodate a wall-mounted Telephone Set shall be considered. This configuration, referred to as "Split Voice", can be used in concert with either of the above configurations.
- The color and material of the frame cover and inserts (if applicable) shall be Electric Ivory Plastic.

- The cover of the telecommunications outlet shall be secured to the base with a screw. The screw(s) shall, in turn, be hidden from view by a label or other covering to discourage casual access.

Copper Only Outlet

The A/E shall specify the following requirements:

- The Copper-Only Outlet shall comply with the general requirements defined above and with the following *additional* requirements:
    - The Copper-Only Outlet shall provide adequate capacity to accommodate the following maximum configurations:
        - Two (2), four (4) or six (6) modular jacks (Voice or Data)
        - The same as above but one (1) "F" Connector substituted for one (1) modular jack.
    - All jacks and couplings shall mount on either the base of the unit or the cover.
    - The Copper-Only Outlet shall be available in both "flush" and surface mount designs and shall be adaptable to mounting on cellular floor presets or posttests poke thru or under floor wiring.
    - Where flush mounting is not possible, a Surface box shall be used. Surface Box shall be Panduit Single Gang One-piece Deep Box.
- Wall-Mounted Copper-Only Outlets
    - Wall mounted Copper-Only Telecommunications Outlets shall be Panduit CFPL2 2 Port CFPL4 4 Port and CFPL6 6 Port.
- Floor-mounted Copper Only Outlets
    - Floor-mounted Copper-only Outlets shall comply with the above general requirements plus the following:
        - Floor-mounted Copper-only Outlets shall be mounted in an aluminum floor "monument".
        - Communications jack assemblies shall mount on one side of the assembly and be sideways facing (parallel floor). Mounting plates shall be designed to accommodate the modular jack type installed.
        - A protective bracket shall be available to guard against damage to the jack assemblies or patch cord plugs.
        - "Copper-Only" Telecommunications Outlets shall be Walker 500HB (Monument) and 500B back plate, with 500DR front plate. Monument shall be fitted with adapter(s) appropriate for the floor-type being accessed.
        - Jack assemblies shall be mounted on Panduit CF1062 for 2 port and CF1064 for 4 port access. Bracket shall be 500-GUARD.
- Wall mounted Voice Only Outlet
    - Wall-mounted "Voice Only" Outlets shall consist of a mounting plate on which a telephone set may be mounted.
    - The Wall Plate shall be of Stainless Steel construction, mount on a standard single gang outlet box or bracket and include mating lugs for wall phone mounting.
    - The wall plate shall be Panduit KWP6PY or equivalent and be fitted with one (1) voice jack meeting the criteria defined below.
- Station Voice Copper Termination at Media Outlet
    - Station Voice Copper Cables shall each be terminated at the Media Outlet in an Eight-pin Modular Jack, Panduit CJE88T.
    - Jacks are to be pinned per TIA/EIA-568B with the pairing as follows:
        - Pair 1 - Pins 5&4

        - Pair 2 - Pins 1&2
        - Pair 3 - Pins 3&6
        - Pair 4 - Pins 7&8
    - The interface between the jack and the station cable shall be a 110-Style block. Blocks shall be designed to maintain the cable's pair twists as closely as possible to the point of mechanical termination.
    - Voice Termination hardware shall meet Category 6 performance specifications as defined by TIA/EIA-A-5 and TSB40 specifications for connecting hardware.
- Station Data Copper Termination at Outlet
    - Station data copper cables shall each be terminated at the Media Outlet in an Eight-pin Modular Jack. Jack contacts shall have a minimum of 50-micro-inches of gold plating. Panduit CJ688T3.
    - Jacks are to be pinned per EIA 568B with the pairing as follows:
        - Pair 1 - Pins 5&4
        - Pair 2 - Pins 1&2
        - Pair 3 - Pins 3&6
        - Pair 4 - Pins 7&8
    - The interface between the jack and the station cable shall be a 110-Style block. Blocks shall be designed to maintain the cable's pair twists as closely as possible to the point of mechanical termination
    - Data Termination hardware shall meet full Category 6 performance specifications as defined by TIA/EIA-568-B-2.1 and TSB-40A specifications for connecting hardware. All pair combinations must be considered, with the worst-case measurement being the basis for compliance. The Jack must be UL verified and listed. All pair combinations must be considered with the worse case measurement being the basis for compliance.
    - The color of the Data Jack shall be BLACK.
    - Data Jack shall be Panduit CJ688T3.

Backbone Voice Copper Cable

A/E shall specify the following requirements:

- Voice Backbone Cable shall incorporate 24 AWG solid annealed Copper Conductors. Conductors shall be insulated with a thermoplastic skin. Maximum diameter of the insulated conductor shall be 0.048 in (1.22 mm).
- Conductors shall be twisted to form pairs and fully color-coded. Conductor twists shall be of varying lay lengths in order to minimize crosstalk.
- All conductors shall be continuous and splice free. Bridge taps are not permitted.
- Cables shall be Underwriters Laboratory (UL) listed, comply with Article 800 (Communications Circuits) of the National Electrical Code and shall meet the specifications of NEMA (low loss), UL 444, and ICEA.
- Cable shall meet the physical and electrical requirements of 100 Ohm "Backbone Cable" as defined by the EIA/TIA-568 Standard for Commercial Building Wiring.
- Inter-Building Cable shall conform to Category 6 performance specifications or better.
- Intra-Building Cable shall conform to Category 6 performance specifications or better.
- Conductors shall be identified by the insulation color of each conductor. The color code shall follow the industry standard composed of ten (10) distinctive colors to identify 25 pairs in accordance with ICEA publication S-80-576-1988. Marking of each mate of the primary conductor in a pair with the color of that primary conductor is optional.
- When cables of larger than 25 pairs are required, the core shall be assembled into 25-pair sub-units, each color coded in accordance with ICEA publication S-80-576-1988. Cables with over

600 pairs shall have 25-pair binder groups combined into super units. These super units shall be wrapped with a solid color thread that follows the primary color scheme of white, red, black, Yellow and violet. Binder color code integrity shall be maintained wherever cables are spliced.
- In exterior applications, the cables shall contain an overall corrugated, coated aluminum shield that is electrically continuous over its entire length.
- The cables shall not incorporate a "T1" screen.
- The cable core shall be protected by a uniform, continuous thermoplastic jacket (sheath) the types specified below. The cable jacket shall be sequentially printed with a footage marker at regular intervals along its length.
- Backbone cabling (Copper/Fiber Optic) shall not share the same raceway or path with horizontal cabling.

Intra-Building Voice Copper Cable

The A/E shall specify the following requirements:
- Where installed in conduit, cable tray and/or in building riser shafts, cables shall be suitable for such installation and comply with the following *additional* requirements:
- Cables shall meet NEC Article 800 Type CMR.
- Cables shall be Air Core with an 8-mil ALVYN Sheath
- Cables shall be "ARMM" Series

Backbone Fiber Optic

The A/E shall specify the following requirements:
- The fiber optic backbone cable may be a multimode fiber (62.5/125µm unless otherwise noted), single-mode fiber (8.3/125µm) or a combination of both.
- All indoor fiber shall have the designation of OFNR (Optical Fiber Non-conductive Riser for non-plenum environments and OFNP (Optical Fiber Non-conductive Plenum for plenum environments). The construction of all fiber optical cable shall be tight-buffered 900 µm of distribution design.
- When installing the fiber optic backbone cable, ensure that the minimum cable bend radius and maximum vertical rise recommended by the fiber manufacture is not exceeded.
- All fiber shall be installed in the appropriately sized and correct environmental inner-duct system. No other fiber shall be installed in occupied inner-duct.
- All optical fiber shall be Panduit.

Inter-building Cabling (Copper and Fiber)

The A/E shall specify the following requirements:
- All inter-building or outdoor communications cabling shall be placed in a rigid conduit system. The conduit system shall be suitable for direct burial or encased in concrete. The minimum requirements for the conduit system shall consist of one 4" conduit for copper environment and one 4" conduit for fiber environment.
- The conduit system designed for the copper environment shall not exceed the 40% fill ratio. All cables shall be installed at the same time and no other cables shall be installed after cable installation.
- The conduit system designed for the fiber environment shall have (3) one inch inner-duct installed the entire length of the system. Each inner-duct shall have pulling rope for fiber installation. All fiber shall be pulled in one continuous pull through inner-duct system and no other copper cable of fiber cable may be installed in the future.

- Outdoor copper & optical fiber types shall be determined based on environmental and system applications at time of installation.
- All copper backbone cabling shall be Panduit.
- All optical fiber backbone cabling shall be Panduit.

Miscellaneous Materials

The A/E shall specify the following requirements:

- Equipment Rack and Associated Hardware
    - Communications equipment rack and cabinets shall be properly anchored at top and bottom.
    - Racks shall be anchored to floor with properly sized drop-in anchors with appropriately sized bolts and washers. All racks and cabinets shall be attached to ladder rack system. If ladder rack system does exist, coordinate with project manager.
    - Horizontal cable management hardware shall be positioned on the equipment racks to allow for an orderly routing of copper and fiber optic jumpers.
    - Jumper Management Panels shall incorporate Horizontal and Vertical distribution rings to accommodate a defined routing of individual jumper cables. Horizontal distribution rings shall be 3" x 3.5" (minimum dimension) and mounted on a 3.5" painted steel plate.
    - Each Jumper Management Panel shall be supplied with a minimum of ten (10) releasable cable support ties. Ties shall be minimum 6-inches in length
    - Vertical Jumper Rings shall be positioned on each rack upright equidistant between each Horizontal Management Panel installed.
    - There shall not be more than (3) three Panduit 48 port patch panels per rack.
    - Relay Racks Panduit NetFrame NFR84 Jumper Management Panels shall be Panduit CMPHH2. Vertical Jumper rings shall be Panduit CMVDRC or equivalent. Releasable cable support ties shall be Panduit HLT2I-X0 (BLACK).
- Surface Raceway
    - The installation of surface mounted outlets and surface mounted station cable is anticipated at some locations where solid walls inhibit the installation of cable behind the wall. Nonmetallic surface raceway shall be used - no exposed cable shall be permitted.
    - The surface raceway shall have a screw-applied base and have a snap on cover. The use of double-sided tape to anchor the raceways will not be permitted.
    - Both the base and cover shall be manufactured of rigid PVC compounds and be suitable for painting.
    - The raceway shall be of a color fitting the decor of the area and be paintable (by others). Approval of samples by the Engineer prior to installation is required (Upon request by Owner). All fittings including, but not limited to, extension boxes, elbows, tees, fixture boxes and fittings shall match the color of the raceway.
    - Fittings and couplings shall be sized to insure that Category 6 and fiber optic cables that are routed through them do not exceed their recommended minimum bend radius requirements.
    - The raceway and all system devices must be UL Listed and exhibit nonflammable self-extinguishing characteristics, tested to specifications of the UL94V-0.
    - Raceway shall be sized to accommodate a 50% increase in the number of cables initially installed while maintaining a fill (ratio of cable area vs. raceway area) no greater than 60%. A nominal cable diameter of 0.2" (Voice and Data Cables) should be assumed.
    - The non-metallic raceway shall be Panduit *Pan-way L Series*.
- Bonding and Grounding

- All bonding conductors shall have green insulation and be copper. The minimum bonding conductor size shall be No. 6 AWG (TIA/EIA-607 5.1.3).
- All Telecommunication Closets (TC) shall be equipped with a ground bus bar capable of terminating multiple #6 AWG ground cable conductors. All TC's ground bus bars shall be labeled TGB (Telecommunications Grounding Bulbar). TGB shall have a #6AWG cable conductor continuously run to the TMGB (Telecommunications Main Grounding Bulbar). The TMGB shall be bonded to the Main Building Grounding Electrode.

Section 27 0004 – Communications - Installation

The A/E shall specify the following requirements:

- The installation shall follow recognized industry recommendations including those defined by the:
  - TIA/EIA-568-B.1 Commercial Building Wiring Standard
  - TIA/EIA-568-B.2 Commercial Building Wiring Standard
  - TIA/EIA-568-B.2.1 Commercial Building Wiring Standard
  - TIA/EIA-569 Commercial Building Standard for Pathways and Spaces
  - TIA/EIA-606 Labeling Guidelines
  - TIA/EIA-607 Grounding
  - National Electrical Code (NEC; 1999)
  - BICSI TDM Manual
  - Applicable State and Local Codes
- Cable Pathways (Renovation Projects)
  - Renovation Projects: The Contractor is responsible for verifying the availability of riser access between floors. Where required, the contractor shall core new risers.
  - All Projects: All new riser holes shall be fitted with sleeves. All riser holes used for the installation, both new and existing, shall be firestopped upon completion of cable installation.
- Cable Installation
  - All cables, termination components and support hardware shall be furnished, tested, installed and wired by the Contractor.
  - During pulling operation an adequate number of workers shall be present to allow cable observation at all points of duct entry and exit as well as the feed cable and operate pulling machinery.
  - Cable pulling shall be done in accordance with cable manufacturer's recommendations and ANSI/IEEE C2 standards. Recommended pulling tensions shall not be exceeded.
  - Manufacturers minimum bend radius specifications shall followed in handling, installation and securing of all cables. Any cable bent or kinked to radius less than recommended dimension shall not be installed.
  - All cables shall be installed splice-free.
  - Cable sheaths shall be protected from damage from sharp edges during and after installation.
  - Where a cable passes over a sharp edge, a bushing or grommet shall be used to protect the cable.
  - All cable shall be free of tension at both ends. In cases where the cable must bear some stress, Kellem grips may be used to spread the strain over a longer length of cable.
  - Ventilation of buildings on the Glen Ellen Campus includes both ducted and ceiling-plenum air return designs as follows:
    - Plenum Return Sites:
      - IC, SRC and PE
    - Ducted Return Sites:
      - M, K & L Buildings, OCC, and Arts Center
    - COD Satellite sites vary by location.
  - The contractor is responsible for verifying cabling requirements prior to construction to insure that the installation is compliant with all code restrictions.

- All openings made to accommodate the installation of any cable shall be sleeved and fire stopped per prevailing code requirements upon completion of cable installation.
- At no time shall horizontal cabling share the same raceway or path with Backbone cabling.

Horizontal Cabling Station

The A/E shall specify the following requirements:

- All Cables and Termination hardware shall be technically compliant with and installed in accordance with TIA-568A, TIA-568-B.2.1 (Standard for Commercial Building Wiring), TIA-569, TSB 36 and TSB-40.
- Where installed free-air, Station Cable shall run at right angles and be kept clear of other trades work. Cables shall be supported according to code utilizing Caddy type J-Hooks mountings and anchored to ceiling concrete, or structural steel beams. The Contractor shall not exceed the maximum cable limit of the cable supports. Cables shall not be attached to existing cabling, plumbing or steam piping, ductwork, ceiling supports or electrical or communications conduit. Supports should be spaced at a maximum 5-foot interval unless limited by building construction. Cable shall never be laid directly on the ceiling grid.
- The maximum Station Cable length shall not exceed 295-feet (90-meters) in order to meet data communications performance specifications. This length is measured from the termination panel in the Telecommunications Closet to the Outlet and must include any slack required for the installation and termination. The Contractor is responsible for installing station cabling in a fashion as to avoid unnecessarily long runs. Any area that cannot be reached within the above constraints should be identified and reported to the College prior to installation. The College must approve any plan changes.
- Slack cable shall be left above each Work Station to allow for repair and/or future office rearrangements without re-cabling. These "service loops" shall be secured at the last cable support (e.g. Caddy type J-Hook) before the cable leaves the ceiling and shall be coiled from 100% to 200% of the cable recommended minimum bend radius. Slack lengths are as follows:
  - At any location where cables are installed into movable partition walls or modular furniture via a service Pole, approximately 6 feet of slack shall be left for each station cable under 250-feet in length.
- To reduce or eliminate EMI, the following minimum distances shall be adhered to. In particular, regard must be paid to the routing of cable and avoidance of potentially disruptive sources of electrical noise such as motors and fluorescent lighting. The contractor shall notify the College if installation conditions inhibit these guidelines.
  - No less than (5) five inches from power lines of 2kVa.
  - No less than (30) thirty inches from high voltage lighting (including fluorescent lighting).
  - No less than (39) thirty-nine inches from power lines of 5kVa or greater.
  - No less than (39) thirty-nine inches from transformers and motors.
- Care should be taken in the use of cable ties to secure and anchor the station cabling. Ties should not be over tightened as to compress the cable jacket. No sharp burrs should remain where excess length of the cable tie has been cut.

Backbone Voice Copper Cable

The A/E shall specify the following requirements:

- Backbone Voice Copper Cable shall be sized to provide a minimum of 2-pairs per outlet planned in the area plus 30% for growth.
- The outer metallic sheath of the Voice Backbone Cable shall be grounded to either (1) the Telecommunications Grounding Busbar (TGB) or (2) an existing backbone cable shield using a #6 AWG solid copper conductor (GREEN jacket). The grounding plan should be devised as to avoid the potential for ground loops through multiple ground points.

Fiber Optic Cable

The A/E shall specify the following requirements:

- At TC locations, provision shall be made to protect exposed fiber optic cables and secure the cable in the transition from cable tray, conduit and/or innerduct to the termination enclosure.
- A minimum of 5-meters (~ 15-feet) of slack Inter- and Intra-building Fiber Optic Cable shall be provided at each TC. This slack is exclusive of the length of fiber that is required to accommodate termination requirements and is intended to provide for cable repair and/or equipment relocation. The cable slack shall be stored in a suitable enclosure to protect the cable from damage.
- Where fiber optic cable is installed in innerduct, the innerduct(s) shall be secured in a fashion as to insure their stability. This may be through fastening to the wall for the riser chase closet or through the installation of a small diameter rigid conduit. The only acceptable residual tension on the fiber optic cable is that due to its own weight.

Telecommunications Outlet

The A/E shall specify the following requirements:

- Telecommunications Outlets shall be positioned at a height matching existing services. Where no guide is available, outlets shall be mounted with the center of the outlet 18-inches above floor height unless instructed otherwise by the College.
- Positioning of wall-mounted telephone outlets should be in compliance with the provisions of the Americans with Disabilities Act (ADA).
- Outlets shall be securely mounted and level.
- All unused slots or positions in the Telecommunications Outlet shall be covered with blank inserts.
- At the Outlet location, subsurface routing of cables inside "fishable" walls is preferred. Where this cannot be accommodated, however, station cable shall be routed via surface raceway. Raceway should be of adequate dimensions to allow for installation of the cable in compliance with the manufacturers specification including bend radius, crush and tensile limits. Exposed surface raceway should be paintable and fit the decor of the space. Telecommunication Outlet installation on sheetrock walls shall be preceded by the installation of a bracket which mounts securely to the sheetrock (e.g. "Caddy" or "MPLS" Bracket). The Outlet Frame shall, in turn, be secured to the bracket. Telecommunications Outlets shall not be screwed directly to the sheetrock.

Copper Termination Hardware

The A/E shall specify the following requirements:

- Copper Termination Hardware at TC
    - At the Telecommunications Closets, all Data and Voice Cables shall be positioned on termination hardware in sequence of the Outlet I.D. starting with the lowest number. All four pairs, terminating on each voice modular jack shall appear on the Telecommunications Closet 110 blocks. Termination Hardware (Blocks and Patch Panels) Positioning and Layout must be reviewed and approved by the College prior to construction. The review does not exempt the Contractor from meeting any of the requirements stated in this document.
    - Except in the IC PBX Room, Voice Termination Hardware shall be wall mounted on plywood board. The contractor shall neatly route and secure new cables via cable management hardware (e.g. D Rings and cable guides) from cable tray to the cable termination hardware. Old cable ties shall be removed and replaced with Velcro style cable wraps to maintain a tidy appearance. Cables shall be fed from below the Termination Hardware in a manner that will facilitate growth.
    - The Height of the Voice Termination Field shall not exceed 6-feet (72-inches) above floor level to facilitate cable maintenance. Backbone Cabling should be positioned to the Left; Station cabling to the Right.
    - Where multiple floors are served from a single TC, the Termination Field for each floor shall be segregated from each of the others. Following the standard established at the site, each cross connect field for a given floor is positioned in a separate vertical column (Voice). Spare capacity should be considered in the design and be provided for each grouping.
    - At the Voice Termination Blocks (all 110-type interface), the installer shall insure that the twists in each Voice Cable pair are preserved to within 1.0-inch of the termination. The cable jacket shall be removed only to the extent required to make the termination.
    - Where Voice Termination Hardware is wall mounted, Horizontal Troughs incorporating split plastic distribution rings shall be provided by the Contractor to accommodate routing of jumpers. Troughs shall be positioned at the top of each column of termination blocks and between each 300-pair wiring block. Troughs shall be Panduit P110JTW.
    - The Contractor shall cross-connect the first 1st (BLUE) pair of each new workstation cable to the riser backbone to link the telecommunications closet to the next closet in the hierarchy. The cross-connects wire of colors matching the color of the station cabling conductors (BLUE) shall be used for each cross-connect.
    - In new installations, a jumper wire spool holder shall be installed at the Telecommunications Closet(s). One full (1000-foot) spool of 24-AWG one-pair jumper wires, one spool each white-blue/blue shall be supplied with the holder. The holder shall be designed for use as a spool holder and shall mount securely to the plywood or ladder rack (above the Voice Field).
    - The Contractor shall provide house count to Owner
- Data Patch Panel
    - At the Data Patch Panel 110-type interface, the installer shall insure that the twists in each Data Cable pair are preserved to within 0.5-inch of the termination. The cable jacket shall be removed only to the extent required to make the termination.

The A/E shall specify the following requirements:

- Jumper Management Hardware
    - Horizontal cable management hardware shall be positioned on the equipment racks to allow for an orderly routing of copper and fiber optic jumpers. At minimum, these Jumper Management Panels shall be positioned:
        - Horizontal management shall be placed above and below each forty-eight (48) port Data Patch Panels.
        - Horizontal management shall be placed above and below each fiber Optic HDC (Station fiber).
        - Horizontal management shall be placed above and below each pair (2) of Fiber Optic Termination Panels (Backbone).
- Surface Raceway
    - Where Outlets are installed in areas where the walls cannot be fished, the Station Cabling serving these outlets shall be covered with raceways. No exposed wire shall be permitted within offices, laboratories, conference rooms, classrooms, etc.
    - The base and cover of the raceway shall be of PVC have a screw applied base and have a snap on cover. Both the base and cover shall be manufactured of rigid natural PVC compounds. The raceway must be UL Listed and exhibit nonflammable self-extinguishing characteristics.
    - The raceway shall originate from a surface mounted Outlet box, have a screw-applied base and terminate above the ceiling. A fitting designed for the raceway shall be used to conceal the ceiling penetration.
    - Surface mounting of an outlet intended for flush-mount installation shall be preceded by the installation of a Surface Box ("Back-box") onto which the outlet frame is mounted.
    - The contractor shall be responsible for all penetrations required to accommodate the raceway in making any transitions between office areas and hallways or other common areas through which the raceway may be routed. All cut molding sections shall be patched and painted upon completion of the raceway installation.
    - All cuts and penetrations must be patched and painted. Upon completion of installation, raceways must be cleaned of all fingerprints, soil, etc.
- Firestop Systems
    - All penetrations through fire rated building structures, walls, and floors; shall be sealed with an appropriate Firestop system. The requirements applies-to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire rated structure). Any penetrating items i.e., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc. shall be properly firestopped.
    - All Firestop systems shall be installed in accordance with the manufacture's recommendations and shall be completely installed and available for inspection by the College.
- Bonding, Grounding and Electrical Protection
    - All Telecommunications Equipment and raceways shall be properly grounded in accordance with TIA/EIA-607 the NFPA 70 (National Electrical Code), and all other applicable codes and regulations.
    - The major components of the telecommunications grounding and bonding infrastructure are as follows:
        - The bonding conductor for telecommunications
        - The Telecommunications Main Grounding Busbar (TMGB)
        - The Telecommunications Grounding Busbar (TGB)
        - The Telecommunications Bonding Backbone (TBB)

    - The Telecommunications Bonding Backbone Interconnecting Bonding Conductor (TBBIBC). The conductors used to bond the components to the TMGB &the TGB's
- All bonding conductors and connectors shall be listed for the purpose intended and approved by a Nationally Recognized Testing Laboratory (NRTL).
- Route ground conductors to provide the shortest, most direct path from point to point.
- Splices in bonding or grounding conductors are not allowed. The minimum bend radius of the conductors shall be eight inches (8").
- The TMGB and the TGB's shall be electro-tin plated and insulated from the supporting structure by at least two inches.
- If an electrical sub-panel resides in a Telecommunications Room, that panel must have a #6 AWG bonding conductor from the TGB to electrical panel ground bar.
- All Telecommunication Closets (TC) shall be equipped with a ground bus bar capable of terminating multiple #6 AWG ground cable conductors. All TC's ground bus bars shall be labeled TGB (Telecommunications Grounding Bulbar). TGB shall have a #6AWG cable conductor continuously run to the TMGB (Telecommunications Main Grounding Bulbar). The TMGB shall be bonded to the Main Building Grounding Electrode.
- All racks, metallic backboards, cable sheaths, metallic strength members, splice cases, cable trays, ladder racks, etc. entering or residing in all Telecommunications Rooms. Shall be grounded to the respective TGM or TMGB using a minimum #6 AWG stranded copper bonding conductor and 2 hole compression connectors. Provide a ground bar at the base of each rack for equipment connections.
- All incoming outdoor cables shall be terminated on the appropriate sized protector, and all protectors shall be attached to the TMGB via a #6 AWG stranded conductor.
- All ground cables shall be labeled with the proper FROM - TO (Origination Point to Destination Point) designation.

Section 27 0005 – Communications - Labeling

The A/E shall specify the following requirements:

- The Telecommunications Administration System shall meet or exceed TIA/EIA-606-A standards.
- All Telecommunications Outlets, Data Patch Panel, Voice Termination Blocks AND CABLES shall be clearly labeled using a Code identifying each Information Outlet location as unique throughout the COD Campus. **The font type shall be similar to Arial, Bold faced with font size of 14. All alternate font type and size must be approved by the owner.** This code, which will identify cabling and terminations at both IDF and Media Outlet locations, shall be as follows:
    - BB-XCC-F-###A
        - BB= the designation to identify the specific building
        - XCC = the Telecommunications Closet (TC) serving that jack. The TC is designated by Floor (XX) and their geographic location on that floor (CC) (e.g. Northwest, Southeast, etc.).
        - F = the Floor on which the jack is located.
        - ### = a sequential number assigned to that jack.
        - A = Alpha designation used ONLY if multiple jacks of a given type (e.g. Voice or Data) are housed in the same Outlet assembly.
        - For example, "IC-2NW-3-123" designates the 123rd jack on the 3rd Floor served from the IDF in the Northwest area of the 2nd Floor of the IC building. If multiple Data cables would be contained in the outlet, they would be identified as "A", "B", "C", and so on.
- This numbering sequence plus a two (2) character Building Designator shall be utilized in the Cable Management System for identification of station cabling. Building designations are as follows:
    - Arts Center (MAC)= AR
    - Instructional Center(BIC) = IC
    - Physical Education(PEC) = PE
    - Seaton Computing Center(SCC) = SC
    - Student Resource Center (SRC) = SR
    - Student Services Center (SSC) = SS
    - WDCB Tower = JJ
    - Westmont Center = WC
    - Naperville Center = NC
    - Addison = AD
    - Lisle Center = LC
    - Carol Stream Community Education Center = CC
    - Early Childhood Education Center(ECC) = EC
    - Technical Education Center(TEC) = TE
    - Health and Science Center(HSC) = HS
    - Culinary and Hospitality Center (CHC) = CH
    - Homeland Security Education Center (HEC) = HE
    - Homeland Training Center (HTC) = HT
- Where adding to an existing installation, cable identification numbering must be integrated into the established plan and must be approved by the Owner.

- Where adding to an installation, both voice and data numbering must remain in a “matched” sequence. Throughout the school, at each location has the “same” numbering on the faceplate ID for both voice and data. Example: If the 4th location in a series is a “voice only” location, then the data patch panel would be skipping number 4 in its sequence. Therefore, if the numbers are continuing, (assuming the “next” location is both voice and data) the data patch panel’s next number would be 5 (skipping # 4) with NO blank data jacks open on the data patch panel. By the same description, if a location in a series is a “data only”, the voice designation strip would represent a “skip” in its sequence. Again the arrangement of the added cables would leave NO blanks on the 110-voice frame.
- ALL labeling shall be machine generated (Panduit) in black ink on white background tags and be permanent. NO HAND WRITTEN LABELS SHALL BE ALLOWED.
- Cables
    - ALL Cables shall be identified AT BOTH ENDS using a self-laminating tag wrapped around the cable (e.g. not a "flag"). The Contractor shall use labeler. Cable labels shall indicate cable designation and destination. In Station cables, for example, this designation shall be the Telecommunications Outlet identification.
- Telecommunications Outlets
    - Telecommunications Outlets are to be labeled (1) on the cover of the assembly, (2) on the base of the assembly (if applicable) and (3) on each cable terminated at that location.
    - Where multiple cables of a given type (e.g. "Data") are contained in a single outlet, the alpha-designator ("A", "B", "C", and so on) those jack positions shall be so labeled.
- Data Patch Panels
    - Data Patch panels shall be clearly labeled as to the destination and position of each cable terminated on that panel. Cables shall be positioned in sequence of Outlet I.D.
    - The TC designator may be omitted on each jack position provided that the panel itself includes the TC designator.
    - Station cables shall be labeled within 4-inches of the cable choke at Data Patch Panels.
- Voice Termination Block
    - Each horizontal row (in pairs) of the Voice Termination Block shall be labeled with "Designation Strips" which identify the destination and position of each cable terminated on that block.
    - Designation Strips shall be color coded to indicate the block's application. Color-coding shall be as follows:
        - Inter-Building Cable (e.g. IC-PE or OCC-"K") = Brown
        - Intra-Building Cable (MDF-IDF) = White
        - Station Cable = Blue
    - Blocks on which "Station" Cabling is terminated will be labeled as to identify Telecommunications Outlet I.D.s. Voice termination blocks on which "Backbone" or "Tie" Cabling is terminated will be labeled to identify Pair Count are identified (e.g. 1-25, 26-50, etc.). Assignment of Pair Count(s) shall consider the existing count and must be approved by Owner.

Section 27 0006 – Communications - Testing

The A/E shall specify the following requirements:

- Upon completion of installation work, the contractor shall visually inspect all cabling and terminations to insure that they are complete and conform to the requirements defined herein.
- The contractor shall provide to the College a written certification that this inspection has been made.
- All cable sub-systems (e.g. Inter-building, Intra-Building and Station) must be tested independently. Testing of these sub-systems cannot be combined (e.g. through interconnection).
- Contractor shall conduct acceptance testing according to a schedule coordinated with the College. Representatives of the College may be in attendance to witness the test procedures. The contractor shall offer adequate advance notice to the College as to allow for such participation.
- The Contractor is responsible for supplying all test equipment and personnel to conduct acceptance test.
- If any link is found to be outside the specification defined herein, that cable and the associated terminations (if applicable) shall be replaced at the expense of the contractor. The applicable tests shall then be repeated.
- All backbone fiber must be tested bidirectional using OTDR. OTDR graphs and lengths of run must be included. Results shall be provided to Owner.
- Voice Backbone Testing
    - All testing shall include the installed termination hardware as part of the test path. Length of the run must be given on test results. Backbone cables shall be tested between TC's and include termination blocks.
    - All cable pairs shall be verified for pair validity, continuity (opens/shorts), and polarity (tip/ring). Split or miss-positioned pairs must be identified and corrected.
    - Inter- and Intra-Building copper cables may have a maximum failure rate of 3% based on total pair count. All bad pairs must be identified and documented.
- Data/Voice UTP Station Cable Testing
    - Cat 6 Installation: field test requirements upon completion of the installation.
        - Every cabling link in the installation shall be tested in accordance with the Telecommunications Industry Association (TIA) standard ANSI/TIA/EIA-568-B.1 (most current version). Length of the run must be given on test results.
    - Optional Requirements:
        - A representative of the end-user may select a random sample of 5% of the installed links. The Owner shall test these randomly selected links and the results shall be stored.

- Field Test Specifications to the data provided by the installation contractor. If more than 2% of the sample results differ in terms of the pass/fail determination, the installation contractor under supervision of the end-user representative shall repeat 100% testing and the cost shall be borne by the installation contractor.

- Optical Fiber and Air Blown Fiber Testing
  - All fiber testing shall be performed on all fibers in the completed end to end system.
  - Testing shall consist of a bi-directional end to end OTDR trace performed per EIA/TIA 455-61 or a bi-directional end to end power meter test performed per EIA/TIA 455-53A.
  - The system loss measurements shall be provided at 850 and 1310 nanometers for multimode fibers and 1310 and 1550 for single mode fibers.
  - Pre-installation cable testing
    - The Contractor shall test all light guide cable prior to the installation of the cable.
    - The Contractor shall assume all liability for the replacement of the cable should it be found defective at a later date.
  - Loss Budget
    - Fiber links shall have a maximum loss of:
      - Allowable cable loss per km)(km of fiber in link) + (.4dB)(number of connectors) = maximum allowable loss
      - A mated connector to connector interface is defined as a single connector.
      - Loss numbers for the installed link shall be calculated by taking the sum of the bi-directional measurements and dividing that sum by two.
      - Any link not meeting the requirements of the standard shall be brought into compliance by the contractor, at no charge to Owner.
      - Documentation shall be provided in both hard copy and electronic, in a format as agreed by the Owner.
  - Air Blown Fiber Tube Cable Tests (Refer to Master Format Division 1-33-26)
    - Pressure Tests and Obstruction Tests shall be submitted to the Owner's Representative on appropriate forms. Forms are included in certified contractors manual. The form must be completed, signed and turned over to the Owner.
    - Sumitomo Electric - Bundled Fiber Optics Testing shall be submitted to the engineer and copies to the Owner's Representative. Submit manufacturer's test reports for each reel of fiber bundle provided prior to installation.
    - Submit Contractors on-reel test results at 850 and 1300 nm for multi-mode and 1310 and 1550nm for Single-mode.
    - Submit Contractor's test results after bundled fiber terminations are installed.
    - Submit soft copy bundled fiber optic cable OTDR test results on compact disc (CD). The test results will need to include all results including the fiber map (graph). Provide proprietary software on the CD to enable viewing of the soft-copy test results.

- Station Coaxial Cable Testing
  - Station Coaxial Cable Testing shall be tested to verify cable length and to test for cable faults and breaks. A step-function high resolution Time Domain Reflectometer shall be employed for this test, such as the Tektronix 1502C or the Hewlett Packard 1415A. The results shall be automatically plotted on an X-Y plotter with a Y-axis voltage reflection coefficient resolution of .001 per division. The X-axis will resolve down to 1" of cable. The TDR will sweep the cable at a rate no greater than 50' per second, or such lower rate as necessary to resolve cable faults to the 1" and .001 VRC level.

- The cables shall be terminated with its characteristic impedance. Where required, an appropriate matching pad shall be used to match the analyzer to the cable.
- A Cable shall be rejected if any single fault is observed of amplitude greater than 0.003 voltage reflection coefficient. Characteristic impedance shall also be measured at 5% of nominal value.
- Cyclic faults (such as cable reel stress and die draw-down) shall be limited to a voltage reflection coefficient of 0.005.

Test Result Documentation and Follow Up

The A/E shall specify the following requirements:

- In system documentation, contractor shall provide test results and describe the conduct of the tests. Test documentation shall include a record of test frequencies or wavelengths, cable type, conductor pair and cable I.D. (e.g. Outlet I.D.), measurement direction, test equipment type, model and serial number, date, reference setup, and crewmember name(s) and the length of the run. Where applicable, printouts generated for each cable by the wire test instrument (e.g. *Fluke DSP4300*) shall be submitted as part of the documentation package.
- At the request of the Owner, the contractor shall provide copies of original test results.
- The Owner may request that a 10% random field re-test be conducted on the cable system - at no additional cost - to verify documented findings. If findings contradict the documentation submitted by the Contractor, additional testing can be requested to the extent determined necessary by the Owner, including a 100% re-test. This re-test shall be at no additional cost to the Owner.
- Should it be determined by the Owner or A/E that the materials or any portion thereof furnished and installed fail to comply with the specifications defined herein, these materials and the related installation shall be rejected and replaced by the Contractor. All work disturbed by changes necessitated in consequence of said defects or imperfections shall be made good at the Contractor's expense. All replaced components shall be re-tested.

Section 27 0007 – Communications Documentation and Closeout

The A/E shall specify the following requirements:

- Upon completion of cable plant installation, the contractor shall provide a complete set of cable records documentation including:
    - Test Data as defined above
    - As-Built Drawings (where applicable)
    - Input Data for Facilities Management System
- As built drawings
    - See also Division 01 of the Design and Engineering Criteria
    - Contractor shall provide accurate as-built construction drawings.
    - The drawing package shall include one or more of the following:
        - Floor plans showing (1) the location of all Telecommunications Outlets as installed and (2) paths by which all cables are routed.
        - Cable lengths as obtained through review of sheath footage markings.
        - Termination field, equipment rack and frame layouts.
    - Numbering and drawing conventions used shall be consistent throughout all documentation provided and comply with established standards at the College. Telecommunications Outlet locations shall be identified by their sequential number as defined elsewhere in this document and include the Building Designator.
    - All documentation, including hard copy and electronic forms (if applicable) shall become the property of the Owner.
    - Documentation shall be submitted within ten (10) working days of the completion of testing.

Section 27 0008 – Communications - Acceptable Material List

The following products are acceptable to the Owner. Any variation shall be subject to review and acceptance by Owner.

Mfgr	Mfgr PN	Description
Panduit	PUP6004BU-UY	High performance Category 6 plenum (CMP) 4-pair UTP copper cable. Copper conductors are 23 AWG construction with FEP insulation. Conductors are twisted in pairs, separated by an integrated pair divider, and placed in a low smoke, flame-retardant PVC jacket.
Panduit	PUR6004BU-UY	High performance Category 6 riser (CMR) 4-pair UTP copper cable. Copper conductors are 23 AWG construction with HDPE insulation. Conductors are twisted in pairs, separated by an integrated pair divider, and placed in a flame-retardant PVC jacket.
Panduit	CFPL2EI	CLASSIC FACEPLATE W/LABEL
Panduit	CFPL4EI	CLASSIC FACEPLATE W/LABEL
Panduit	CFPL6EI	CLASSIC FACEPLATE W/LABEL
Panduit	CF1062EIY	106 FRAME - DATA - 2 PORT
Panduit	CF1064EIY	MINI-COM 106 FRAME
Panduit	JB1DEI-A	1 PCS DEEP JUNCTION BOX**
Panduit	CFFPL4BL	FURN. FACEPLATE 4 POS. W/LABEL&LABEL COV
Panduit	CJ688TGEI	MINICOM CAT6 JACK MODULE
Panduit	P110BW300-X	110 WIRING BLOCK W/LEGS
Panduit	P110CB4-X	110 CONNECTING BLOCK 4PR
Panduit	P110CB5-X	110 CONNECTING BLOCK 5PR
Panduit	P110JTW-X	GIGA PUNCH JUMPER TROUGH
Panduit	DP48688TGY	48 PORT FLAT DP6 DATA
Panduit	DP24688TGY	24 PORT FLAT DP6 DATA
Panduit	CMPHH2	PANNET 2 RU HORZ. 3X5" D-RINGS FRONT
Panduit	NFR84	PANNET NETFRAME RACK, 7FT
Panduit	CMPH1	19" Manager, Front and Rear, 1 RU
Panduit	CMPH2	19" Manager, Front and Rear, 2 RU
Panduit	NFD884	Full length, dual hinged metal door
Panduit	NFD484	Full length, single hinged metal door
Panduit	NFBRFK	Bend Radius Fingers Kit

Panduit	NFEP	84" NetFrame End Panel
Panduit	HLT2I-X0	TAK-TY LOOP TIE
Mfgr	**Mfgr PN**	**Description**
Panduit	DPLF	KIT- FRONT LABEL HOLDER
Panduit	DPLT	KIT - TOP LABEL HOLDER
Panduit	FRME1	PANNET OPTICOM 1 RU BLACK ENCL
Panduit	FRME2	PANNET OPTICOM 2 RU BLACK ENCL
Panduit	FRME3	PANNET OPTICOM 3 RU BLACK ENCL
Panduit	FAPB	FIBER ADAPTER PANELS
Panduit	FAP6WBUDSCZ	FIBER ADAPTER PANEL W/6BU
Work Station Hardware		
Panduit	CFPL2EI	Single gang, vertical faceplate accepts two *Mini-Com*® Modules
Panduit	CFPL4EI	Single gang, vertical faceplate accepts four *Mini-Com*® Modules
Panduit	CFPL6EI	Single gang, vertical faceplate accepts six *Mini-Com*® Modules
Panduit	CFPF12EI-2G	Double gang, vertical faceplate frame and six flat inserts (two module spaces each). Accepts twelve *Mini-Com*® Modules.
Panduit	JB1EI-A	Single gang one-piece outlet box with adhesive backing
Panduit	KWP6PY	Stainless steel phone plate with *Giga-TX*™ Style cat 6 Keystone Jack Module
Panduit	CFFP4BL	Faceplate snaps into industry standard knockouts found on modular furniture
Panduit	CMBEI-X	1-position, reserves space for future use

NOTES - SHEET A1

GENERAL NOTES

1. ROOMS AND DOORS NOT NUMBERED ARE EXISTING AND DO NOT APPEAR IN SCHEDULES.
2. UNLESS OTHERWISE NOTED, ALL DIMENSIONS TO CMU WALLS OR FURRED CMU WALLS ARE TO FACE OR CORNER OF CMU. ALL DIMENSIONS TO GYPSUM BOARD PARTITIONS ARE TO FACE OF GYPSUM BOARD.
3. WALLS, PARTITIONS, DOORS, COLUMNS, ETC. SHOWN IN LIGHT LINEWORK IS EXISTING CONSTRUCTION TO REMAIN.

KEYED NOTES - DRWG. 16/A1

1. DOCK BUMPER-SEE 16/A22.
2. DOCK SHELTER-SEE 12/A22.
3. TRENCH DRAIN-SEE STRUCT. DRWGS.
4. DOCK LEVELER-SEE 21/A22.
5. 1.1/4" NOM. DIAMETER STEEL PIPE RAILING-SEE 12/SD2.
6. LOUVER, SEE DETAILS ON DRAWING A22.
7. SANDBLAST EXISTING CONC. FOUNDATION WALL TO CLEAN CONC.
8. POCKETS FOR STAIR STRINGERS IN CMU. SEE SHEET A30 FOR DETAILS.
9. 8" STEEL PIPE GUARDRAIL, SEE 23/A23 & 2/A1.
10. REMOVE EXISTING DOOR & FRAME. ENLARGE EXISTING OPENING AND INSTALL NEW DOORS & FRAME AS SHOWN.
11. REMOVE PORTION OF EXISTING FOUNDATION WALL FOR NEW DOOR OPENING. INSTALL NEW DOORS & FRAME AS SHOWN.
12. REMOVE EXISTING RETAINING WALL & FOUNDATION. SEE SD DRWGS.
13. ELEVATOR PIT LADDER, SEE 22/A23.
14. REMOVE EXISTING DOOR & FRAME.
15. 3/4" PLYWOOD ON BACK WALL OF COMM. CLOSET FULL HEIGHT.
16. TYPE "A" VINYL TILE FLOORING.
17. TYPE "B" VINYL TILE FLOORING.
18. TYPE "C" VINYL TILE FLOORING.
19. 2" FEATURE STRIP
20. TYPE "A" RUBBER TILE FLOORING.
21. TYPE "B" RUBBER TILE FLOORING.
22. TERRAZZO FLOORING
23. PROVIDE 3'-0"W x 7'-0"H OPENING THROUGH EXISTING FOUNDATION WALL. PATCH ENDS OF WALLS.
24. STORAGE CUBES
25. (6) ADJUSTABLE PLASTIC LAMINATE SHELVES ON BRACKETS AND STANDARDS.
26. FIRE PROTECTION LINE
27. FIRE EXTINGUISHER
28. 4'-0"x12'-0" WRITING SURFACE
29. 8'-0"x8'-0" TACK BOARDS
30. FIRE EXTINGUISHER WITH CABINET.
31. SEE RAILING DESIGN ON A22. SIM.

16 FIRST LEVEL FLOOR PLAN-WEST
1/8"=1'-0"

KEY PLAN

THE LZT/FILLUNG PARTNERSHIP
45 South Park Blvd.
Glen Ellyn, Illinois 60137
(708)858-5444
ARCHITECTS PLANNERS ENGINEERS

LZT/F

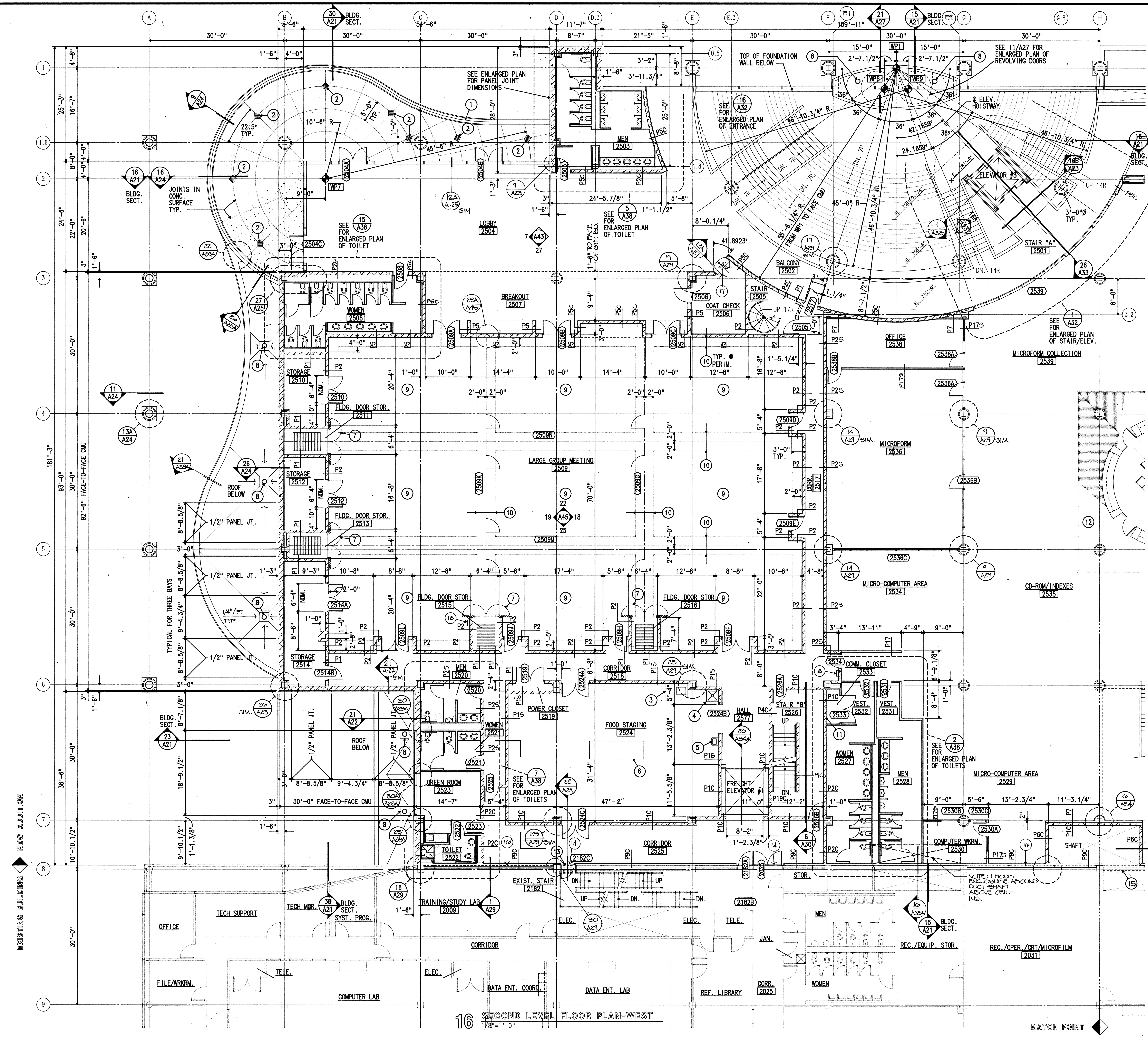
Date	Issued For

STUDENT RESOURCE CENTER ADDITION

COLLEGE OF DuPAGE
22nd & LAMBERT
GLEN ELLYN, ILLINOIS

Checked By —
Drawn By KDO
Revised —
Sheet Title FIRST LEVEL FLOOR PLAN-WEST

Sheet No. A1
Job No. 291209
Date 07OCT92



16 SECOND LEVEL FLOOR PLAN-WEST
1/8"=1'-0"

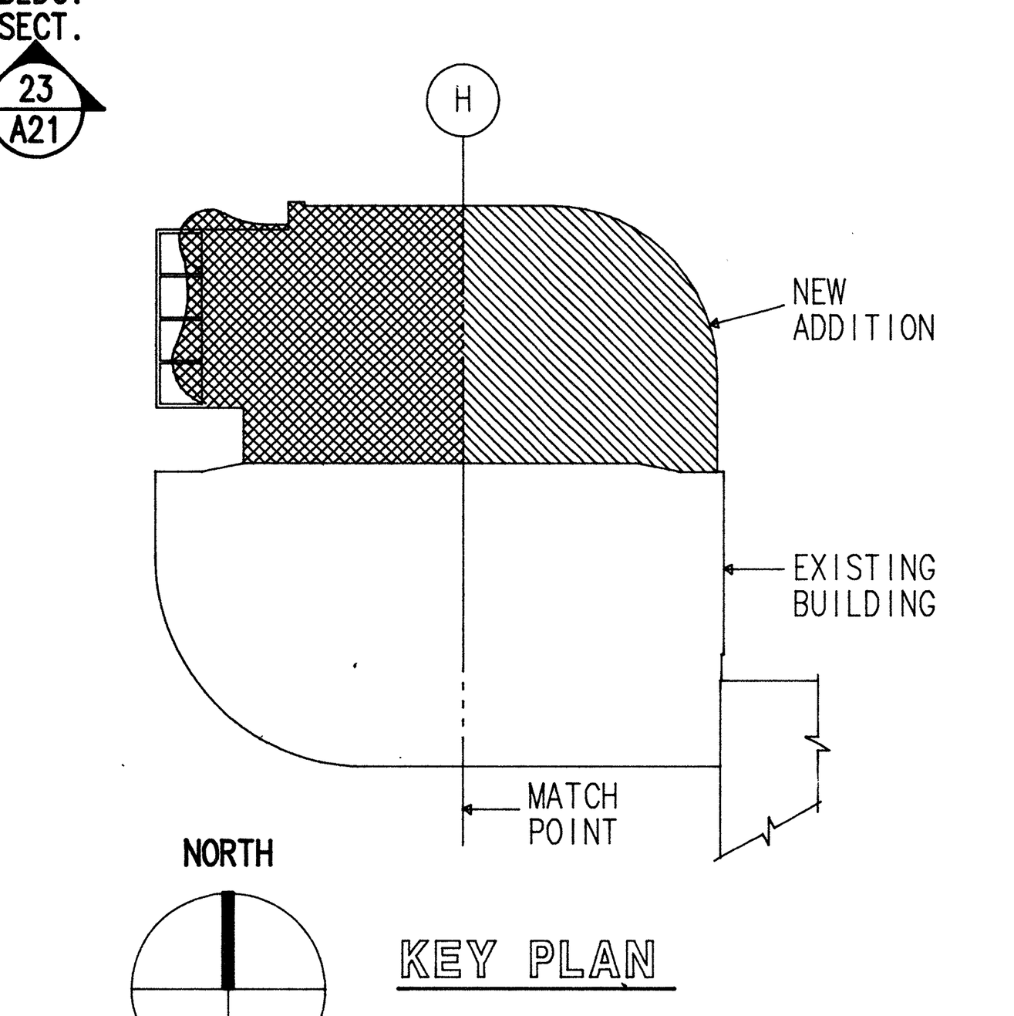
NOTES - SHEET A3

GENERAL NOTES

1. ROOMS AND DOORS NOT NUMBERED ARE EXISTING AND DO NOT APPEAR IN SCHEDULES.
2. UNLESS OTHERWISE NOTED, ALL DIMENSIONS TO CMU WALLS OR FURRED CMU WALLS ARE TO FACE OR CORNER OF CMU. ALL DIMENSIONS TO GYPSUM BOARD PARTITIONS ARE TO FACE OF GYPSUM BOARD.
3. WALLS, PARTITIONS, DOORS, COLUMNS, ETC. SHOWN IN LIGHT LINEWORK IS EXISTING CONSTRUCTION TO REMAIN.

KEYED NOTES - DRWG. 16/A3

1. 6"Ø STEEL TUBE GUARD RAIL, SEE 5/A25.
2. DECK DRAIN
3. COUNTERTOP WITH SINK
4. MOP SINK
5. HAND SINK
6. 4'-0" W. x 12'-0" LONG PLATING TABLE
7. POCKET DOORS BY FOLDING PARTITION MANUFACTURER.
8. ROOF DRAIN, SEE 22/A17.
9. TYPE "A" CARPET.
10. TYPE "B" CARPET.
11. 3/4" PLYWOOD ON BACK WALL OF COMM. CLOSET FULL HEIGHT.
12. WOOD FLOORING.
13. REMOVE EXISTING CURTAIN WALL & FRAMING.
14. EXPANSION JOINT COVER. SEE 22/A29
15. REMOVE LOUVERS
16. REMOVE GLAZING - TYPICAL
17. BI-FOLD DOORS (BY CASEWORK SUPPLIER)
18. FIRE EXTINGUISHER W/ CABINET.



KEY PLAN

THE LZT/FILLIUNG PARTNERSHIP
LZT/F ARCHITECTS PLANNERS ENGINEERS
45 South Park Blvd.
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(708)469-5444

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STUDENT RESOURCE CENTER ADDITION

COLLEGE OF DuPAGE
22nd & LAMBERT
GLEN ELLYN, ILLINOIS

Revised | Drawn By KCO | Checked By
Sheet Title: SECOND LEVEL FLOOR PLAN-WEST
Sheet No. A3
Job No. 291209
Date 07OCT92

NOTES - SHEET A13

GENERAL NOTES

1. SEE SHEET A9 FOR REFLECTED CEILING PLAN SYMBOLS.
2. LIGHT FIXTURES, DIFFUSERS, GRILLES, ETC. NOT SHOWN IN STORAGE, MECHANICAL AND ELECTRICAL SPACES.

KEYED NOTES - DRWG. 16/A13

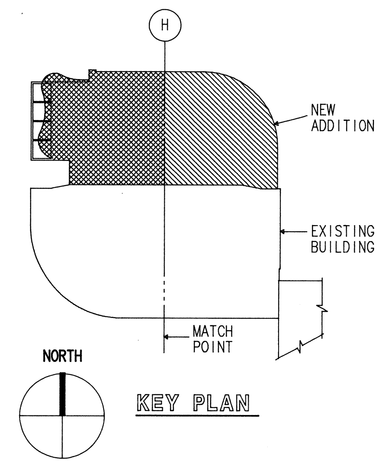
1. PORTLAND CEMENT PLASTER SOFFIT
2. CONTROL JOINT IN PLASTER SOFFIT
3. 3/4" WIDE REVEAL IN PLASTER SOFFIT
4. LIGHT COVE.
5. POWER PROJECTION SCREEN
6. 8'-0" LONG POWER PROJECTION SCREEN
7. CONTINUOUS AIR DIFFUSERS
8. LIGHTING TRACK.
9. ACOUSTIC FINISHED SURFACE
10. 5'-0" WIDE RADIANT PANELS
11. ROOF HATCH, SEE 7/A17.
12. ℄ CURTAIN TRACK.

AREA SHOWN SHADED:
ROOF CONSTRUCTION INCLUDING BEAMS, TRUSSES AND FRAMING AND ROOF DECK 25'-0" OR MORE IN HEIGHT ABOVE FLOOR IMMEDIATELY BELOW, LOWEST MEMBER NO FIREPROOFING

EXISTING BUILDING — NEW ADDITION

MATCH POINT

16 THIRD LEVEL REF. CEILING PLAN-WEST
1/8"=1'-0"



KEY PLAN

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LZT/TE ARCHITECTS PLANNERS ENGINEERS

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STUDENT RESOURCE CENTER ADDITION

COLLEGE OF DuPAGE
22nd & LAMBERT
GLEN ELLYN, ILLINOIS

Checked By —

Drawn By KCO

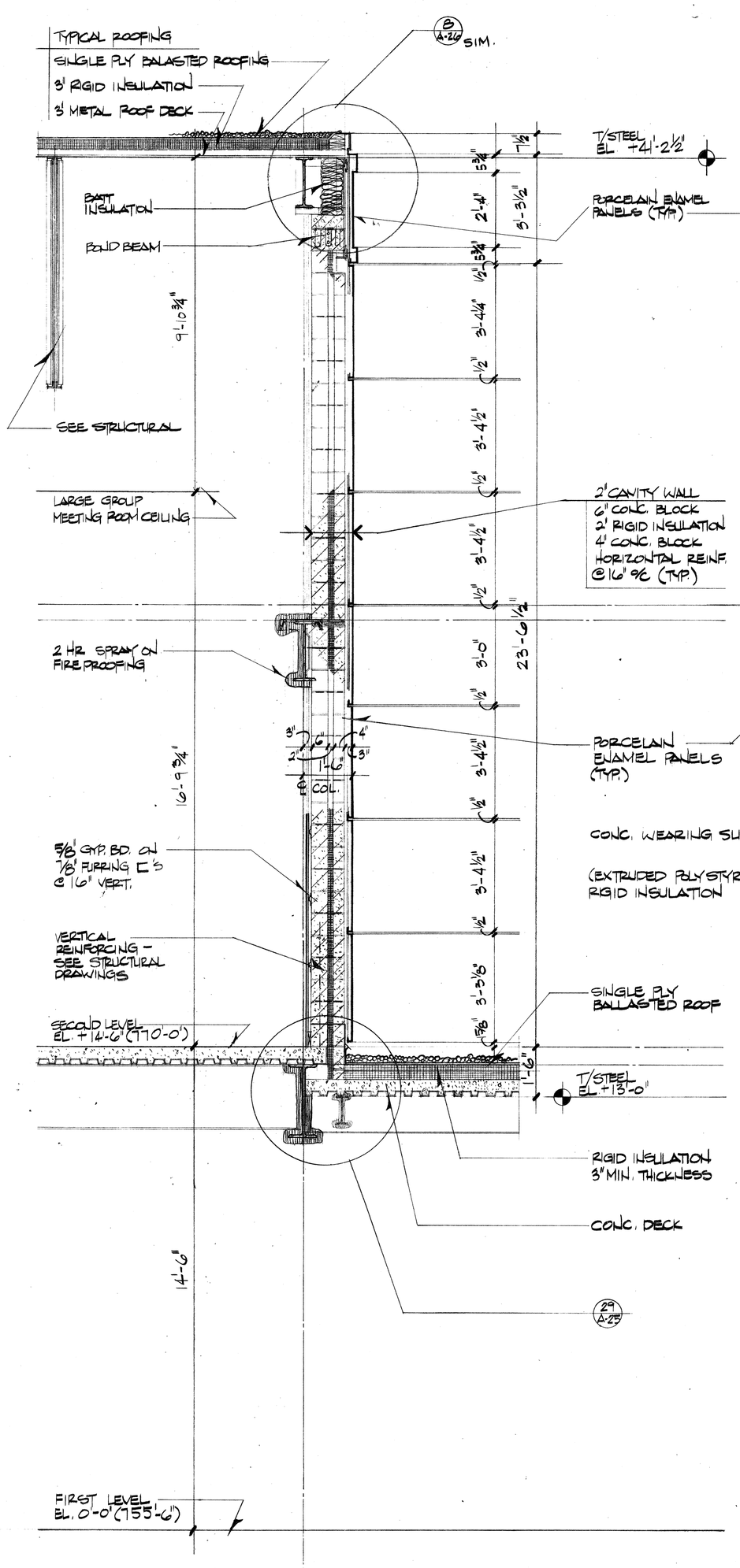
Revised —

Sheet Title THIRD LEVEL REF. CEILING PLAN-WEST

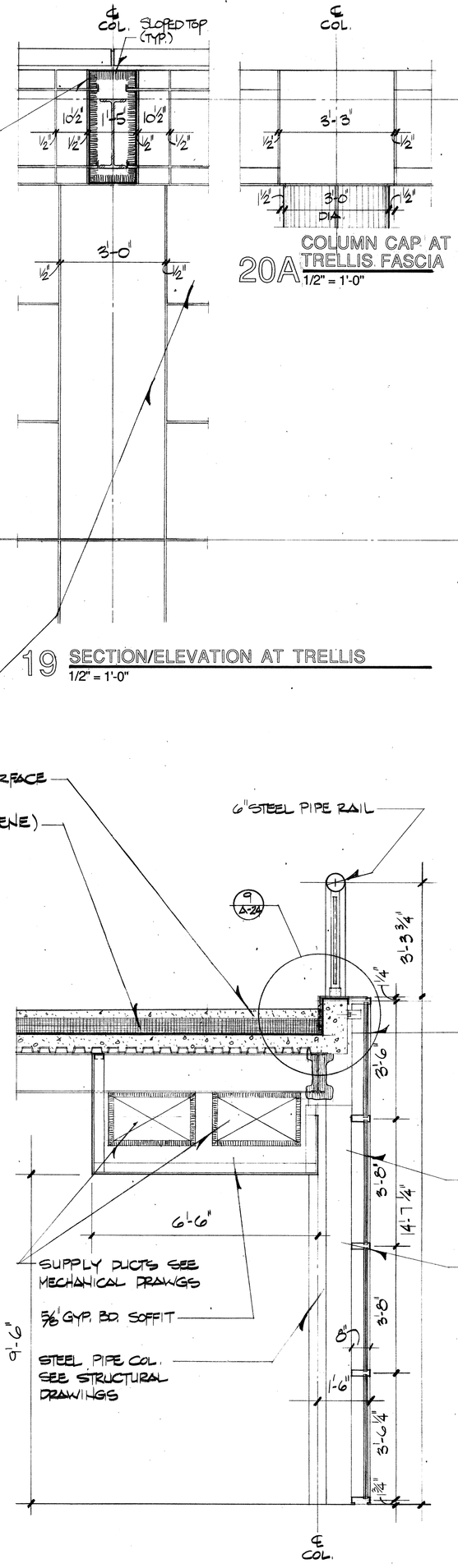
Sheet No. A13

Job No. 291209

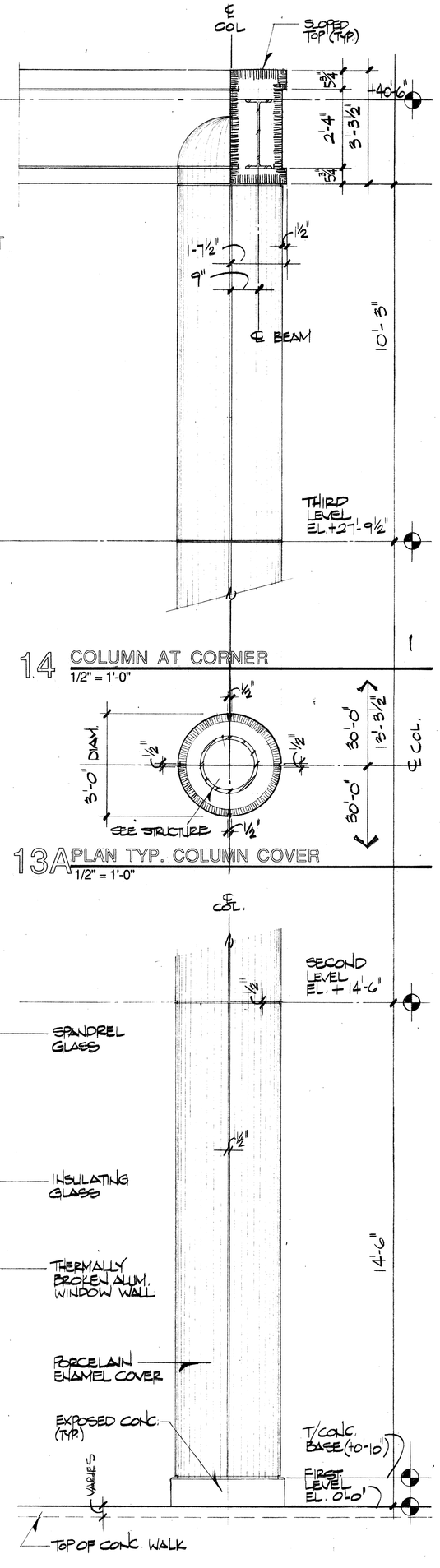
Date 070CT92



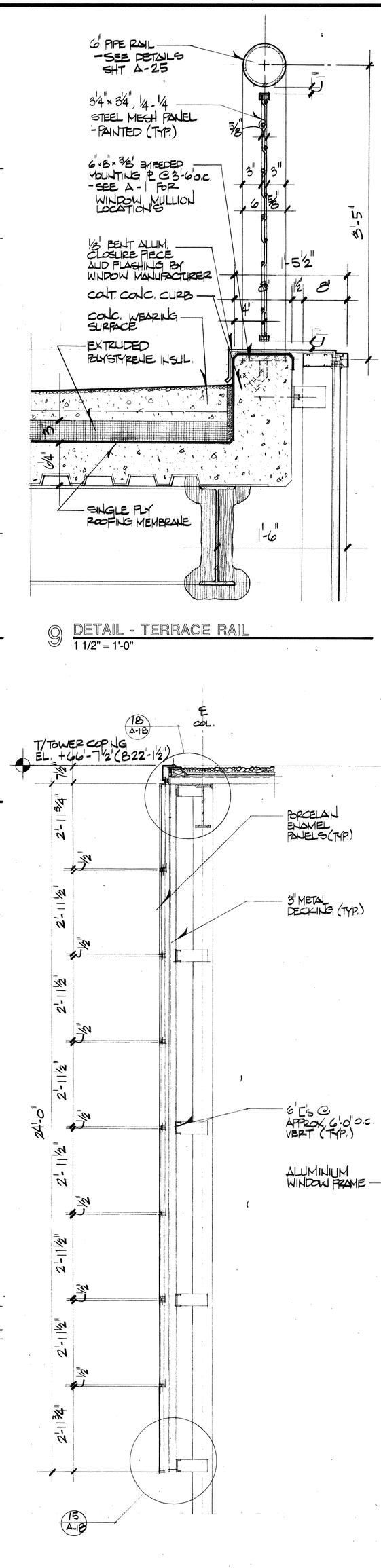
26 SECTION THROUGH WEST WALL AT PORCELAIN ENAMEL PANELS
1/2" = 1'-0"



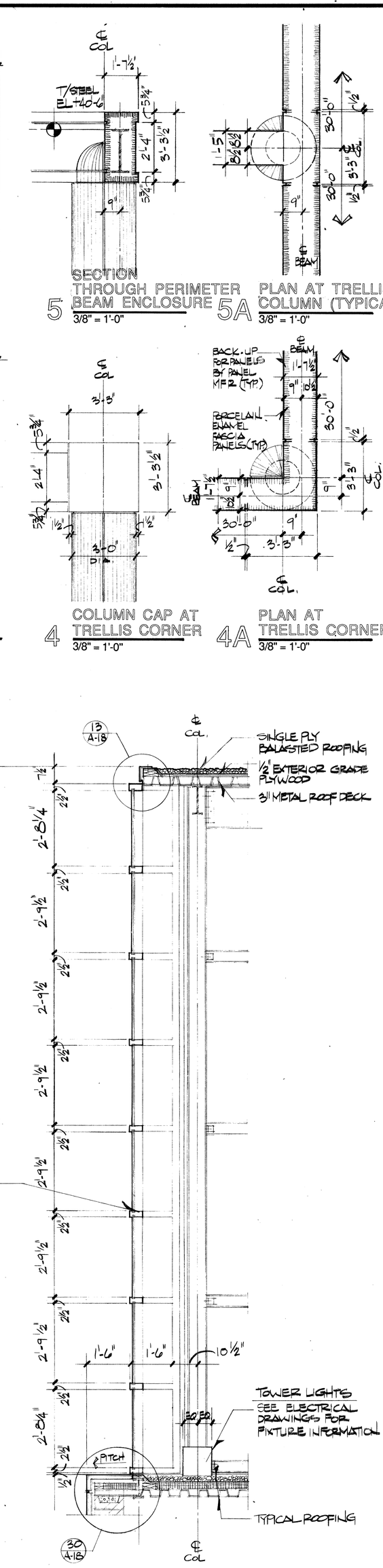
16 SECTION THROUGH WEST WALL AT TERRACE
1/2" = 1'-0"



11 TYPICAL TRELLIS COLUMN
1/2" = 1'-0"



6 TOWER WALL SECTION THROUGH PANELS
1½" = 1'-0"



1 TOWER WALL SECTION THROUGH GLAZING
1½" = 1'-0"

9 DETAIL - TERRACE RAIL
1 1/2" = 1'-0"

13A PLAN TYP. COLUMN COVER
1/2" = 1'-0"

5 SECTION THROUGH PERIMETER BEAM ENCLOSURE
3/8" = 1'-0"

5A PLAN AT TRELLIS COLUMN (TYPICAL)
3/8" = 1'-0"

4 COLUMN CAP AT TRELLIS CORNER
3/8" = 1'-0"

4A PLAN AT TRELLIS CORNER
3/8" = 1'-0"

THE LZTF ILLING PARTNERSHIP
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RESOURCE CENTER ADDITION - STUDENT RESOURCE CENTER ADDITION

COLLEGE OF DUPAGE
22nd & LAMBERT
GLEN ELLYN, ILLINOIS

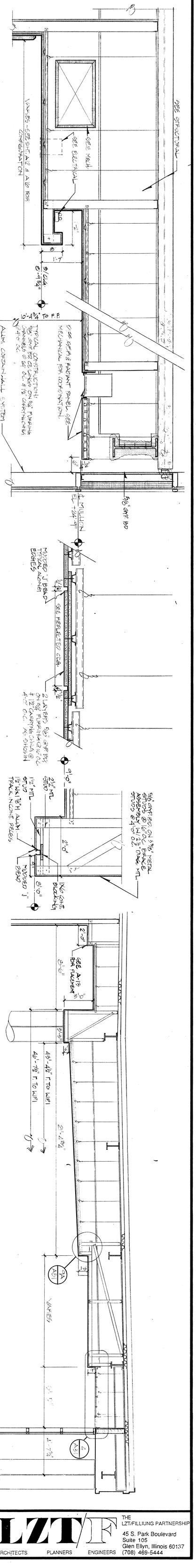
Sheet Title
WALL SECTIONS/DETAILS @ TRELLIS

Sheet No.
A-24

Job No.
291209

Date
OCTOBER 7, 1992

551116

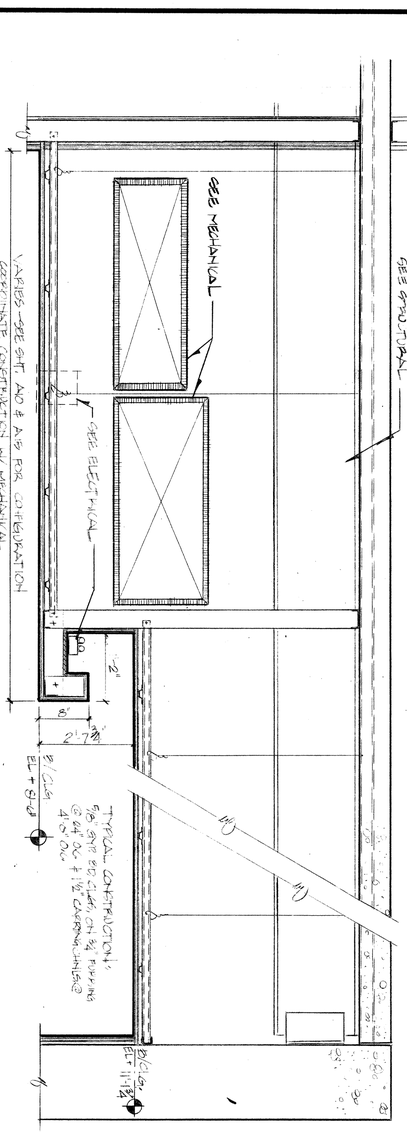


30 SECTION THRU CLASS SECOND FLR. CORRIDOR
¾"=1'-0"

20 DETAIL@CEILING REVEALS TYPICAL
1½"=1'-0"

15 DETAIL@ FOLDING GRILLE OVER SNACK COUNTER
¾"=1'-0"

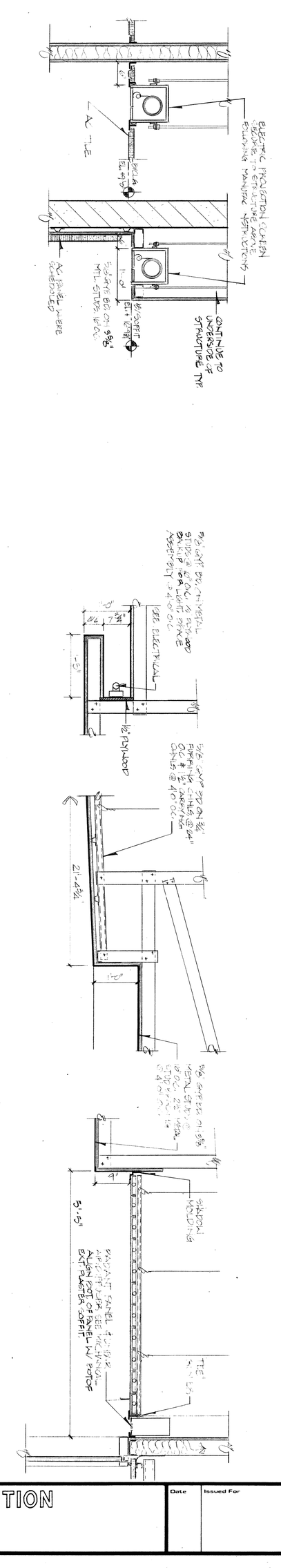
10 SECTION THRU CEILING BOUNDRY
¼"=1'-0"



29 SECTION THRU CLASS FIRST FLR. CORRIDOR
¾"=1'-0"

19 DETAIL
¾"=1'-0"

19A DETAIL
¾"=1'-0"

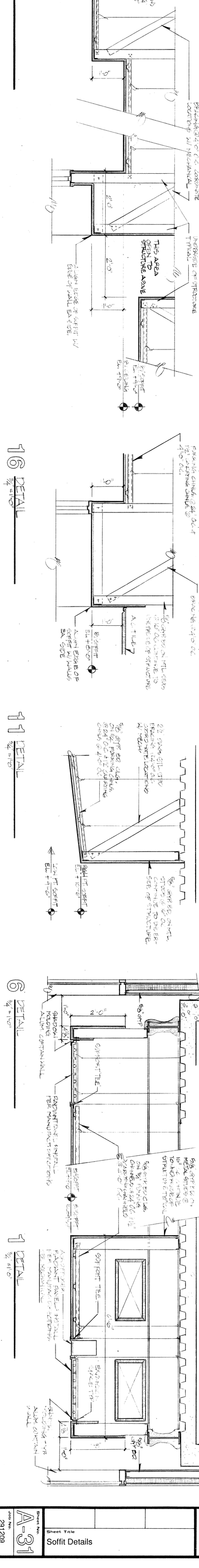


9 DETAIL
¾"=1'-0"

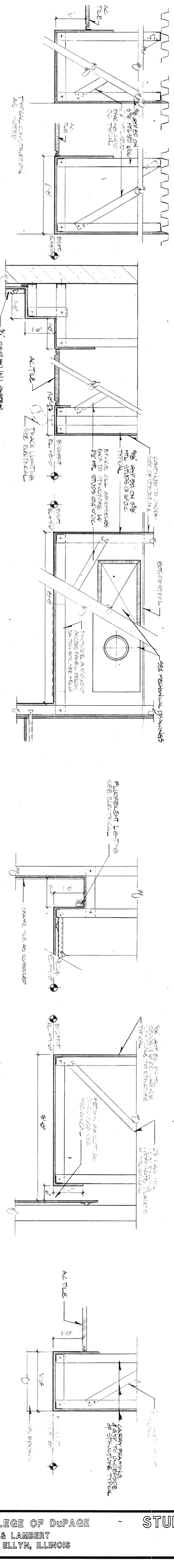
9A DETAIL
¾"=1'-0"

3 SECTION

4 DETAIL



26 DETAIL
¾"=1'-0"



27 DETAIL
¾"=1'-0"

27A DETAIL
¾"=1'-0"

22 DETAIL
¾"=1'-0"

17 DETAIL
¾"=1'-0"

18 DETAIL
¾"=1'-0"

16 DETAIL
¾"=1'-0"

13 DETAIL
¾"=1'-0"

12 DETAIL
¾"=1'-0"

7 DETAIL
¾"=1'-0"

11 DETAIL
¾"=1'-0"

6 DETAIL
¾"=1'-0"

1 DETAIL
¾"=1'-0"

2 DETAIL
¾"=1'-0"

Sheet No. A-31	Sheet Title: Soffit Details	COLLEGE OF DuPAGE 22nd & LAMBERT GLEN ELLYN, ILLINOIS	STUDENT RESOURCE CENTER ADDITION	Date / Issued For
Job No. 291209				
Date OCTOBER 7, 1992				

THE LZT/FILLIUNG PARTNERSHIP
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(708) 469-5444

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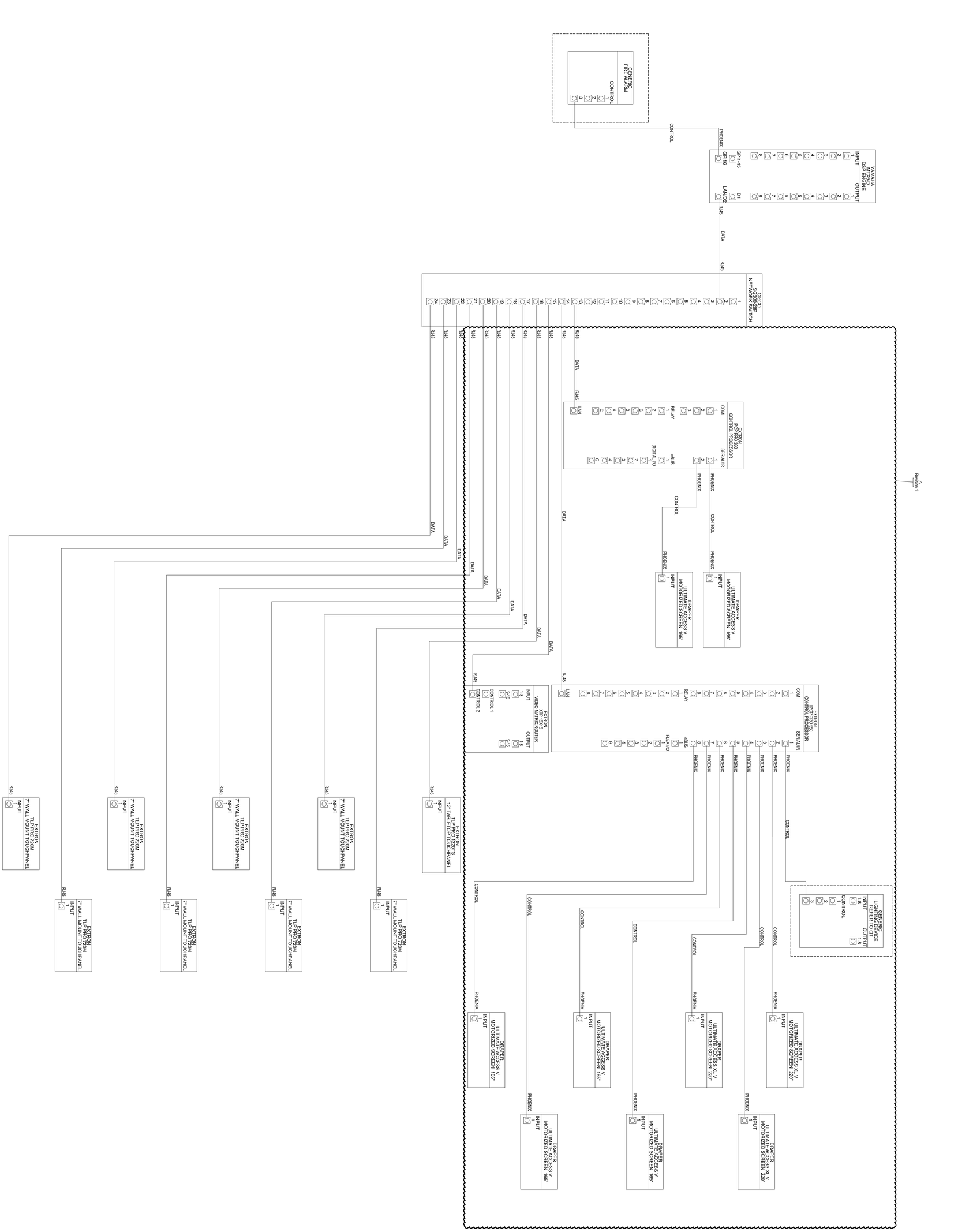
1 BLOCK DIAGRAM - AV CONTROL

12" = 1'-0"



DLR Group

Architecture Engineering Planning Interiors

TA-613

22-17142-00

ISSUE DATE

Revisions ADDENDUM 3 - 01/05/2018

Revisio Date 1

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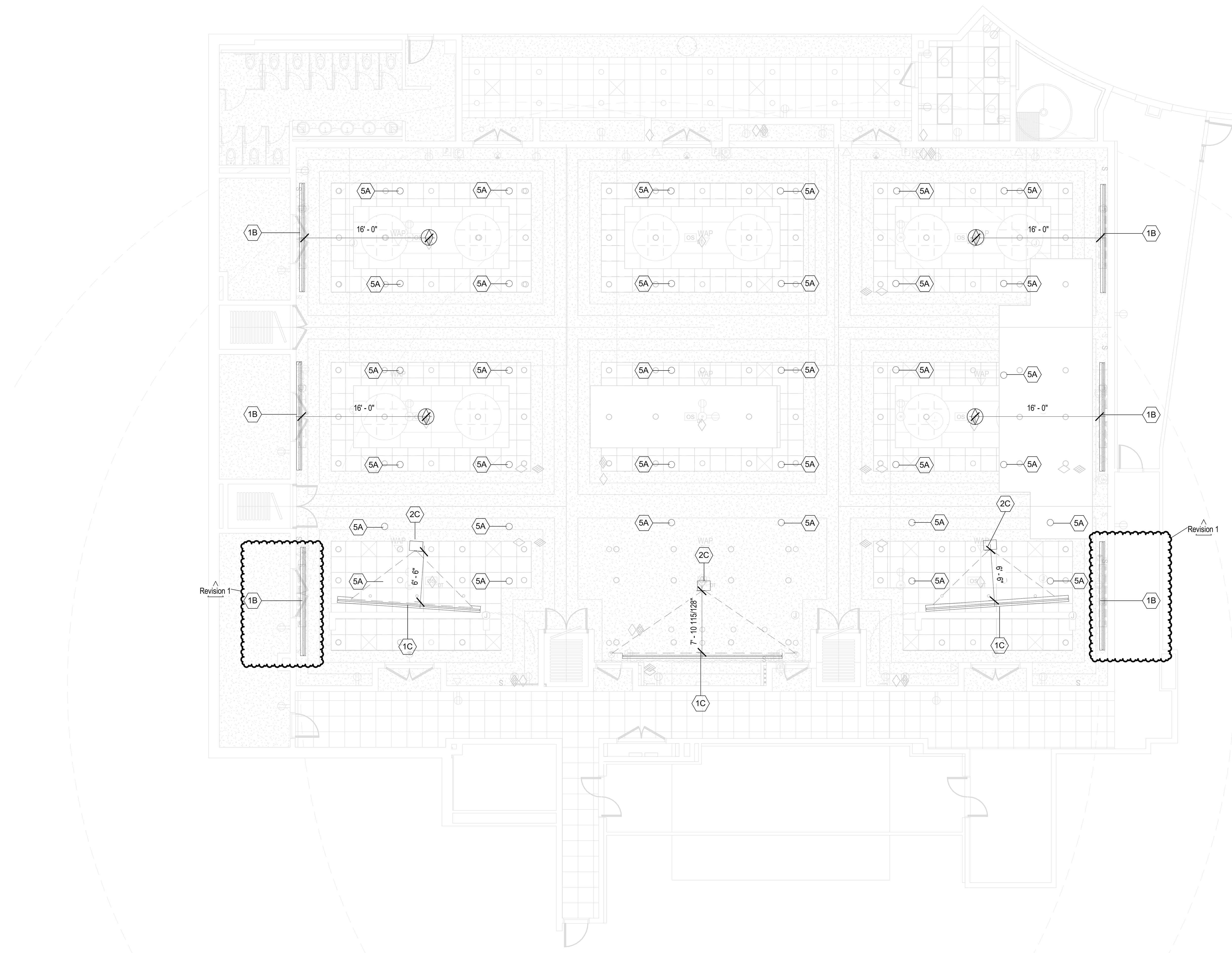
CONTROL SYSTEM BLOCK DIAGRAM

COLLEGE OF DUPAGE SRC2000 RENNOVATION

100% CD

Revision 1



1 LEVEL 02 EQ.P
1/8" = 1'-0"

LEGEND NOTES

LEGEND NOTES ARE COMMON TO ALL
SOME NOTES MAY NOT APPLY TO THIS SHEET

AUDIOVISUAL SYMBOL LEGEND

AUDIOVISUAL SYMBOL

XX-###-#
- DEVICE ID
- ROOM NUMBER
- DEVICE NUMBER

AUDIOVISUAL SYMBOL ID KEY

AV	AUDIOVISUAL TERMINATION
ANT	ANTENNA TERMINATION
AVR	AUDIOVISUAL EQUIPMENT RACK
CAM	CAMERA TERMINATION
FB	FLOORBOX TERMINATION
IC	INTERCOM TERMINATION
LT	LOUDSPEAKER TERMINATION
SW	SUBWOOFER TERMINATION
VT	VIDEO TERMINATION
LM	LIVE MICROPHONE TERMINATION
WAP	WIRELESS ACCESS POINT TERMINATION

POWER SYMBOLS

- 20A, 125V, 2 POLE, 3 WIRE, GROUNDING TYPE, NEMA 5-20 DUPLEX RECEPTACLE CONTAINED IN AUDIOVISUAL WIRING DEVICE PLATE (+18" AFF, UON).
- QUADRUPLEX RECEPTACLE - TWO (2) 20A, 125V, 2 POLE, 3 WIRE, GROUNDING TYPE, DUPLEX RECEPTACLES CONTAINED IN AUDIOVISUAL WIRING DEVICE PLATE (+18" AFF UON).
- CONCEALED CEILING MOUNTED QUADRUPLEX RECEPTACLE - TWO (2) 20A, 125V, 2 POLE, 3 WIRE, GROUNDING TYPE CONTAINED IN AUDIOVISUAL WIRING DEVICE (CEILING UON).
- CONCEALED SERVICE, STEEL FLOOR BOX COMPLETE WITH A QUADRUPLEX RECEPTACLE - TWO (2) 20A, 125V, 2 POLE, 3 WIRE, GROUNDING TYPE RECEPTACLES. PROVIDE CAST- IRON BOX IN SLABS THAT ARE IN DIRECT CONTACT WITH EARTH IN AV WIRING DEVICE.
- (J) JUNCTION BOX.

DATA SYMBOLS

- WALL MOUNTED DATA RECEPTACLE FOR BUILDING WIDE LAN CONTAINED IN AUDIOVISUAL WIRING DEVICE PLATE (+18" AFF UON).
- WALL MOUNTED DATA RECEPTACLE FOR BUILDING WIDE LAN, NOT CONTAINED IN AUDIOVISUAL WIRING DEVICE PLATE - FOR REFERENCE ONLY.

Keynote Legend

Key Value	Keynote Text
1B	PROJECTION SCREEN - 87.5"x140" REFER TO SPECIFICATION SECTION 274116 FOR BASIS OF DESIGN REQUIREMENTS AND QUANTITY
1C	PROJECTION SCREEN - 120"x192" REFER TO SPECIFICATION SECTION 274116 FOR BASIS OF DESIGN REQUIREMENTS AND QUANTITY
2C	OWNER PROVIDED PROJECTOR & MOUNT
4D	FLUSH WALL-MOUNT AV CONTROL INTERFACE - REFER TO SPECIFICATION SECTION 274116 FOR BASIS OF DESIGN REQUIREMENTS AND QUANTITY
5A	CEILING MOUNTED LOUDSPEAKER - REFER TO SPECIFICATION SECTION 274116 FOR BASIS OF DESIGN REQUIREMENTS AND QUANTITY
6A	AV EQUIPMENT RACK - REFER TO SPECIFICATION SECTION 274116 FOR BASIS OF DESIGN REQUIREMENTS AND QUANTITY

Revision 1
100% CD

RCP EQUIPMENT PLAN - SECOND FLOOR
COLLEGE OF DUPAGE SRC2000 RENNOVATION

TA-212
22-17142-00
ISSUE DATE
Revisions ADDENDUM 3 - 01/05/2018
Revisio n 1 Date 1

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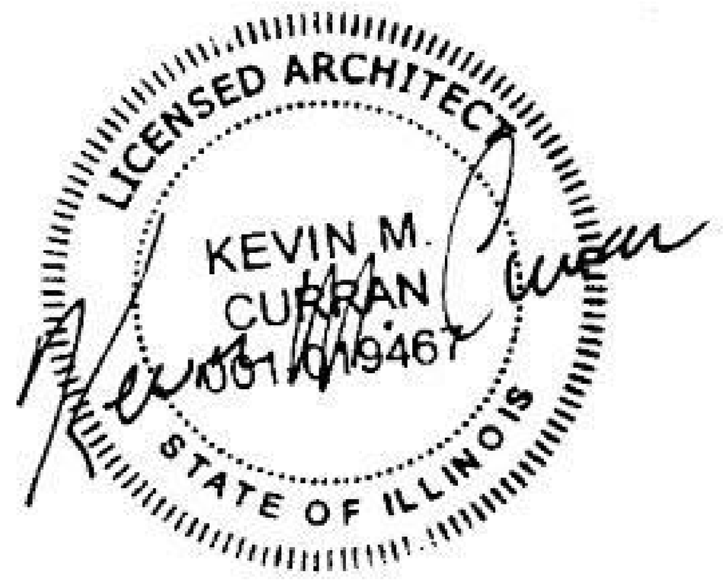

SRC 2000

CONFERENCE AREA RENOVATION

425 FAWELL BLVD
GLEN ELLYN, ILLINOIS

ADDENDUM 3

JANUARY 5, 2018

PROJECT DESCRIPTION

THIS PROJECT CONSISTS OF REMODELING OF EXISTING SRC 2000 CONFERENCE CENTER. THE SCOPE INCLUDES NEW ARCHITECTURAL FINISHES, NEW AV SYSTEM, NEW THEATRICAL LIGHTING AND NEW ARCHITECTURAL LIGHTING.

PROJECT TEAM

OWNER
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DIRECTOR OF FACILITIES, PLANNING & DEVELOPMENT - BRUCE H. SCHMIEDL
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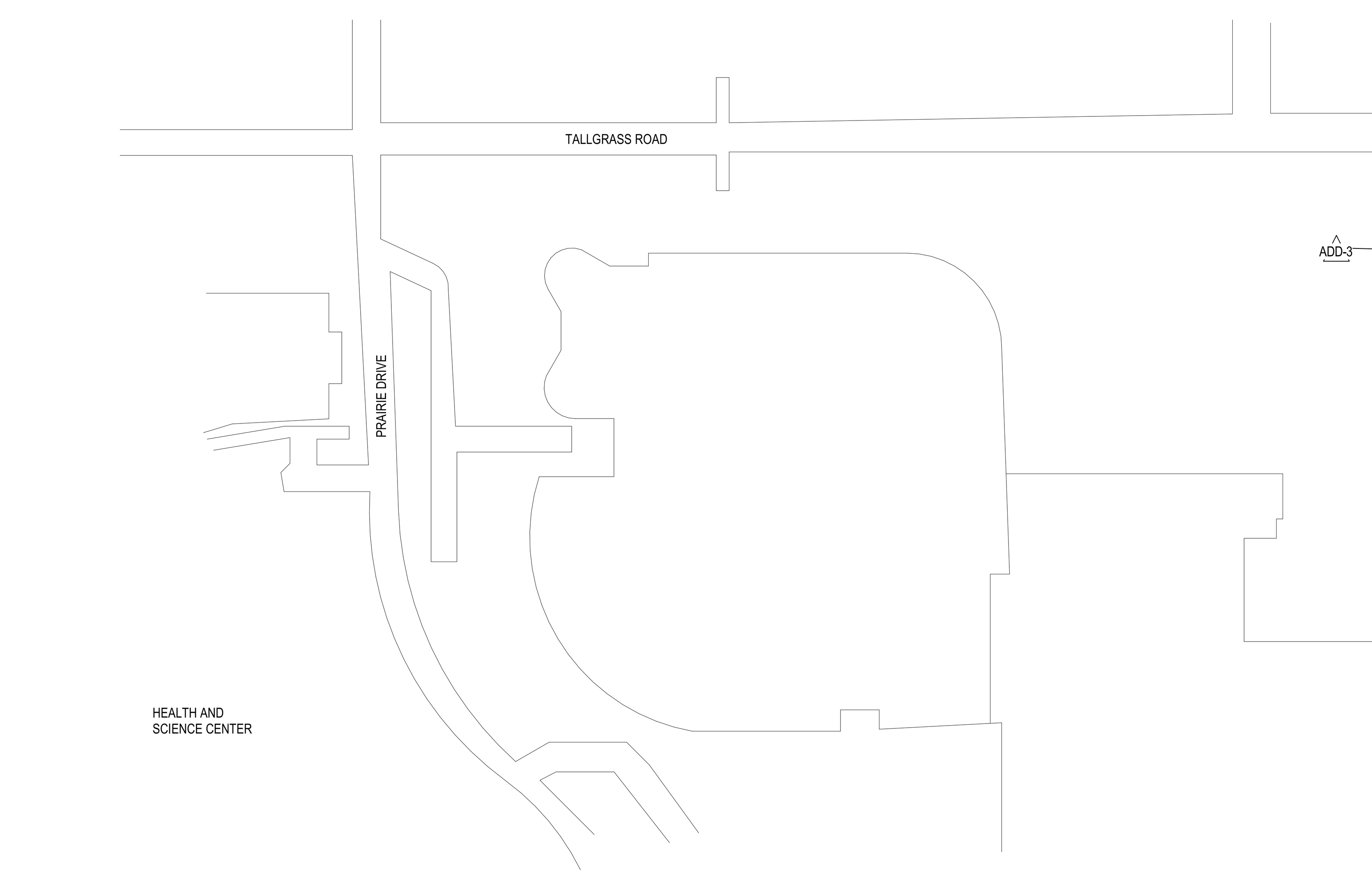
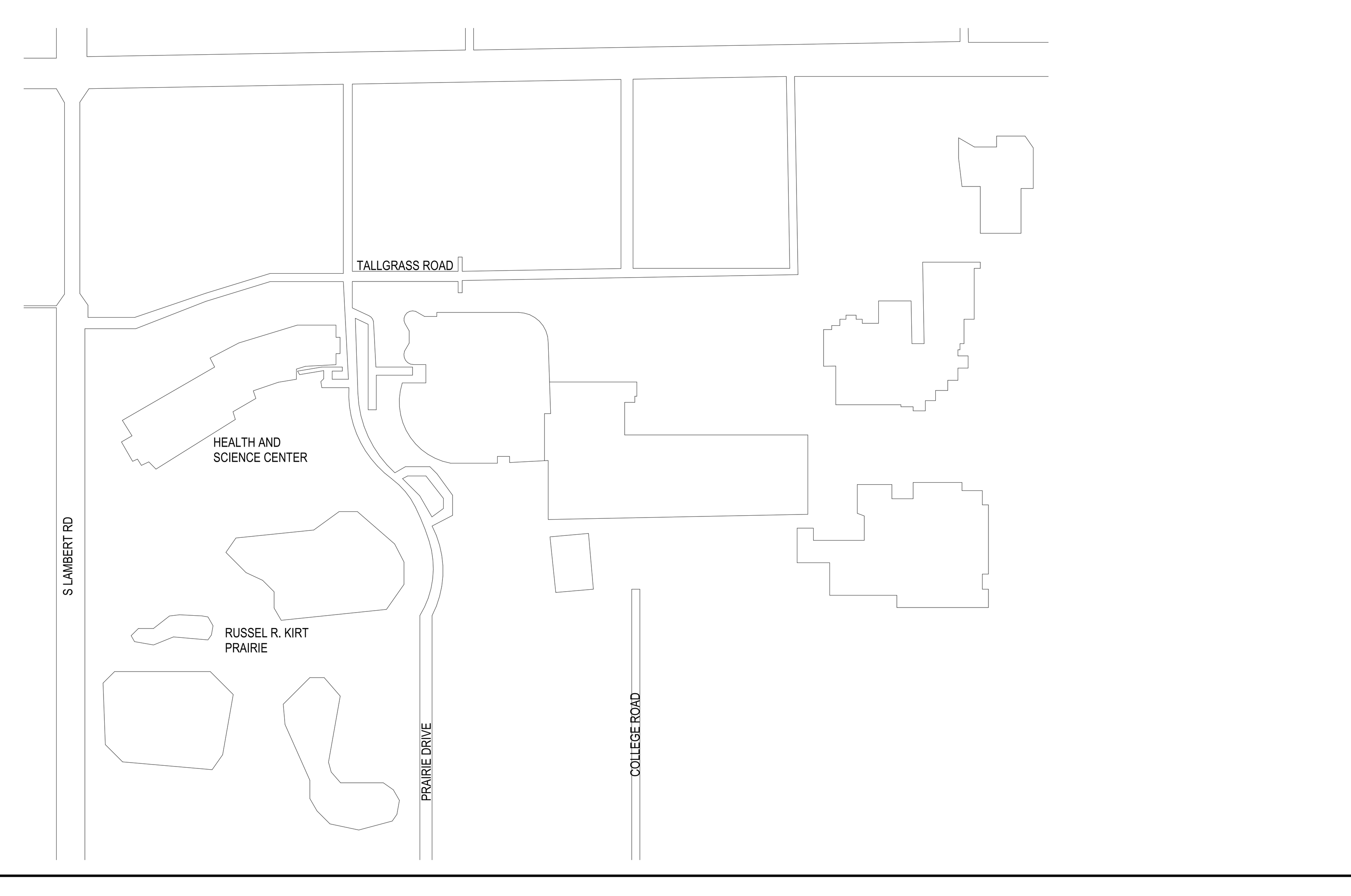
310.266.4344

PROPERTY LOCATION



SITE MAP



INDEX OF DRAWINGS

ADD-3

APPLICABLE CODES

ICC 2009 INTERNATIONAL BUILDING CODE
ICC 2009 INTERNATIONAL RESIDENTIAL CODE
ICC 2009 INTERNATIONAL FIRE CODE
ICC 2009 INTERNATIONAL MECHANICAL CODE
ICC 2009 INTERNATIONAL PROPERTY MAINTENANCE CODE
ICC 2009 INTERNATIONAL FUEL GAS CODE
NEX 2011 NATIONAL ELECTRICAL CODE
DUPAGE COUNTY COUNTRYWIDE STORMWATER FLOODPLAIN ORDINANCE, 2013
ILLINOIS STATE PLUMBING CODE, 2004 (SUPERCEDED BY ILLINOIS STATE PLUMBING CODE, 2014)
ILLINOIS, NFPA 101 LIFE SAFETY CODE, 2009
VILLAGE CODE - TITLE 2, CHAPTER 8 - APPERANCE GUIDELINES ORDINANCE 5508VC
VILLAGE CODE - TITLE 4, CHAPTER 1 - CONTRACTOR REGISTRATION REQUIREMENTS
VILLAGE CODE - TITLE 4, CHAPTER 5 - SIGN CODE
VILLAGE CODE - TITLE 4, CHAPTER 7 - STORMWATER AND FLOODPLAIN REGULATIONS
VILLAGE CODE - TITLE 7, CHAPTER 9 - SEWER USE REGULATIONS
VILLAGE CODE - TITLE 7, CHAPTER 10 - WATER SYSTEM REGULATIONS
VILLAGE CODE - TITLE 8, CHAPTER 1 - STREETS AND SIDEWALKS
VILLAGE CODE - TITLE 8, CHAPTER 4 - FORESTRY MANAGEMENT
VILLAGE CODE - TITLE 8, CHAPTER 6 - PUBLIC UTILITY CONSTRUCTION REGULATIONS
VILLAGE CODE - TITLE 10, CHAPTER 1 - ZONING CODE
VILLAGE CODE - TITLE 10, CHAPTER 2 - SUBDIVISIONS REGULATIONS
VILLAGE CODE - TITLE 10, CHAPTER 4, ANNEXATION REGULATIONS
DUPAGE COUNTY FOOD SERVICE DESIGN AND CONSTRUCTION MANUAL
DUPAGE COUNTY PRIVATE WATER SUPPLY ORDINANCE
DUPAGE COUNTY PRIVAGE SEWERAGE DISPOSAL ORDINANCE
ILLINOIS ACCESSIBILITY CODE, 1997
ILLINOIS ENERGY CONSERVATION CODE (ICC 2015 INTERNATIONAL ENERGY CONSERVATION CODE WITH AMENDMENTS)
ILLINOIS DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION
ILLINOIS, UTILITY LOCATION ACT 220 ILCS 50 (JUILE)
ILLINOIS, ASHRAE ENERGY STANDARD 90.1, 2004
ILLINOSI, ENVIRONMENTAL PROTECTION AGENCY, ASBESTOS ABATEMENT
ILLINOSI ENVIRONMENTAL PROTECTION AGENCY, RADON RESISTANT CONSTRUCTION ACT
ILLINOIS, STATE FIRE MARSHALL BOILER REGULATIONS
ILLINOIS STATE FIRE MARSHALL, UNDERGROUND STORE TANK REGULATIONS
ILLINOIS STATE FIRE MARSHALL, ELEVATOR REGULATIONS
USEPA RENOVATION REPAIR AND PAINTING PROGRAM RULE (LEAD)
APPLICABLE REGULATIONS OF OTHER FEDERAL, STATE AND LOCAL AGENCIES AND PUBLIC UTILTIY SERVICE PROVIDERES

ORDINANCES

VILLAGE CODE - TITLE 2, CHAPTER 8 - APPERANCE GUIDELINES ORDINANCE 5508VC
VILLAGE CODE - TITLE 4, CHAPTER 1 - CONTRACTOR REGISTRATION REQUIREMENTS
VILLAGE CODE - TITLE 4, CHAPTER 5 - SIGN CODE
VILLAGE CODE - TITLE 4, CHAPTER 7 - STORMWATER AND FLOORPLAIN REGULATIONS
VILLAGE CODE - TITLE 4, CHAPTER 8 - TREE PRESERVATION REGULATIONS
VILLAGE CODE - TITLE 7, CHAPTER 9 - SEWER USE REGULATIONS
VILLAGE CODE - TITLE 7, CHAPTER 10 - WATER SYSTEM REGULATIONS
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VILLAGE CODE - TITLE 10, CHAPTER 4 - ANNEXATION REGULATIONS
DUPAGE COUNTY FOOD SERVICE DESIGN AND CONSTRUCTION REGULATIONS
DUPAGE COUNTY PRIVATE WATER SUPPLY ORDINANCE
DUPAGE COUNTY PRIVATE SEWERAGE DISPOSAL ORDINANCE
ILLINOIS ACCESSIBILITY CODE, 1997
ILLINOIS ENERGY CONSERVATION CODE (ICC 2015 INTERNATIONAL ENERGY CONSERVATION CODE WITH AMENDMENTS)
ILLINOIS DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION
ILLINOIS, UTILTY LOCATION ACT 220 ILCS 50 (JULIE)
ILLINOIS, ASHRAE ENERGY STANDARD 90.1, 2004
ILLINOIS, ENVIRONMENTAL PROTECTION AGENCY, ASBESTOS ABATEMENT
ILLINOIS ENVIRONMENTAL PROTECTION AGENCY, RADON RESISTANT CONSTRUCTION ACT
ILLINOIS, STATE FIRE MARSHALL, BOILER REGULATIONS
ILLINOIS, STATE FIRE MARSHALL, UNDERGROUND STORAGE TANK REGULATIONS
ILLINOIS STATE FIRE MARSHALL ELEVATOR REGULATIONS
USEPA, RENOVATION, REPAIR AND PAINTING PROGRAM RULE (LEAD)
APPLICABLE REGULATIONS OF OTHER FEDERAL, STATE AND LOCAL AGENCIES AND PUBLIC UTILITY SERVICE PROVIDERS
(1) AS AMENDED BY VILLAGE CODE TITLE 4, CHAPTER 1
(2) AS AMENDED BY VILLAGE COCE TITLE 5, CHAPTER 2
(3) AS AMENDED BY VILLAGE CODE, TITLE 4, CHAPTER 2
(4) AS AMENDED BY VILLAGE CODE, TITLE 4, CHAPTER 7
(5) AS AMENDED BY VILLAGE CODE, TITLE 4, CHAPTER 3

Addendum 1

Community College District 502
SRC 2000 - Conference Center Renovation
425 Fawell Blvd.
Glen Ellyn, Illinois 60137

COVER SHEET
SRC 2000

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22-17142-00
01/05/2018

DLR Group
Architecture Engineering Planning Interiors

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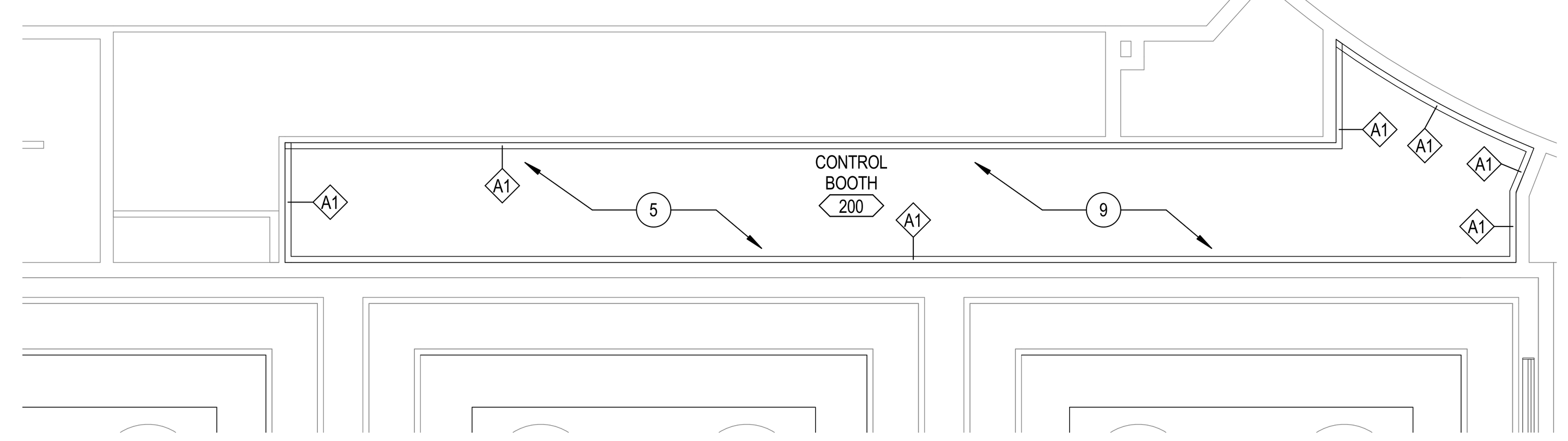
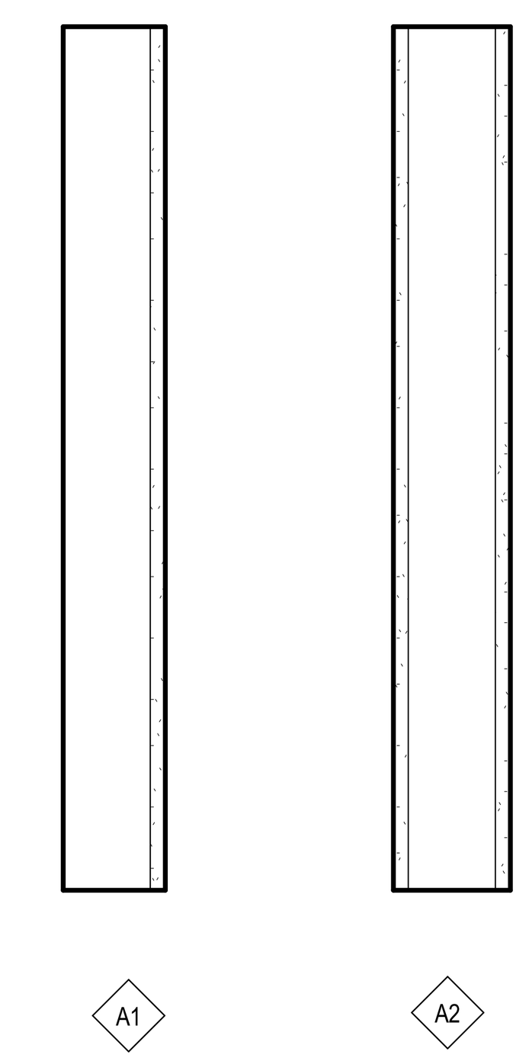


2 A1.1 CONTROL ROOM FLOOR PLAN
SCALE: 1/8" = 1'-0"



WALL TYPES - STUD					
WALL TYPE	FIRE RATING		TESTED ASSEMBLIES	STC RATING	NOTES
A1	None				3 5/8" STEEL STUDS AT 16" O.C., 1 LAYER OF 5/8". WALLS EXTEND TO UNDERSIDE OF DECK AND BRACE. NO SOUND ATTENUATING BLANKET INSULATION.
A2	None				3 5/8" STEEL STUDS AT 16" O.C., 1 LAYER OF 5/8" ON EACH SIDE. WALLS EXTEND TO UNDERSIDE OF DECK AND BRACED. NO SOUND ATTENUATING BLANKET INSULATION.

ADD-3

DOOR AND FRAME SCHEDULE

NUMBER	DOOR PANEL: NO. OF PANELS	WIDTH	HEIGHT	THICKNESS	MATERIAL	TYPE	FRAME: DEPTH	MATERIAL	TYPE	FIRE RATING	HARDWARE SET	COMMENTS
100	2	3' - 0"	7' - 0"	1 3/4"	HM	MATCH EXISTING	5 3/4"	HM	EXISTING TO REMAIN	VERIFY EXISTING	1.0	
101	2	3' - 0"	7' - 0"	1 3/4"	HM	MATCH EXISTING	5 3/4"	HM	EXISTING TO REMAIN	VERIFY EXISTING	1.0	
102	2	3' - 0"	7' - 0"	1 3/4"	HM	MATCH EXISTING	5 3/4"	HM	EXISTING TO REMAIN	VERIFY EXISTING	1.0	
103	2	3' - 0"	7' - 0"	1 3/4"	HM	MATCH EXISTING	5 3/4"	HM	EXISTING TO REMAIN	VERIFY EXISTING	1.02	
104	2	3' - 0"	7' - 0"	1 3/4"	HM	MATCH EXISTING	5 3/4"	HM	EXISTING TO REMAIN	VERIFY EXISTING	2.0	
105	2	3' - 0"	7' - 0"	1 3/4"	HM	MATCH EXISTING	5 3/4"	HM	EXISTING TO REMAIN	VERIFY EXISTING	2.0	
106	2	3' - 0"	7' - 0"	1 3/4"	HM	MATCH EXISTING	5 3/4"	HM	EXISTING TO REMAIN	VERIFY EXISTING	2.0	
108	1	3' - 0"	7' - 0"	1 3/4"	HM	MATCH EXISTING	5 3/4"	HM	EXISTING TO REMAIN	VERIFY EXISTING	1.01	
109	1	3' - 0"	7' - 0"	1 3/4"	HM	MATCH EXISTING	5 3/4"	HM	EXISTING TO REMAIN	VERIFY EXISTING	1.01	
110	2	3' - 0"	7' - 0"	1 3/4"	HM	MATCH EXISTING	5 3/4"	HM	EXISTING TO REMAIN	VERIFY EXISTING	1.02	

HARDWARE SETS

Set: 1.00
Doors: 100, 101, 102,

6 Hinge (heavy weight) T4A3786 4-1/2" x 4-1/2" US26D MK
1 Removable Mullion Reuse Existing VD
2 Pull RM201 US32D RO
2 Fire Rated Rim Exit CD 99L-OP US26D VD
Cylinders Reuse existing Salvaged Cylinders
2 Door Closer 4040XP EDA AL LC
2 Kick Plate K1050 12" high BEV CSK US32D RO
2 Wall Stop 400 US26D RO
1 Gasketing S88BL 20' PE
1 Astragal S772BL 8' PE

Set: 1.02
Doors: 103, 110

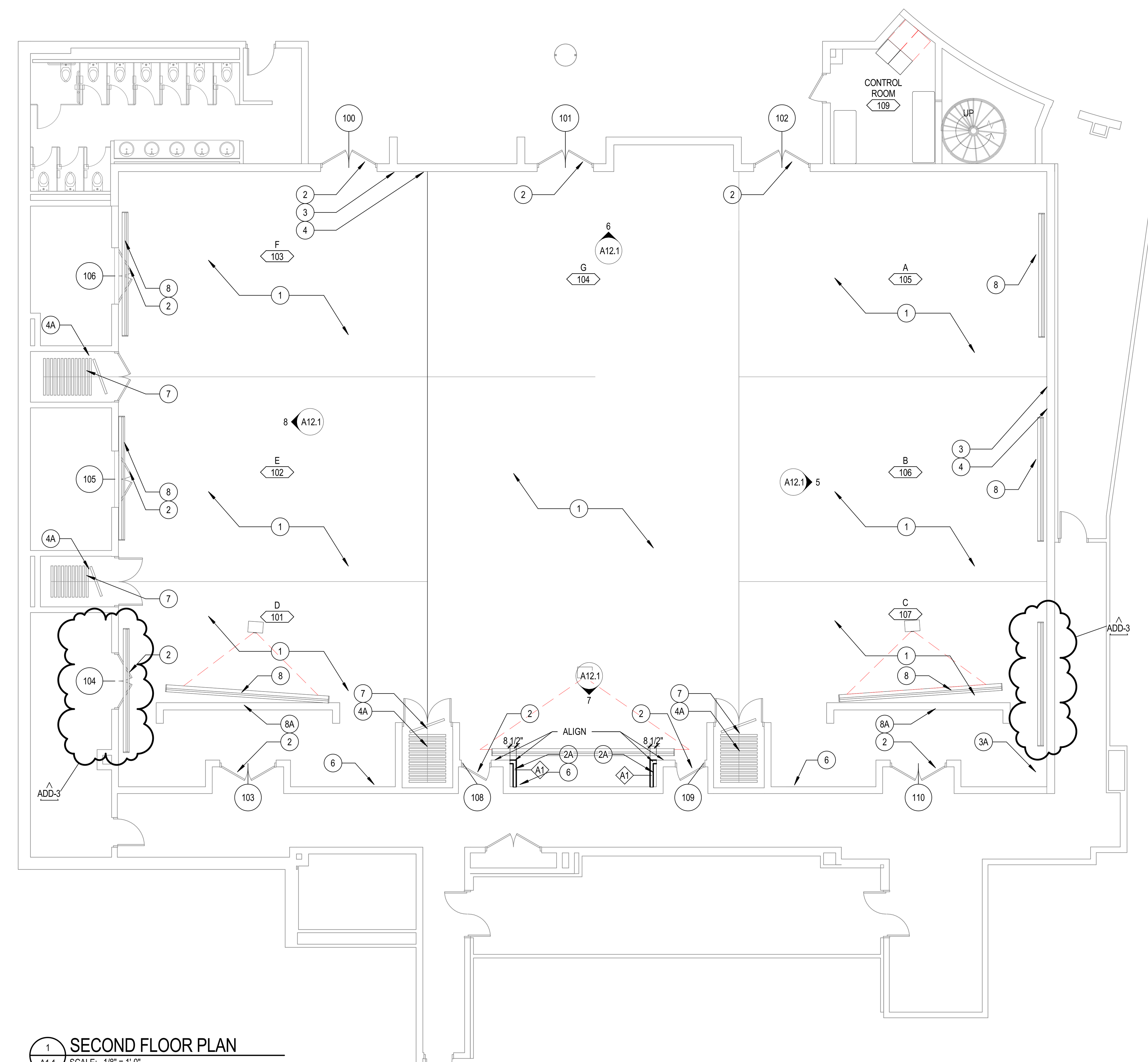
6 Hinge (heavy weight) T4A3786 4-1/2" x 4-1/2" US26D MK
1 Removable Mullion Reuse Existing VD
2 Pull RM201 US32D RO
Cylinders Reuse existing Salvaged Cylinders
2 Fire Rated Rim Exit 99L-03 996L US26D VD
2 Door Closer 4040XP EDA AL LC
2 Kick Plate K1050 12" high BEV CSK US32D RO
2 Wall Stop 400 US26D RO
1 Gasketing S88BL 20' PE
1 Astragal S772BL 8' PE

Set: 1.01
Doors: 108, 109

3 Hinge (heavy weight) T4A3786 4-1/2" x 4-1/2" US26D MK
2 Pull RM201 US32D RO
Cylinders Reuse existing Salvaged Cylinders
1 Fire Rated Rim Exit 99L-03 996L US26D VD
1 Door Closer 4040XP EDA AL LC
1 Kick Plate K1050 12" high BEV CSK US32D RO
1 Wall Stop 400 US26D RO
1 Gasketing S88BL 20' PE

Set: 2.00
Doors: 104, 105, 106

6 Hinge (heavy weight) T4A3786 4-1/2" x 4-1/2" US26D MK
1 Flush Bolt 555 US26D RO
1 Dust Proof Strike 570 US26D RO
1 Mortise Lock L9080 03C 626 SC
Cylinders Reuse existing Salvaged Cylinders
2 Surf Overhead Stop 9-X36 630 RF
2 Silencer 608-RKW RO



1 A1.1 SECOND FLOOR PLAN
SCALE: 1/8" = 1'-0"

LEGEND

LEGEND NOTES ARE COMMON TO ALL
SOME NOTES MAY NOT APPLY TO THIS SHEET

INTERIOR FINISH PLAN GENERAL NOTES

A. INTERIOR PLAN GENERAL NOTES APPLY TO ALL INTERIORFINISH PLAN SHEETS.
B. NOT ALL FLOOR AND WALL FINISHES ARE NOTED ON THE INTERIOR FINISH PLANS. SEE ROOM FINISH SCHEDULE FOR FLOOR AND WALL FINISHES NOT NOTED.
C. FLOOR PATTERN DIMENSIONS AND LOCATIONS ARE APPROXIMATE. MINOR ADJUSTMENTS MAY BE MADE FOR LAYOUT AND TO MINIMIZE WASTE AS LONG AS THE DESIGN INTENT IN MAINTAINED.

WALL TYPE GENERAL NOTES

A. THE SIDE OF THE PARTITION THAT THE WALL TYPE SYMBOL IS LOCATED ON (AS SHOWN ON THE FLOOR PLANS), INDICATES THE SIDE OF THE PARTITION TO RECEIVE DOUBLE LAYER GYPSUM BOARD AND/OR MATERIAL INDICATED BY THE WALL TYPE.
B. SEE "CP" SERIES SHEETS FOR LOCATIONS OF FIRE RATED WALLS.
C. REFER TO THE GENERAL NOTES ON SHEET A0.1 FOR ADDITIONAL REQUIREMENTS REGARDING GWB PARTITIONS.
D. CONSTRUCT FIRE RATED GWB PARTITIONS ACCORDING TO FIRE RATED ASSEMBLIES INDICATED BELOW WALL TYPE.
E. ALL NEW WALLS TO BE BRACED TO STRUCTURE ABOVE. PROVIDE SHOP DRAWINGS.
F. PROVIDE SHOP DRAWINGS FOR ALL NEW STEEL LOCATIONS.

DOOR AND WINDOW FRAME SCHEDULE GENERAL NOTES

A. ALL HOLLOW METAL FRAMES SHALL BE GROUTED SOLID.
B. INSTALL EXTERIOR FRAMES WITH 1/4 INCH SHIM AND JOINT SEALANT AROUND PERIMETER OF FRAME.
C. GLASS TYPES FOR DOORS ARE INDICATED IN NOTES COLUMNS OF DOOR AND FRAME SCHEDULE OR IN SPECIFICATIONS. GLASS TYPES FOR FRAMES ARE INDICATED ON FRAME ELEVATIONS OR IN SPECIFICATIONS.
D. FRAME MANUFACTURER SHALL COORDINATE LOCATIONS OF CONCEALED CONDUIT AND J-BOXES REQUIRED FOR SECURITY SYSTEM HARDWARE PRIOR TO MANUFACTURING OF HOLLOW METAL FRAMES AND COORDINATE WITH SECURITY HARDWARE AND DEVICES.

1 CPT-1
2 NEW DOORS
2A NEW 3 5/8" MTL STUD WALL WITH 5/8" GYP SIDES. RELOCATE EXISTING RECEPTICLES TO NEW WALLS
3 WC-1 ABOVE ACOUSTICAL PANELS
3A NEW 3 5/8" MTL STUD WALL WITH 5/8" GYP BOTH SIDES. RELOCATE EXISTING RECEPTICLES TO NEW WALLS
4 RELOCATE EXISTING ACOUSTICAL PANELS
4A MODERNFOLD NEW FABRIC
5 NEW PLYWOOD FLOORING
6 NEW RECESSED FIRE EXTINGUISHER CABINET
7 REFURBISH EXISTING MODERNFOLD WALL. UNHINGE PANELS, TAKE POCKET DOORS AND JAMBS DOWN, REMOVE EXISTING FABRIC FINISH, DISPOSE OF IN OWNER'S DUMPSTER AND PREPARE PANEL SKINS. FURNISH MODERNFOLD STANDARD FABRIC (COLOR TO BE APPROVED BY ARCHIECT), ADHESIVE AND MISCELLANEOUS SUNDRIES AND RECOVER 72 PANELS (144 SIDES) AND (4) SETS OF POCKET DOORS AND JAMBS. REHINGE PANELS, REHANG POCKET DOORS, REALIGN, RE-ANCHOR AND REINSTALL ALL TRIM AND HARDWARE.
9 PRIME AND PAINT WALLS, TYP.

Addendum 1

Community College District 502
SRC 2000 - Conference Center Renovation
425 Fawell Blvd.
Glen Ellyn, Illinois 60137

FLOOR PLANS & DOOR SCHEDULE
SRC 2000

A1.1
22-17142-00
01/05/2018
Revision ADDENDUM 3 - 01/05/2018
ADD-3 Date 1 TYPE DESCRIPTION HERE

DLR Group
Architecture Engineering Planning Interiors

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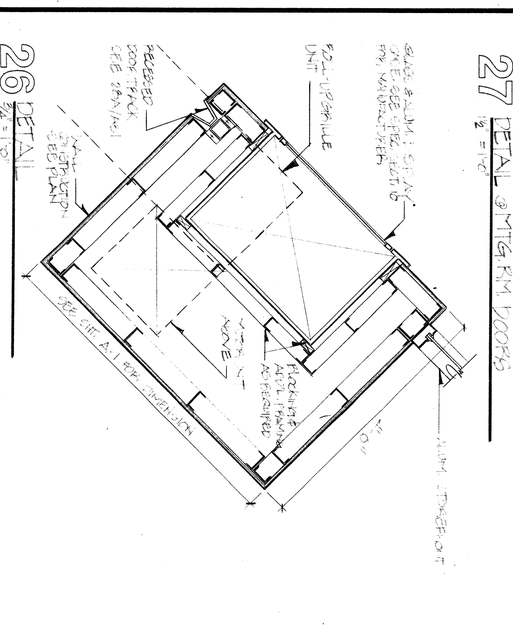
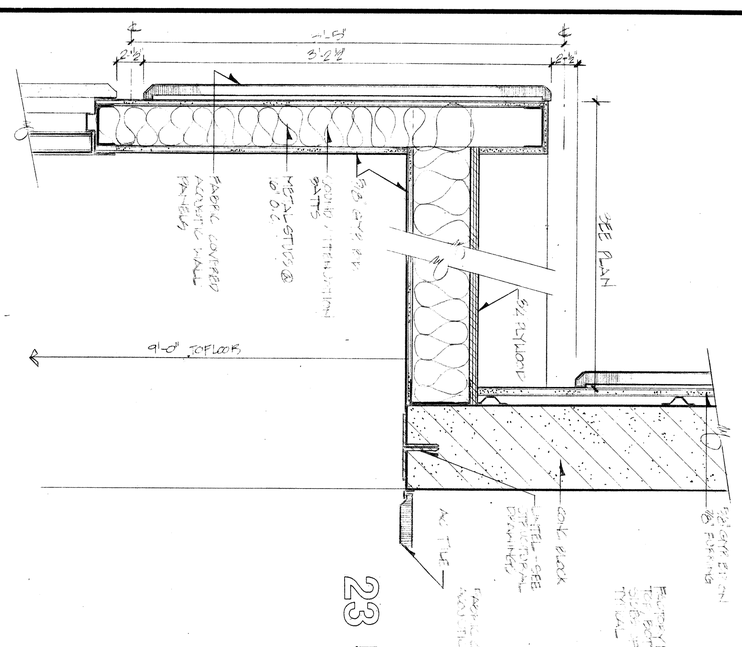


26 DETAIL
3/4" = 1'-0"

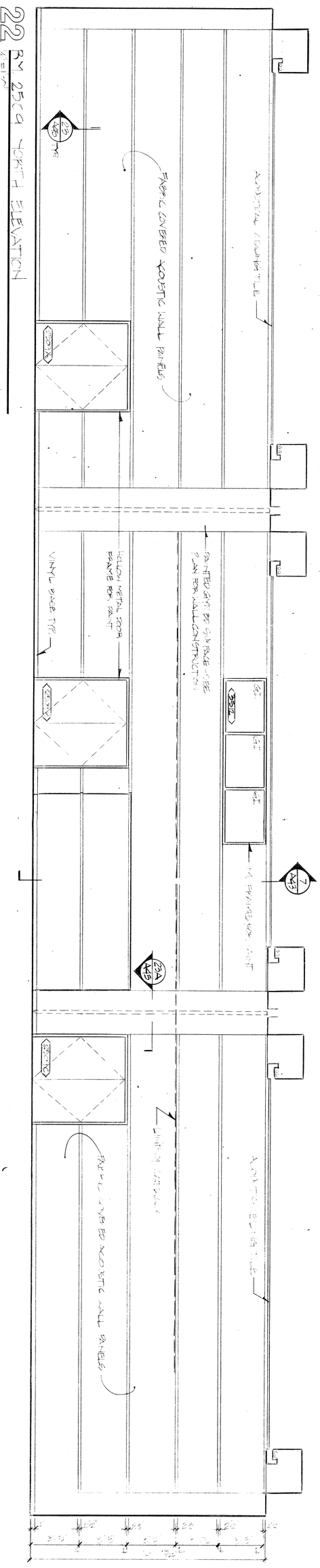
27 DETAIL @ MTG RM DOORS
1/2" = 1'-0"



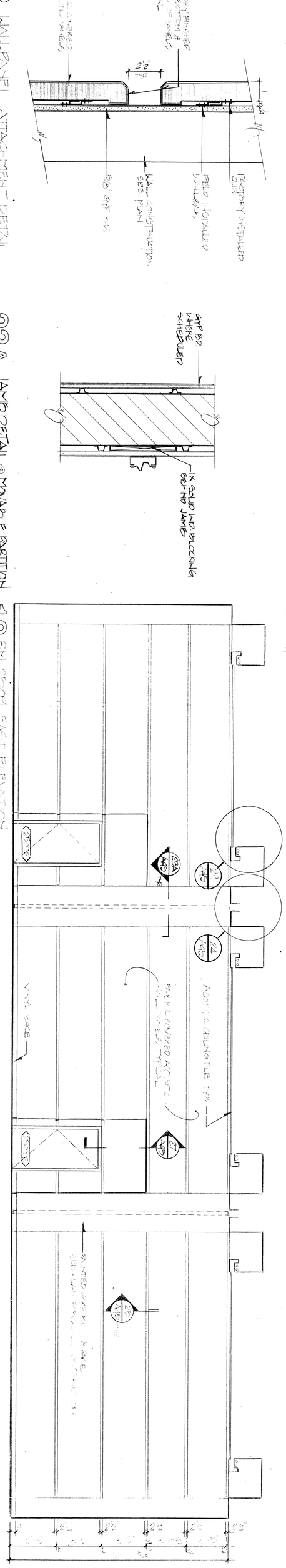
23 WALL PANEL ATTACHMENT DETAIL
3"=1'-0"

23A JAMB DETAIL @ MOVABLE PARTITION
1 1/2" = 1'-0"

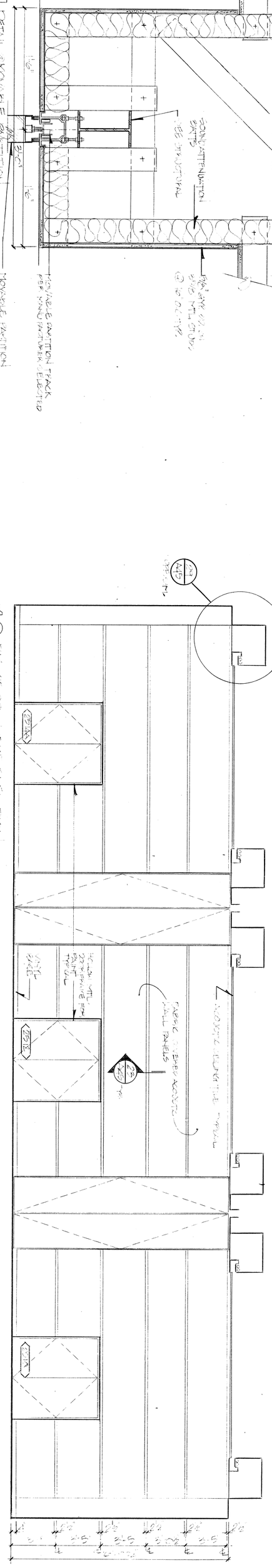
22 RM. 2509 NORTH ELEVATION
1/4" = 1'-0"



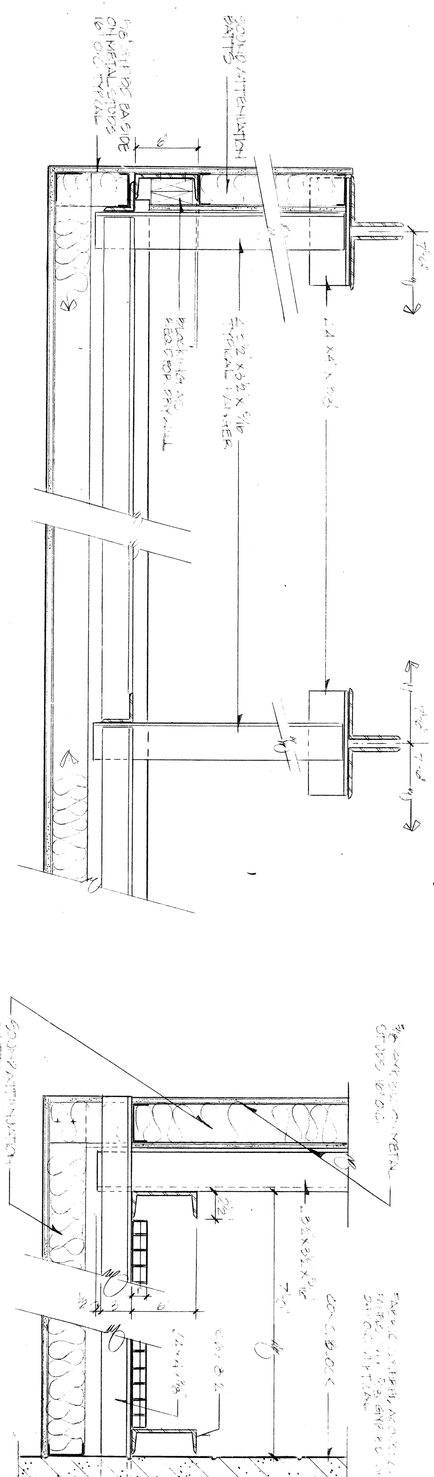
18 SOUTH EAST ELEVATION
1/4" = 1'-0"



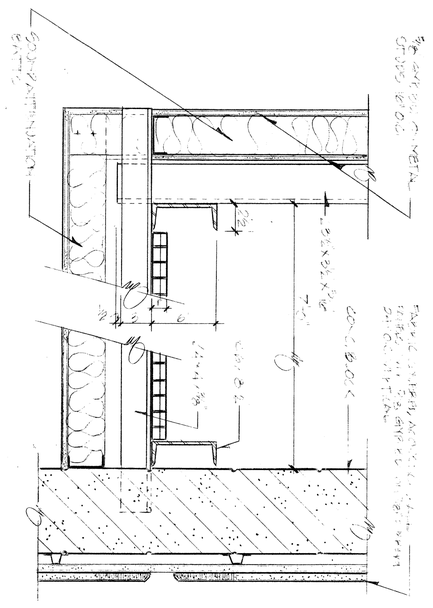
19 SOUTH WEST ELEVATION
1/4" = 1'-0"



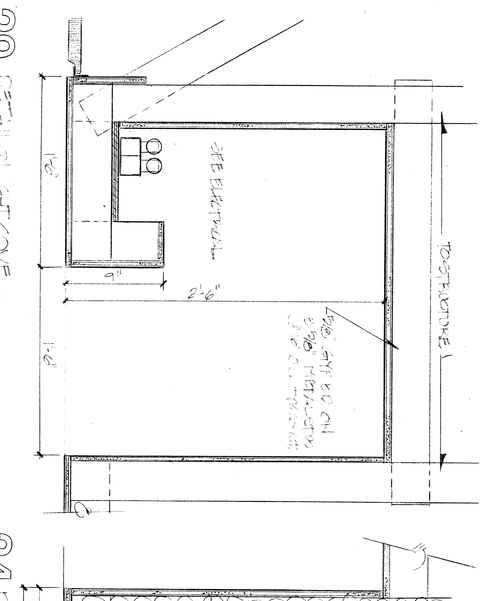
11 SECTION THRU CATWALK
1/2" = 1'-0"



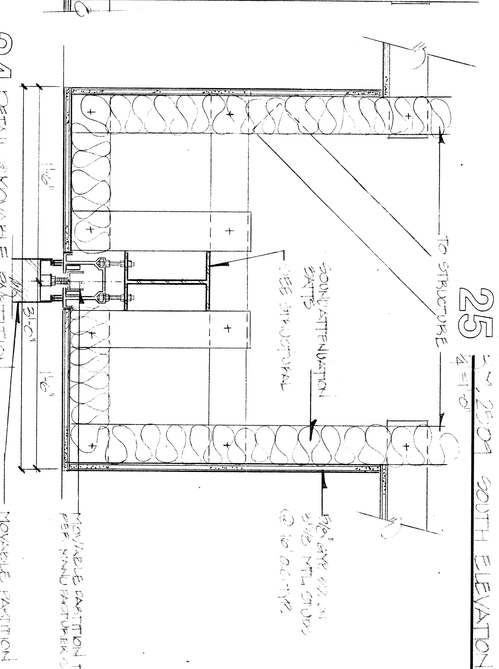
1 SECTION THRU CATWALK
1/2" = 1'-0"



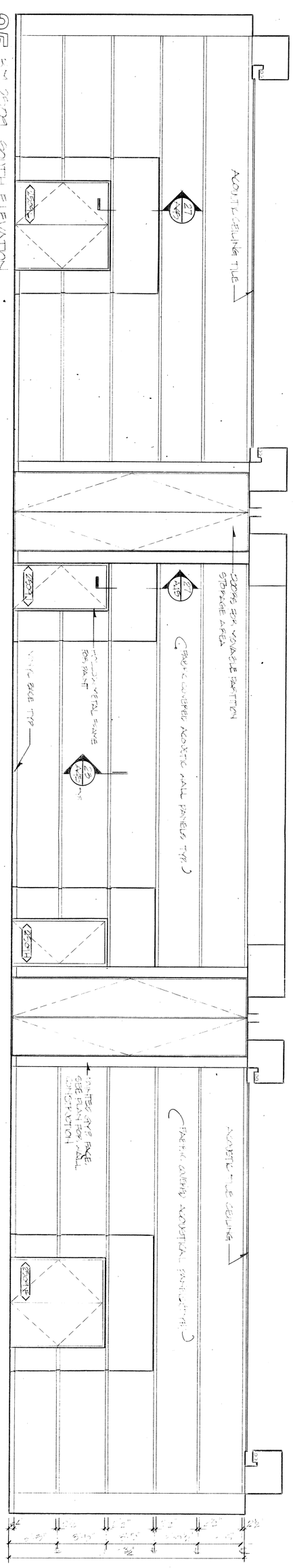
29 ENTRY LIGHT COVE
1/2" = 1'-0"



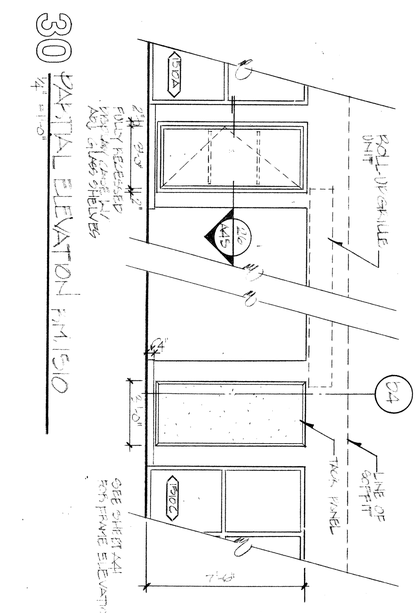
24 DETAIL @ MOVABLE PARTITION
1/2" = 1'-0"



25 RM. 2509 SOUTH ELEVATION
1/4" = 1'-0"



30 PARTIAL ELEVATION
1/4" = 1'-0"



Sheet No. A45	Sheet Title: Large Group Meeting Rooms Interior Elevations/Details	COLLEGE OF DuPAGE 22nd & LAMBERT GLEN ELLYN, ILLINOIS	STUDENT RESOURCE CENTER ADDITION	Date / Issued For
Job No. 29209				
Date: OCTOBER 7, 1992				

LZT/F
ARCHITECTS PLANNERS ENGINEERS
THE LZT/FILLIUNG PARTNERSHIP
45 S. Park Boulevard
Suite 105
Glen Ellyn, Illinois 60137
(708) 469-5444

THEATRICAL ABBREVIATIONS

SYMBOL	DESCRIPTION
ACT	ACOUSTIC CEILING TILE
AFF	ABOVE FINISHED FLOOR
AHU	AIR HANDLING UNIT
AWG	AMERICAN WIRE GAUGE
C	CONDUIT
CKT	CIRCUIT
CL	CENTERLINE
CM	CONSTRUCTION MANAGER
DWG	DRAWING
EMT	ELECTRICAL METALLIC TUBING
FB	FLOOR BOX
FBO	FURNISHED BY OTHERS
FCU	FAN COIL UNIT
FFE	FURNITURE FIXTURES & EQUIPMENT
FPM	FEET PER MINUTE
FUT	FUTURE
GC	GENERAL CONTRACTOR
HP	HORSE POWER
HR	HOUR
JB	JUNCTION BOX
LB	POUNDS
LF	LINEAL FEET
LV	LOW VOLTAGE
MAX	MAXIMUM
MIN	MINIMUM
NIC	NOT IN CONTRACT
NPS	NOMINAL PIPE SIZE
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTSIDE DIAMETER
OFE	OWNER FURNISHED EQUIPMENT
OI	OWNER INSTALLED
PWR	POWER
RA	RETURN AIR
SA	SUPPLY AIR
SP	STANDPIPE PIPING
SPR	SPRINKLER PIPING
TBD	TO BE DETERMINED
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED
V	VOLTS
VIF	VERIFY IN FIELD
Ø	DIAMETER

APPLICABLE SPECIFICATION SECTIONS

DIVISION 11 - EQUIPMENT

- 11 61 43 STAGE DRAPERY
- 11 61 63 THEATRICAL LIGHTING FIXTURES AND ACCESSORIES
- 11 61 73 THEATRICAL WIRING DEVICES
- 11 61 83 THEATRICAL INTEGRATED LIGHTING CONTROL SYSTEM
- 11 61 93 STAGE RIGGING SYSTEM

DIVISION 26 - ELECTRICAL

- 26 01 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
- 26 05 23 - CONTROL VOLTAGE POWER CABLES
- 28 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
- 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
- 26 05 33 - RACEWAY & BOXES FOR ELECTRICAL SYSTEM
- 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS
- 26 09 23 - LIGHTING CONTROL DEVICES
- 26 27 26 - WIRING DEVICES
- 26 28 16 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS
- 28 36 00 - TRANSFER SWITCHES
- 26 51 00 - INTERIOR LIGHTING

APPLICABLE CODES AND STANDARDS

- ALL THEATRICAL SYSTEMS IDENTIFIED HEREIN ARE TO BE INSTALLED IN ACCORDANCE WITH APPLICABLE NATIONAL AND LOCAL CODES AND ORDINANCES.

THEATRICAL SYSTEMS INSTALLATION WILL CONFORM TO STANDARDS OUTLINED BY ANSI AND ESTA, TO INCLUDE THE FOLLOWING:

- ANSI E1.3 - 2001(R2006): LIGHTING CONTROL SYSTEMS - 0-10V ANALOG CONTROL SPECIFICATION
- ANSI E1.11 - 2008 (R2013): USITT DMX512-A, ASYNCHRONUS SERIAL DIGITAL DATA TRANSMISSION STANDARD FOR CONTROLLING LIGHTING EQUIPMENT & ACCESSORIES
- ANSI E1.15 - 2006 (R2016): PRACTICES FOR THE ASSEMBLY AND USE OF BOOM & BASE ASSEMBLIES
- ANSI E1.17 - 2015: ARCHITECTURE FOR CONTROL NETWORKS (ACN)
- ANSI E1.20 - 2010: RDM REMOTE DEVICE MANAGEMENT OVER USITT DMX512 NETWORKS
- ANSI E1.31 - 2009: LIGHTWEIGHT STREAMING PROTOCOL FOR TRANSPORT OF DMX512 USING ACN

THEATRICAL NOTES

1. THE LAYOUT OF DRAPERY SHOWN IN THESE DRAWING IS FOR COMMISSIONING PURPOSES ONLY AND DOES NOT REPRESENT ANY SUGGESTED REPERTORY PLOT.

THEATRICAL SHEET INDEX

COORDINATION MATRIX

STAGE LIGHTING CONTROL AND DISTRIBUTION

THIS MATRIX SERVES AS A SUPPLEMENT TO THE PROJECT SPECIFICATIONS, AND IS INTENDED TO CLARIFY AND FACILITATE COORDINATION OF RESPONSIBILITY BETWEEN CONTRACTORS.

CONTRACTOR ABBREVIATIONS:

E.C. ELECTRICAL CONTRACTOR
F.T. THEATRICAL CONTROL MANUFACTURER'S FACTORY-AUTHORIZED TECHNICIAN
TH.L.C. THEATRICAL LIGHTING CONTRACTOR (LIGHTING SYSTEM INTEGRATOR)

ITEM	SHOWN ON	SPEC SECTION	FURNISHED BY	INSTALLED BY	KEY NOTES
POWER TO LIGHTING CONTROL PANELBOARDS, LIGHTING CONTROL RELAY PANELS, LIGHTING NETWORK EQUIPMENT RACKS, AND RELATED LIGHTING CONTROL EQUIPMENT.	E-SERIES	260523 260526 262816	E.C.	E.C.	1, 2
LIGHTING CONTROL PANELBOARDS, AND LIGHTING CONTROL RELAY PANELS	QT-SERIES E-SERIES	116183 260523 260526 262816	TH.L.C.	E.C.	1, 2
LIGHTING NETWORK EQUIPMENT RACKS AND DIN-RAIL ENCLOSURES AS WELL AS ALL EQUIPMENT WITHIN, UNLESS OTHERWISE NOTED.	QT-SERIES E-SERIES	116183 260519 260523 260526 262816	TH.L.C.	E.C.	1, 2
EMERGENCY BYPASS DEVICES AND RELATED EQUIPMENT.	QT-SERIES E-SERIES	116183 263600	TH.L.C.	E.C.	1, 2
THEATRICAL WIRING DEVICES, INCLUDING LINE-VOLTAGE RECEPTACLES SHOWN WITHIN SUCH DEVICES.	QT-SERIES E-SERIES	116173 262726	TH.L.C.	E.C.	2
THEATRICAL NETWORK AND CONTROL DEVICES.	QT-SERIES E-SERIES	116183	TH.L.C.	E.C.	2
CONDUIT AND BACK BOXES, OTHER THAN THOSE NOTED BELOW.	QT-SERIES E-SERIES	116173 116183 260533	E.C.	E.C.	
NON-STANDARD BACK BOXES FOR THEATRICAL WIRING DEVICES AND CONTROL DEVICES.	QT-SERIES E-SERIES	116173 116183	TH.L.C.	E.C.	
FIRE ALARM SIGNAL CABLING TO THEATRICAL RACKS, PANELS AND DEVICES, POWER-LOSS DETECTION WIRING, AND RELATED CONDUIT.	QT-SERIES E-SERIES	116183	E.C.	E.C.	2
CLASS 2 THEATRICAL CONTROL WIRING, ARCHITECTURAL CONTROL WIRING, CONNECTION TO AV PROCESSOR, AND RELATED LOW-VOLTAGE CABLING.	QT-SERIES E-SERIES	116183 260519	E.C.	E.C.	

GENERAL NOTES

1) E.C. IS RESPONSIBLE FOR COMPLETE CONDUIT SYSTEM, INCLUDING LINE SUPPLY WHERE REQUIRED, AS WELL AS CONDUIT BETWEEN THEATRICAL DEVICES AND EQUIPMENT, INSTALLED TO COMPLY WITH CODES AND SPECIFICATIONS. REFER TO ELECTRICAL NOTES AND DIVISION 26 SPECIFICATIONS.

2) E.C. SHALL FURNISH AND INSTALL ALL BACKBOXES, CONDUIT, LINE-VOLTAGE AND CONTROL WIRING SERVING ALL PANELS AND DEVICES, UNLESS OTHERWISE NOTED.

KEY NOTES

1) FINAL CONNECTION OF CONTROL ELECTRONICS AND SYSTEM ENERGIZATION TO BE AS SPECIFIED BY EQUIPMENT MANUFACTURER.
2) E.C. SHALL TERMINATE ALL WIRING AT RACKS, DEVICES, AND OTHER THEATRICAL EQUIPMENT AS SPECIFIED BY EQUIPMENT MANUFACTURER.

LEGEND NOTES

LEGEND NOTES ARE COMMON TO ALL
SOME NOTES MAY NOT APPLY TO THIS SHEET

100% CD

COMMUNITY COLLEGE
DISTRICT 502
SRC 2000 - CONFERENCE
CENTER
RENOVATION
425 FAWELL BLVD.
GLEN ELLYN, ILLINOIS 60137

THEATRICAL GENERAL NOTES
COLLEGE OF DUPAGE SRC2000

QT-001
22-17142
12/19/17
Revisions

DLR Group
Architecture Engineering Planning Interiors

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1 LEVEL 2 - STAGE LIGHTING PLAN
1/4" = 1'-0"

LEGEND NOTES

LEGEND NOTES ARE COMMON TO ALL
SOME NOTES MAY NOT APPLY TO THIS SHEET

LIGHTING DEVICE SYMBOLS LEGEND

- THEATRICAL WIRING DEVICE, AS LABELED AND SCHEDULED
- THEATRICAL LIGHTING CONTROL DEVICE, AS LABELED AND SCHEDULED

LIGHTING DEVICE TAGS LEGEND

- WD # — WIRING DEVICE TERMINATES IN RELAY PANEL. REFER WIRING DEVICE SCHEDULE.
- LCP # — LIGHTING CONTROL PANEL (INTEGRATED)
- ALP # — LIGHTING PROCESSOR & NETWORK RACK
- ET # — ETHERNET TAP
- DMX # — DMX IN RECEPTACLE
- OS # — OCCUPANCY SENSOR

GENERAL NOTES

1. THEATRICAL WIRING DEVICES FURNISHED BY THEATRICAL WIRING DEVICE MANUFACTURER AND INSTALLED BY ELECTRICAL CONTRACTOR.

100% CD

COMMUNITY COLLEGE
DISTRICT 502
SRC 2000 - CONFERENCE
CENTER
RENOVATION
425 FAWELL BLVD.
GLEN ELLYN, ILLINOIS 60137

LEVEL 2 - STAGE LIGHTING PLAN
COLLEGE OF DUPAGE SRC2000

QT-100
23-17142
12/18/17
Revisions

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1 LEVEL 3 - STAGE LIGHTING PLAN
1/4" = 1'-0"

LEGEND NOTES

LEGEND NOTES ARE COMMON TO ALL
SOME NOTES MAY NOT APPLY TO THIS SHEET

LIGHTING DEVICE SYMBOLS LEGEND

- THEATRICAL WIRING DEVICE, AS LABELED AND SCHEDULED
- THEATRICAL LIGHTING CONTROL DEVICE, AS LABELED AND SCHEDULED

LIGHTING DEVICE TAGS LEGEND

- WD # — WIRING DEVICE. TERMINATES IN RELAY PANEL. REFER WIRING DEVICE SCHEDULE.
- LCP # — LIGHTING CONTROL PANEL (INTEGRATED)
- ALP # — LIGHTING PROCESSOR & NETWORK RACK
- ET # — ETHERNET TAP
- DMX # — DMX IN RECEPTACLE
- OS # — OCCUPANCY SENSOR

GENERAL NOTES

1. THEATRICAL WIRING DEVICES FURNISHED BY THEATRICAL WIRING DEVICE MANUFACTURER AND INSTALLED BY ELECTRICAL CONTRACTOR.

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COMMUNITY COLLEGE
DISTRICT 502
SRC 2000 - CONFERENCE CENTER
RENOVATION
425 FAWELL BLVD.
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LEVEL 3 - STAGE LIGHTING PLAN
COLLEGE OF DUPAGE SRC2000

QT-101

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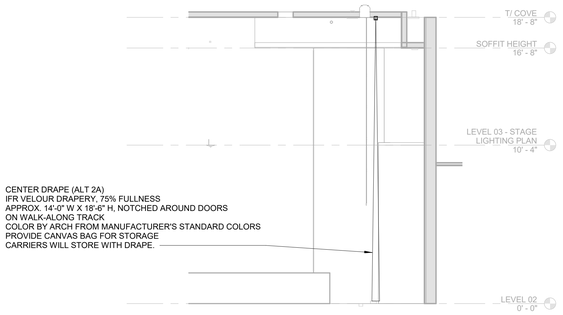
STAGE DRAPERY SCHEDULE

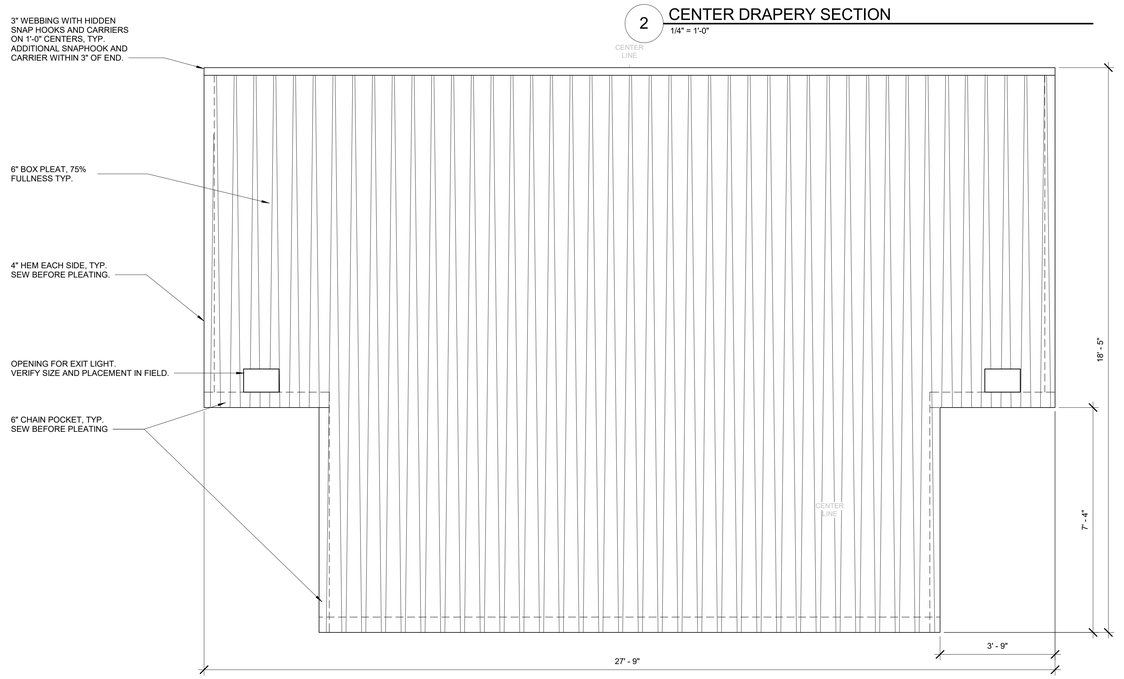
QTY. TO FURNISH	DRAPERY TYPE	COLOR	FINISHED DIMENSIONS (PER PANEL) ADDED FULLNESS	WIDTH	HEIGHT	SIDE HEM RETURN ONSTAGE	SIDE HEM RETURN OFFSTAGE	BOTTOM HEM	LOCATION	KEY NOTES
2	SLL 1 PANEL	BY ARCH	75%	22'-5"	16'-0"	4"	4"	6" CHAIN POCKET	"SLL DRAPE 1" IN AREAS C AND D	2,3
2	SLL 2 PANEL	BY ARCH	75%	8'-0"	16'-0"	4"	4"	6" CHAIN POCKET	"SLL DRAPE 2" IN AREAS C AND D	2,3
1	CENTER DRAPE PANEL	BY ARCH	75%	27'-9"	18'-3"	4"	4"	6" CHAIN POCKET	"CENTER DRAPE" IN AREA G	4,5,6

NOTES:
1) REFER TO DRAWINGS FOR INSTALLATION LOCATIONS OF DRAPERY.
2) ALL DRAPERY DIMENSIONS SHALL BE FIELD-VERIFIED.
3) REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION.

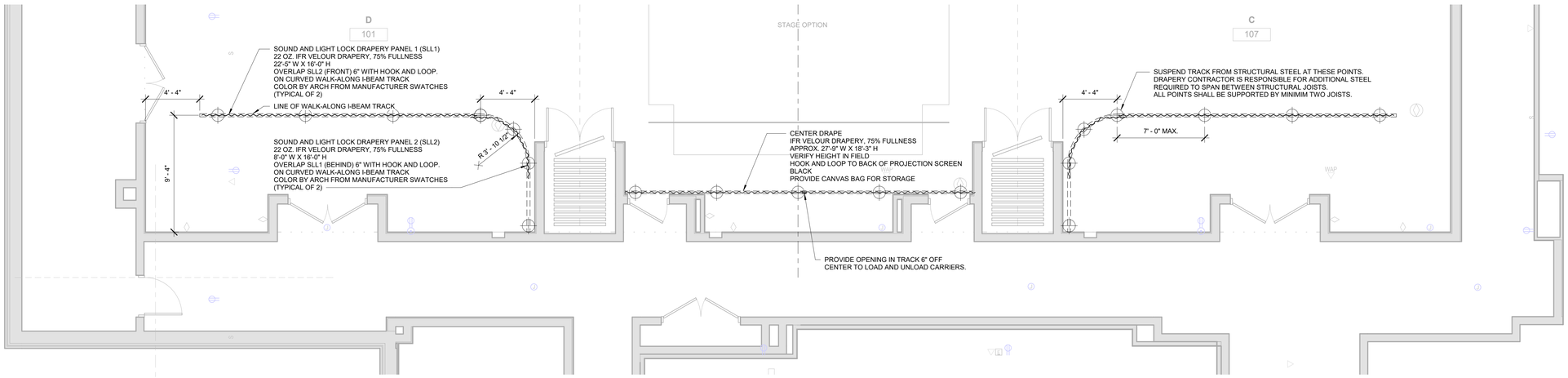
KEY NOTES:
1) REFER TO ARCHITECTURAL FINISH SCHEDULE FOR DRAPERY COLOR SELECTION.
2) PROVIDE CURVED, HEAVY DUTY WALK-ALONG I-BEAM TRACK COMPLETE WITH ALL NECESSARY ACCESSORIES (CWANA).
3) OVERLAP 6" AND PROVIDE HOOK AND LOOP WHERE SSL1 AND SLL2 MEET.
4) PROVIDE STRAIGHT, MEDIUM DUTY WALK-ALONG TRACK, COMPLETE WITH ALL NECESSARY ACCESSORIES (CWANA).
5) NOTCH AROUND DOORS AND EXIT SIGNS, SEE DETAIL.
6) PROVIDE CANVAS STORAGE BAG



2 CENTER DRAPERY SECTION
1/4" = 1'-0"



3 "G" AREA BACKGROUND PANEL
1/2" = 1'-0"



1 LEVEL 02 - DRAPERY PLAN
1/4" = 1'-0"

LEGEND NOTES

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LEVEL 2 - STAGE DRAPERY PLAN
COLLEGE OF DUPAGE SRC2000

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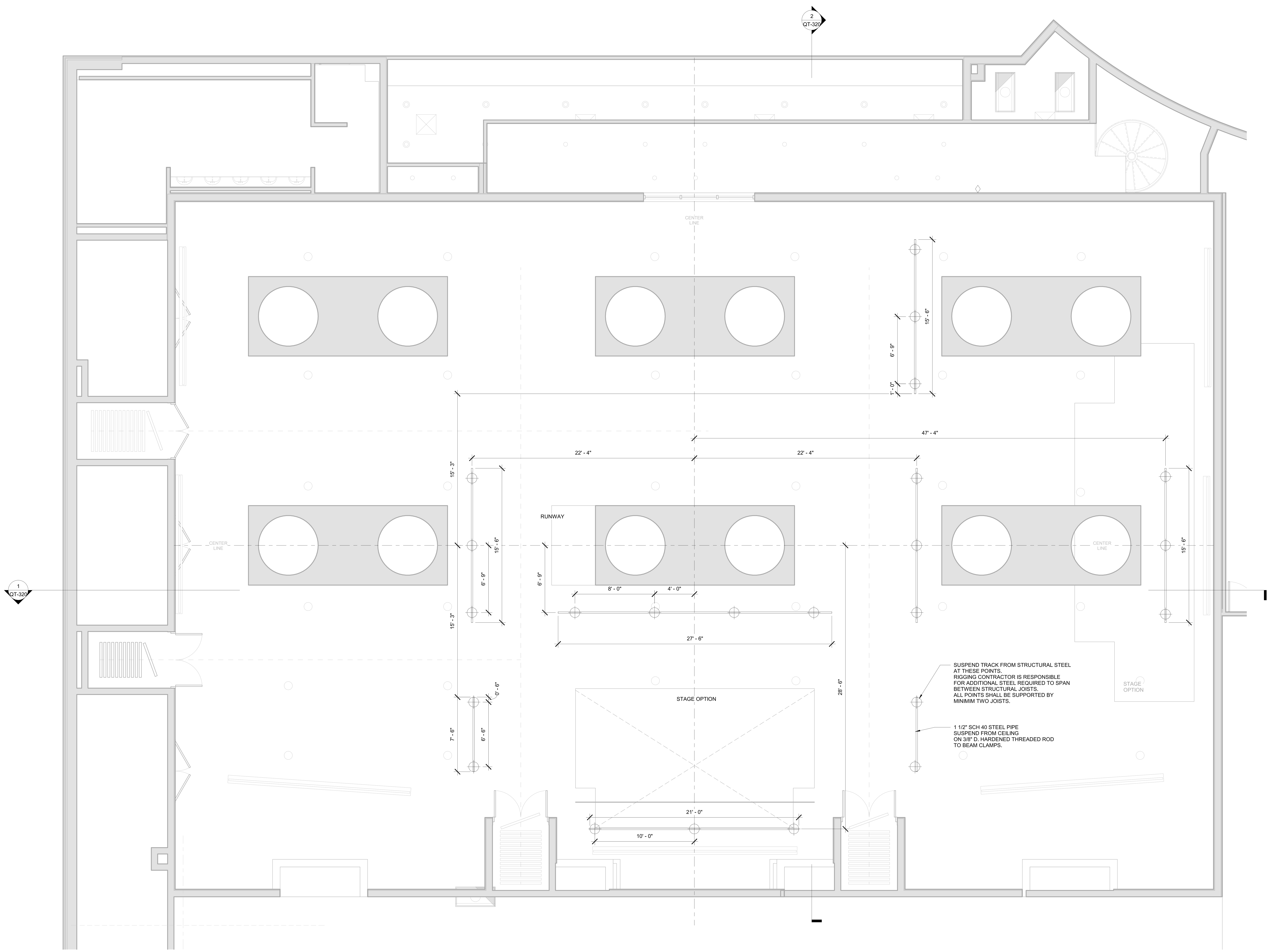

1 LEVEL 3 - STAGE RIGGING PLAN
1/4" = 1'-0"

LEGEND NOTES

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LEVEL 3 - STAGE RIGGING PLAN
COLLEGE OF DUPAGE SRC2000

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LEGEND NOTES

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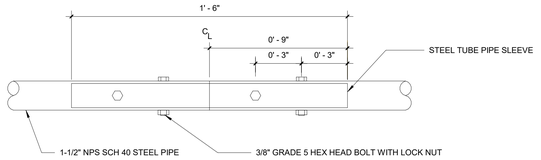
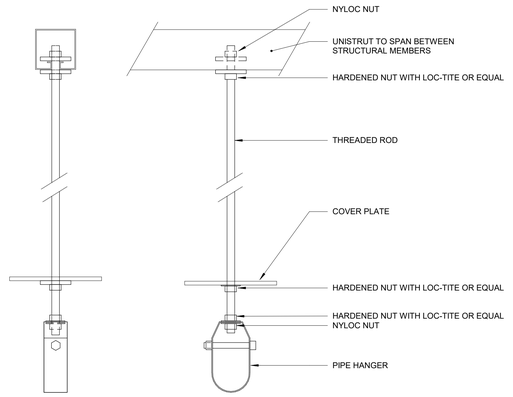
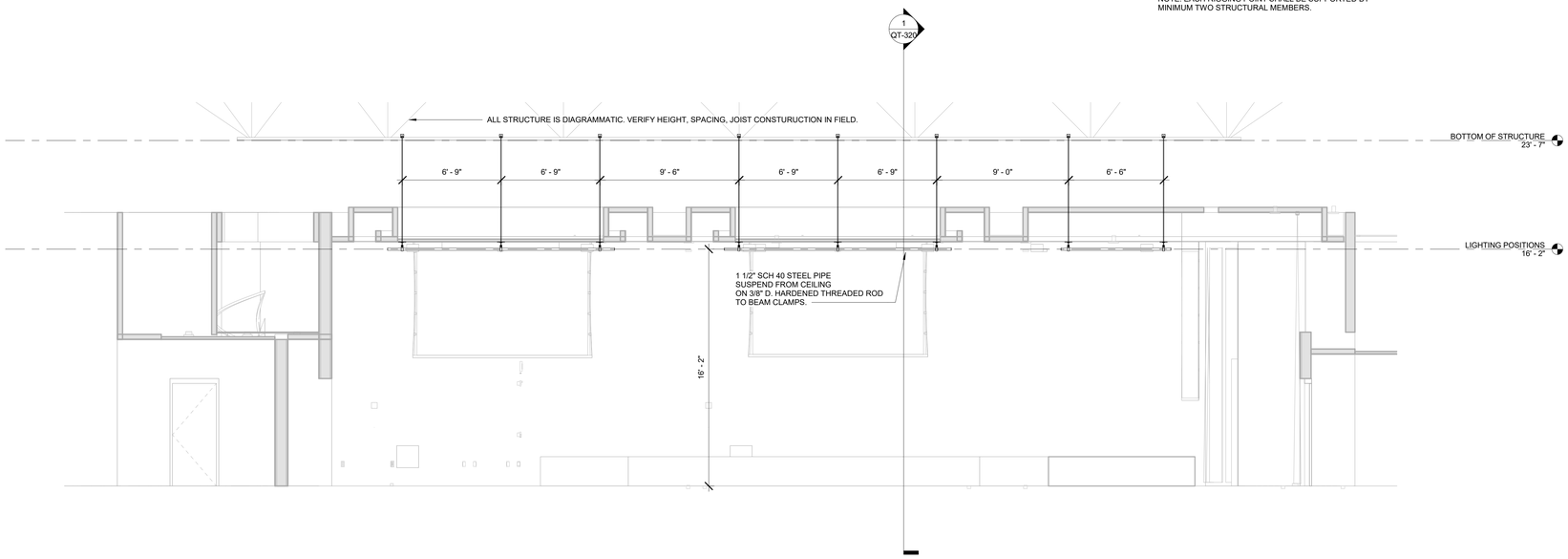


4 TYP. BATTEN SLEEVE DETAIL
3" = 1'-0"

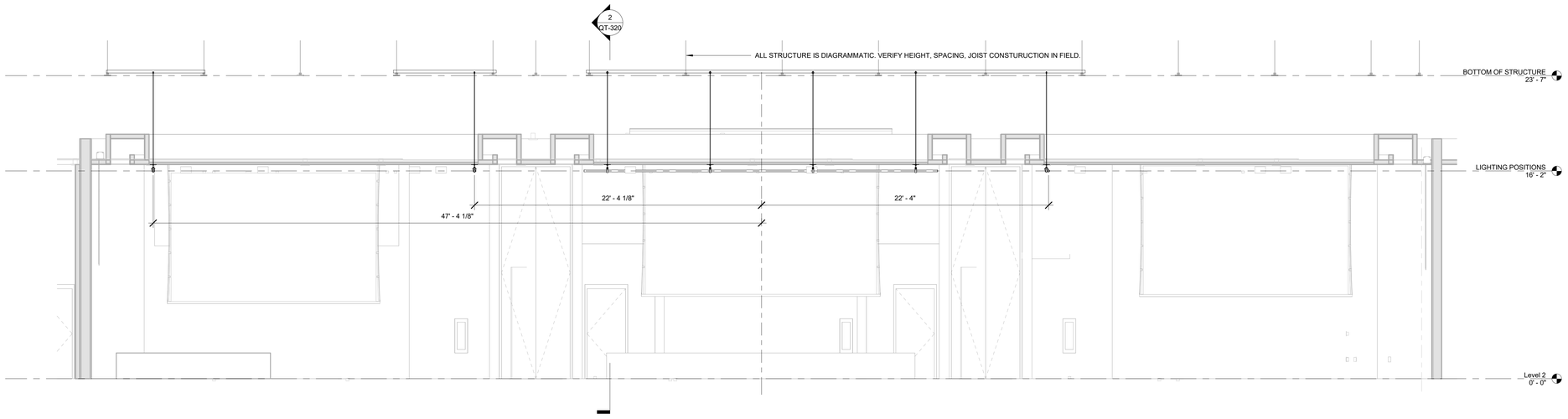


3 PIPE GRID ATTACHMENT DETAIL
3" = 1'-0"

NOTE: EACH RIGGING POINT SHALL BE SUPPORTED BY MINIMUM TWO STRUCTURAL MEMBERS.



2 STAGE RIGGING TRANSVERSE SECTION ON CENTER
1/4" = 1'-0"



1 STAGE RIGGING LONGITUDINAL SECTION ON CENTER
1/4" = 1'-0"

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STAGE RIGGING SECTIONS
COLLEGE OF DUPAGE SRC2000

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LEGEND NOTES

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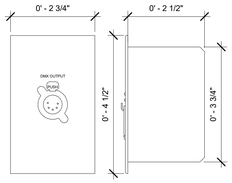
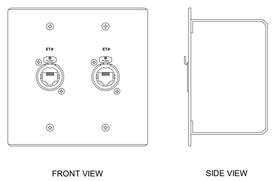
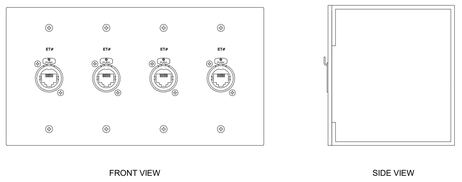


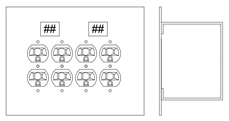
5 DMX1
6" = 1'-0"



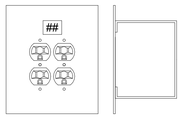
4 ET1
6" = 1'-0"



3 ET2
6" = 1'-0"



2 WD2
3" = 1'-0"



1 WD1
3" = 1'-0"

COLLEGE OF DUPAGE - CONTROL DEVICE SCHEDULE

DEVICE NO.	DEVICE TYPE	CONTROL DEVICE DESCRIPTION AND MOUNTING	COLOR	MOUNTING HEIGHT	CONTROL DEVICE LOCATION	FED FROM
ET-1	ET1	ETHERNET TAP, RECESSED, WITH (2) RJ-45 JACK	TBD BY ARCH	+24" A.F.F.	SRC2000G	ALP-1
ET-2	ET1	ETHERNET TAP, RECESSED, WITH (2) RJ-45 JACK	TBD BY ARCH	+24" A.F.F.	SRC2000D	ALP-1
ET-3	ET1	ETHERNET TAP, RECESSED, WITH (2) RJ-45 JACK	TBD BY ARCH	+24" A.F.F.	SRC2000A	ALP-1
ET-4	ET1	ETHERNET TAP, RECESSED, WITH (2) RJ-45 JACK	TBD BY ARCH	+24" A.F.F.	SRC2000G	ALP-1
ET-5	ET1	ETHERNET TAP, RECESSED, WITH (2) RJ-45 JACK	TBD BY ARCH	+24" A.F.F.	SRC2000F	ALP-1
ET-6	ET2	ETHERNET TAP, SURFACE-MOUNT, WITH (4) RJ-45 JACKS	BLACK	+48" A.F.F.	SRC2000 LEVEL 3 CONTROL BOOTH	ALP-1
ET-7	ET2	ETHERNET TAP, SURFACE-MOUNT, WITH (4) RJ-45 JACKS	BLACK	+48" A.F.F.	SRC2000 LEVEL 2 CONTROL ROOM	ALP-1
DMX-1	DMX1	ETHERNET-TO-DMX GATEWAY, RECESSED, WITH (1) DMX OUT RECEPTACLE	TBD BY ARCH	CEILING RECESS	SRC2000B	ALP-1
DMX-2	DMX1	ETHERNET-TO-DMX GATEWAY, RECESSED, WITH (1) DMX OUT RECEPTACLE	TBD BY ARCH	CEILING RECESS	SRC2000A	ALP-1
DMX-3	DMX1	ETHERNET-TO-DMX GATEWAY, RECESSED, WITH (1) DMX OUT RECEPTACLE	TBD BY ARCH	CEILING RECESS	SRC2000G	ALP-1
DMX-4	DMX1	ETHERNET-TO-DMX GATEWAY, RECESSED, WITH (1) DMX OUT RECEPTACLE	TBD BY ARCH	CEILING RECESS	SRC2000G	ALP-1
DMX-5	DMX1	ETHERNET-TO-DMX GATEWAY, RECESSED, WITH (1) DMX OUT RECEPTACLE	TBD BY ARCH	CEILING RECESS	SRC2000F	ALP-1
DMX-6	DMX1	ETHERNET-TO-DMX GATEWAY, RECESSED, WITH (1) DMX OUT RECEPTACLE	TBD BY ARCH	CEILING RECESS	SRC2000E	ALP-1
DMX-7	DMX1	ETHERNET-TO-DMX GATEWAY, RECESSED, WITH (1) DMX OUT RECEPTACLE	TBD BY ARCH	CEILING RECESS	SRC2000C	ALP-1
DMX-8	DMX1	ETHERNET-TO-DMX GATEWAY, RECESSED, WITH (1) DMX OUT RECEPTACLE	TBD BY ARCH	CEILING RECESS	SRC2000D	ALP-1

COLLEGE OF DUPAGE - WIRING DEVICE SCHEDULE

KEY NOTES:
1. 'ARCH' = REFER COLOR FINISH SCHEDULE BY ARCH. 'MFR' = COLOR PER MANUFACTURER

DEVICE NO.	DEVICE TYPE	DEVICE DESCRIPTION AND MOUNTING	MOUNTING HEIGHT	LOCATION	COLOR (1)	CIRCUIT QTY	FED FROM	CONDUIT AND FEEDER SIZE	KEY NOTES
WD-1	WD1	RECESSED, HORIZONTAL, WITH (2) DUPLEX RECEPTACLES ON ONE CIRCUIT	+24" A.F.F.	SRC2000G, WALL	TBD BY ARCH	1-20A	LCP-2 9	REFER ELECTRICAL	1
WD-2	WD1	RECESSED, HORIZONTAL, WITH (2) DUPLEX RECEPTACLES ON ONE CIRCUIT	+24" A.F.F.	SRC2000A, WALL	TBD BY ARCH	1-20A	LCP-2 10	REFER ELECTRICAL	1
WD-3	WD1	RECESSED, HORIZONTAL, WITH (2) DUPLEX RECEPTACLES ON ONE CIRCUIT	+24" A.F.F.	SRC2000D, WALL	TBD BY ARCH	1-20A	LCP-2 11	REFER ELECTRICAL	1
WD-4	WD1	RECESSED, HORIZONTAL, WITH (2) DUPLEX RECEPTACLES ON ONE CIRCUIT	+24" A.F.F.	SRC2000G, WALL	TBD BY ARCH	1-20A	LCP-2 12	REFER ELECTRICAL	1
WD-5	WD1	RECESSED, HORIZONTAL, WITH (2) DUPLEX RECEPTACLES ON ONE CIRCUIT	+24" A.F.F.	SRC2000C, WALL	TBD BY ARCH	1-20A	LCP-2 13	REFER ELECTRICAL	1
WD-6	WD1	RECESSED, HORIZONTAL, WITH (2) DUPLEX RECEPTACLES ON ONE CIRCUIT	CEILING RECESS	SRC2000E, CEILING	TBD BY ARCH	1-20A	LCP-2 14	REFER ELECTRICAL	1
WD-7	WD1	RECESSED, HORIZONTAL, WITH (2) DUPLEX RECEPTACLES ON ONE CIRCUIT	CEILING RECESS	SRC2000D, CEILING	TBD BY ARCH	1-20A	LCP-2 15	REFER ELECTRICAL	1
WD-8	WD2	RECESSED, HORIZONTAL, WITH (4) DUPLEX RECEPTACLES ON TWO CIRCUITS	CEILING RECESS	SRC2000G, CEILING	TBD BY ARCH	2-20A	LCP-2 16, 17	REFER ELECTRICAL	1
WD-9	WD1	RECESSED, HORIZONTAL, WITH (2) DUPLEX RECEPTACLES ON ONE CIRCUIT	CEILING RECESS	SRC2000G, CEILING	TBD BY ARCH	1-20A	LCP-2 18	REFER ELECTRICAL	1
WD-10	WD1	RECESSED, HORIZONTAL, WITH (2) DUPLEX RECEPTACLES ON ONE CIRCUIT	CEILING RECESS	SRC2000A, CEILING	TBD BY ARCH	1-20A	LCP-2 19	REFER ELECTRICAL	1
WD-11	WD1	RECESSED, HORIZONTAL, WITH (2) DUPLEX RECEPTACLES ON ONE CIRCUIT	CEILING RECESS	SRC2000B, CEILING	TBD BY ARCH	1-20A	LCP-2 20	REFER ELECTRICAL	1
WD-12	WD1	RECESSED, HORIZONTAL, WITH (2) DUPLEX RECEPTACLES ON ONE CIRCUIT	CEILING RECESS	SRC2000B, CEILING	TBD BY ARCH	1-20A	LCP-2 22	REFER ELECTRICAL	1
WD-13	WD1	RECESSED, HORIZONTAL, WITH (2) DUPLEX RECEPTACLES ON ONE CIRCUIT	CEILING RECESS	SRC2000C, CEILING	TBD BY ARCH	1-20A	LCP-2 23	REFER ELECTRICAL	1

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LIGHTING DETAILS AND SCHEDULES
COLLEGE OF DUPAGE SRC2000

QT-501
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STAGE LIGHTING RELAY CONTROL PANEL SCHEDULE

LCP-1 - LOCATED IN DIMMER ROOM (107E)

CONTROLLER CIRCUIT BREAKER #	CIRCUIT BREAKER RATING	DMX UNIVERSE	DMX ADDRESS	0-10V CIRCUIT	LOAD LOCATION	DEVICE OR FIXTURE LABEL	NOTES	CONTROL INPUT DEVICE	STAGE LIGHTING CONTROL...	AV CP#-2000A-#	AV CP#-2000B-#	AV CP#-2000C-#	AV CP#-2000D-#	AV CP#-2000E-#	AV CP#-2000F-#	AV CP#-2000G-1	AV CP#-2000G-2	OCCUPANCY SENSOR (BY AREA)
1	20A	5	1	1	PRESENTER LIGHTS A	C2A, C2B	ZONE A2	X	X	X						X		x
2	20A	5	2	2	HOUSE LIGHTS A	C2A, C2B	ZONE A3 (GENERAL DOWNLIGHT)	X	X	X						X		x
3	20A	5	3	3	SCREEN A	C2A, C2B	ZONE A4	X	X	X						X		x
4	20A	5	4	4	PRESENTER LIGHTS B	C2A, C2B	ZONE B2	X	X		X					X		x
5	20A	5	5	5	HOUSE LIGHTS B	C2A, C2B	ZONE B3 (GENERAL DOWNLIGHT)	X	X		X					X		x
6	20A	5	6	6	SCREEN B	C2A, C2B	ZONE B4	X	X		X					X		x
7	20A	5	7	7	PRESENTER LIGHTS C	C2A, C2B	ZONE C2	X	X			X				X		x
8	20A	5	8	8	HOUSE LIGHTS C	C2A	ZONE C3 (GENERAL DOWNLIGHT)	X	X			X				X		x
9	20A	5	9	9	SCREEN C	C2A	ZONE C4	X	X			X				X		x
10	20A	5	10	10	PRESENTER LIGHTS D	C2A, C2B	ZONE D2	X	X				X			X		x
11	20A	5	11	11	HOUSE LIGHTS D	C2A, C2B	ZONE D3 (GENERAL DOWNLIGHT)	X	X				X			X		x
12	20A	5	12	12	SCREEN D	C2A, C2B	ZONE D4	X	X				X			X		x
13	20A	5	13	13	PRESENTER LIGHTS E	C2A, C2B	ZONE E2	X	X					X		X		x
14	20A	5	14	14	HOUSE LIGHTS E	C2A, C2B	ZONE E3 (GENERAL DOWNLIGHT)	X	X					X		X		x
15	20A	5	15	15	SCREEN E	C2A, C2B	ZONE E4	X	X					X		X		x
16	20A	5	16	16	PRESENTER LIGHTS F	C2A, C2B	ZONE F2	X	X						X	X		x
17	20A	5	17	17	HOUSE LIGHTS F	C2A, C2B	ZONE F3 (GENERAL DOWNLIGHT)	X	X						X	X		x
18	20A	5	18	18	SCREEN F	C2A, C2B	ZONE F4	X	X						X	X		x
19	20A	5	19	19	PRESENTER LIGHTS G	C2A, C2B	ZONE G3	X	X							X	X	x
20	20A	5	20	20	HOUSE LIGHTS G	C2A, C2B	ZONE G4 (GENERAL DOWNLIGHT)	X	X							X	X	x
21	20A	5	21	21	HOUSE LIGHTS G	C2A, C2B	ZONE G5 (GENERAL DOWNLIGHT)	X	X							X	X	x
22	20A	5	22	22	HOUSE LIGHTS G	C2A, C2B	ZONE G6 (GENERAL DOWNLIGHT)	X	X							X	X	x
23	20A	5	23	23	HOUSE LIGHTS G	C2A, C2B	ZONE G7 (OVER PROJECTION SCREEN)	X	X							X	X	x
24	20A	5	24		SPARE													

STAGE LIGHTING RELAY CONTROL PANEL SCHEDULE

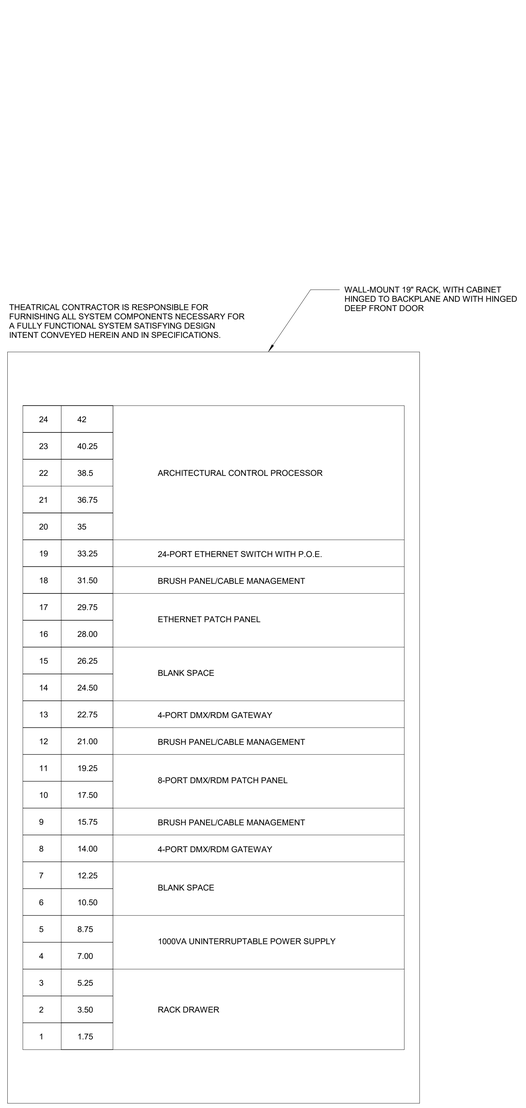
LCP-2 - LOCATED IN DIMMER ROOM (107E)

CONTROLLER CIRCUIT BREAKER #	CIRCUIT BREAKER RATING	DMX UNIVERSE	DMX ADDRESS	0-10V CIRCUIT	LOAD LOCATION	DEVICE OR FIXTURE LABEL	NOTES	CONTROL INPUT DEVICE	STAGE LIGHTING CONTROL...	AV CP#-2000A-#	AV CP#-2000B-#	AV CP#-2000C-#	AV CP#-2000D-#	AV CP#-2000E-#	AV CP#-2000F-#	AV CP#-2000G-1	AV CP#-2000G-2	OCCUPANCY SENSOR
1	20A	5	25	1	SOFFIT A	C1	ZONE A1	X	X	X						X		
2	20A	5	26	2	SOFFIT B	C1	ZONE B1	X	X		X					X		
3	20A	5	27	3	SOFFIT C	C1	ZONE C1	X	X			X				X		
4	20A	5	28	4	SOFFIT D	C1	ZONE D1	X	X				X			X		
5	20A	5	29	5	SOFFIT E	C1	ZONE E1	X	X					X		X		
6	20A	5	30	6	SOFFIT F	C1	ZONE F1	X	X						X	X		
7	20A	5	31	7	SOFFIT G	C1	ZONE G1	X	X							X	X	
8	20A	5	32	8	SOFFIT G	C1	ZONE G2	X	X							X	X	
9	20A	5	33		STAGE LIGHTING WALL RECEPT. IN G	WD-1	2 DUPLEX RECEPTACLES ON THIS CIRCUIT		X							X		
10	20A	5	34		STAGE LIGHTING WALL RECEPT. IN A	WD-2	2 DUPLEX RECEPTACLES ON THIS CIRCUIT		X							X		
11	20A	5	35		STAGE LIGHTING WALL RECEPT. IN D	WD-3	2 DUPLEX RECEPTACLES ON THIS CIRCUIT		X							X		
12	20A	5	36		STAGE LIGHTING WALL RECEPT. IN G	WD-4	2 DUPLEX RECEPTACLES ON THIS CIRCUIT		X							X		
13	20A	5	37		STAGE LIGHTING WALL RECEPT. IN C	WD-5	2 DUPLEX RECEPTACLES ON THIS CIRCUIT		X							X		
14	20A	5	38		CEILING ABOVE LIGHTING PIPE IN E	WD-6	2 DUPLEX RECEPTACLES ON THIS CIRCUIT		X							X		
15	20A	5	39		CEILING ABOVE LIGHTING PIPE IN D	WD-7	2 DUPLEX RECEPTACLES ON THIS CIRCUIT		X							X		
16	20A	5	40		CEILING ABOVE LIGHTING PIPE IN G	WD-8	2 DUPLEX RECEPTACLES ON THIS CIRCUIT		X							X		
17	20A	5	41		CEILING ABOVE LIGHTING PIPE IN G	WD-8	2 DUPLEX RECEPTACLES ON THIS CIRCUIT		X							X		
18	20A	5	42		CEILING ABOVE LIGHTING PIPE IN G	WD-9	2 DUPLEX RECEPTACLES ON THIS CIRCUIT		X							X		
19	20A	5	43		CEILING ABOVE LIGHTING PIPE IN A	WD-10	2 DUPLEX RECEPTACLES ON THIS CIRCUIT		X							X		
20	20A	5	44		CEILING ABOVE LIGHTING PIPE IN B	WD-11	2 DUPLEX RECEPTACLES ON THIS CIRCUIT		X							X		
21	20A	5	45		CEILING ABOVE LIGHTING PIPE IN B	WD-12	2 DUPLEX RECEPTACLES ON THIS CIRCUIT		X							X		
22	20A	5	46		CEILING ABOVE LIGHTING PIPE IN C	WD-13	2 DUPLEX RECEPTACLES ON THIS CIRCUIT		X							X		
23	20A	5	47		SPARE													
24	20A	5	48		SPARE													

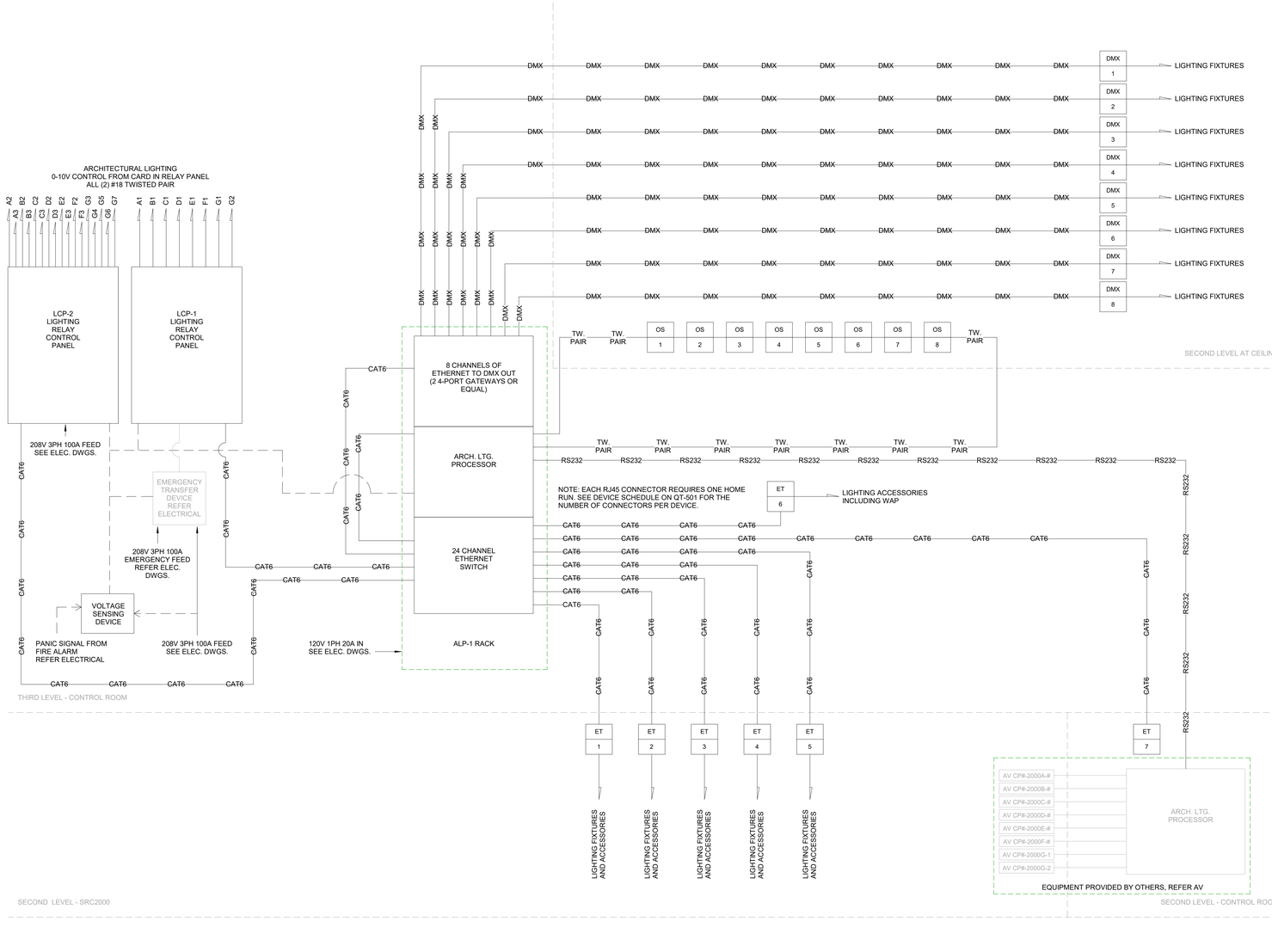
LEGEND NOTES

LEGEND NOTES ARE COMMON TO ALL
SOME NOTES MAY NOT APPLY TO THIS SHEET

NOTES:
1. PROVIDE ALL WIRING IN CONDUIT.
2. FINAL WIRING SIZES AND TYPES DETERMINED BY THE STAGE LIGHTING MANUFACTURER.



2 ALP-1
3" = 1'-0"



1 LIGHTING CONTROL WIRE RISER DIAGRAM

100% CD

COMMUNITY COLLEGE
DISTRICT 502
SRC 2000 - CONFERENCE CENTER
RENOVATION
425 FAWELL BLVD.
GLEN ELLYN, ILLINOIS 60137

LIGHTING CONTROL SCHEDULES AND RISER
COLLEGE OF DUPAGE - SRC2000

QT-601
22-11742
12/19/17
Revisions

DLR Group
Architecture Engineering Planning Interiors

C:\Revit\22-11742-000 CoD Theatrical_2017_2mariteli.rvt
12/18/2017 3:24:26 PM

2018-B0031 Student Resource Center (SRC) 2000 Event Space Upgrade

ADDENDUM # 3

January 10, 2018

This signed Addendum is required to be returned with your Bid no later than the due date set forth for this Invitation to Bid. If you have already submitted your Bid, please submit this signed form via email to purchasing@cod.edu.

You can submit this completed addendum to the Purchasing Office by one of the means below:

All issued addenda must be signed and returned to the College as per the instructions in the addenda or bid will not be accepted.

SECTION III ACKNOWLEDGMENT

You can submit this completed addendum to the Purchasing Office by one of the means below:

1. If you have not yet submitted your bid, please sign this addendum and include with your sealed bid**.**
2. If you have already submitted your bid, please sign and return to the Purchasing office via email at purchasing@cod.edu no later than the scheduled bid deadline. We will make sure it accompanies your bid.

You also have the option of withdrawing your proposal, if necessary.

ACKNOWLEDGEMENT:

I HAVE RECEIVED THIS ADDENDUM #_____

Company Name: _____

Address: _____

Authorized Signature: _____

College of DuPage

Purchasing Department

425 Fawell Boulevard
Glen Ellyn, Illinois 60137-6599
PHONE (630) 942-2355
FAX (630) 942-4322

2018-B0031 Student Resource Center (SRC) 2000 Event Space Upgrade

ADDENDUM # 4

January 19, 2018

This addendum is being issued to update the specifications and provide additional information.

This information becomes part of the Bid/RFP Documents upon receipt. Please review and incorporate into your Bid/Proposal accordingly.

For which Bids are scheduled to be received on January 23, 2018 no later than 2:00 p.m., Central Time.

Bids will be received by the College of DuPage, District 502, at the office of the Purchasing Manager, Berg Instructional Center (BIC) Building, **Room 1B03**, 425 Fawell Blvd., Glen Ellyn, IL 60137.

The signed Addendum acknowledgment is required to be returned with your Bid no later than the due date set forth for this Invitation for Bid.

This Addendum No. 4 includes revisions and answers to questions found relevant as set forth in the Bid:

I. The Due Date Change;
II. Answers to 37 questions submitted for clarification;
III. Notice of Revisions and Changes;
IV. Addendum Receipt Acknowledgment

The information contained in this **Addendum No. 4** is incorporated by reference into the original Bid document issued on December 21, 2017.

Below are clarifications to this bid:

Section I. The Due Date Change

Currently Reads:

BIDS DUE: TUESDAY, JANUARY 23, 2018 at 2:00 p.m. Central Time

Change To:

BIDS DUE: FRIDAY, JANUARY 26, 2018 at 10:00 a.m. Central Time

Section II. Clarification / Answers

Q1 **Do you have a date when Section 27000 Audiovisual will be released?**

A1 **Was issued in Addendum, re issued with refinements in this addendum 4.**

Q2 **Do you have an exact equipment list of owner supplied equipment?**

A2 **Yes. Owner supplied equipment has been added 74116 and is released in Addendum 4.**

Q3 **Will the walls be completely opened for the A/V and electrical install or are they to be fished?**

A3 **Contractor to determine means and methods.**

Q4 **Could the exit signs be replaced in lieu of finding or making mounting brackets? If so, please provide a model #. E1.1 Note 8**

A4 **For bid purposes, price brackets.**

Q5 **Could conduit sizes be reduced if A/ V contractor approves. For example: AV3 is a single data cable in an 1-1/2" conduit. Can that be reduced between the electrical and the A/V contractor?**

A5 **Yes.**

Q6 **The SRC 2000 drawing numbered 0.0 that contains the Index of Drawings dated December 18, 2017 refers to and has listed in the index of drawings the following:**

QT001 Theatrical General Notes
QT100 Level 2 Stage Lighting Plan
QT101 Control RM Level Stage Lighting Plan
QT110 Level 2 Stage Drapery Plan
QT120 Control Room Level Stage Rigging Plan
QT320 Stage Rigging Section on Center
QT501 Lighting Details and Schedules
QT601 Lighting Schedules and Riser

These drawings are not in the drawing set nor have they been available through any of the contractors or the planrooms. If these drawings are available, can they be made available so that we may have the information we require to bid the project.

A6 **Issued in Addendum 3.**

Q7 **The spec section 099123 does not list any manufacturers for paint. Is Sherwin Williams acceptable as a manufacturer for paints? Please advise.**

A7 **Benjamin Moore is listed as the Basis of Design. Sherwin Williams may be substituted with color match information provided by contractor.**

Q8 **Please clarify notes 8 and 8A on A1.1**

A8 **Note 8 = New projector screens**
Note 8a = Demo existing walls
The long item at the center bay, should also have a note 8 on it, a projection screen.

Q9 **Clarify the scope of work for the owner furnished projectors.**

A9 **Audiovisual Contractor is to install and commission 7 owner purchased projectors. Refer to revised division 274116 Section 1.7.A.2.a - Functional Requirements/Video.**

Q10 **On page 274116 – 5 section A.1 a (pre bid submittals) it references Credentials. Will not having one of these credentials disqualify us from bidding? We do not presently have a CTS certified technician. We are fully experienced in all aspects of A/V beyond this requirement. Please advise.**

A10 **Language has been revised in section 74116 1.9.B.**

Q11 **There is no Master Equipment Listing that includes all equipment numbers, i.e., Black Magic Design equipment on drawings and portable Black Magic Design transmitters not on drawings**
-Equipment Racks
-etc

A11 **Refer to revised division 274116 section 2.2.B.1 - Major Equipment List.**

Q12 **Can we substitute manufacturers if functionality stays the same?**

A12 **Refer to division 274116 section 1.9.D – Substitutions.**

Q13 **Drawings refer to section 274116 of specifications but that section does not appear to exist. Please advise.**

A13 **Division 274116 was issued on in Addendum 3, 01.09.18, re issued with revisions, this addendum 4.**

Q14 **There are 7 screens but only three projectors. Is this correct?**
How are other 4 projectors fed? Assuming portable projectors?
TA-611 shows 4 outputs of the Extron Matrix going to AV3 devices. AV3 devices are shown to be transmitters, not receivers.

A14 **There are nine new screens (housings, motors, etc.) for installation. Contractor to plan on removing 7 existing screens, housings, motors, etc. Audiovisual Contractor is it install and commission 7 owner purchased projectors. The other two projectors are on roll out carts. Refer to division 274116 Section 1.7.A.2.a - Functional Requirements/Video.**

Q15 **TA-601, detail 7, shows a wall plate for RS-232 and IR for screen control. TA-613 shows screen control via relays; which method is intended?**

A15 **Screen control is RS-232. TA-613 was corrected and issued in Addendum 3, 01.09.18.**

Q16 **TA-613 shows screen controls via relays but they only account for one relay each. A minimum of two relays should be needed for each device. Extra relay control will be needed.**

A16 **Screen control is RS-232. TA-613 was corrected and issued in Addendum 3, 01.09.18**

Q17 **What are the make and model numbers of OFE projectors?**

A17 **Design standard is Epson Pro L1505UHNL, subject to change after coordination.**

Q18 **Are projectors already installed or will we need to retrieve and reinstall?**

A18 **Projectors are not currently installed. Audiovisual contractor will be responsible for receiving from owner, installing and commissioning new owner purchased projectors.**

Q19 **What is the dimmer system make and model?**
What will be the interface? RS-232 or Network. Control drawing shows as Serial/IR??

A19 **There are no dimmers in the project. See QT 100-101, 601 and E2.1. Relay panels are networked to the arch lighting processor. Additionally, there is a serial connection to the AV processor.**

Q20 **Will the dimmer system have partition sensors to let the control processor know when partition walls are open or closed?**

A20 **That is not in the current design.**

Q21 **Rack SDI panels 2 and 3 on TA551 are not shown on any flow drawing like other panels. Assuming they are all the tie lines from room WPs?**

A21 **Correct they are tie lines from room WPs.**

Q22 **Please provide details of the New Drapery since this is insufficient for us to price this feature of work.**

A22 **Refer to QT-110 & Specification Section 11 61 43 Stage Drapery.**

Q23 **The OFE projectors being supplied, are they supplied with mounting brackets?**

If not, what is the brand and model of the projectors?

How far are they to drop from ceiling?

A23 **OFE projectors will be supplied with mounting brackets. Drop should be 2-4 feet. Audiovisual contractor to coordinate with designer and owner's representative to confirm projector drop.**

Q24 **Do we have to provide mounting for projectors at the other four ceiling locations?**

A24 **7 owner purchased projectors come with mounting plates, Contractor provides rest of support. 27 41 16 section 1.7.2.a has been updated.**

Q25 **Per the pre-bid meeting, it was stated that the projections screens will be OFE.**

The projection screens are listed in the equipment list. Are they to be included or are the OFE?

Will the installation of the screens be listed in the rigging section or will they stay with installed by EC per Drawing TA-001 Schedule of Responsibility?

A25 **Screens are not OFE. 9 Screens shall be installed as per TA-001. All work in this bid package is included in the general contractor package, subcontracting divisions are under the General Contractor.**

Q26 **The equipment list has a quantity of 6 of the smaller screen but drawings only indicate 4.**

Where are the other 2 screen locations?

A26 **TA-212 has been corrected and released in Addendum 3, 01.09.18, 9 screens total.**

Q27 **Drawing TA-001, Audiovisual Cable: Audio Line Level as the Belden 9460.**

The 9460 is Digital Audio cable and not the standard Mic/Line audio cable. Is this correct?

A27 **Belden 9460 is "One 18 AWG pair stranded (16x30) tinned copper conductors, polyethylene insulation, overall Beldfoil® shield (100% coverage), PVC jacket."**

Q28 **The specifications refer to ADA Assisted Listening, but I cannot find any reference on the drawings or the equipment lists.**

Is the ADA being furnished and installed by the owner?

A28 **ADA assisted listening is a portable Listen Technologies LKS-2 system. 27 41 16 2.2.B is correct and showing the pertinent information.**

Q29 **Are any wireless microphones, antennas, distribution being provided under this project?**

A29 **No.**

Q30 **Please provide list of patch cables, types, lengths, colors, etc.?**

A30 **Ten (10) black XLR – three (3) foot. Ten (10) black XLR – four (4) foot. Ten (10) black HD-SDI – three (3) foot. Ten (10) black HD-SDI – four (4) foot.**

Q31 **Please provide list of any turnover gear? (i.e. ClearCom, HDMI cables, Extenders for the Breakout rooms, etc.)**

A31 **For bid purposes, include no turn over gear.**

Q32 **The equipment list Yamaha for the ceiling loudspeakers and amplifier.**

Can we provide as equal or greater Tannoy, SoundTube, JBL or any other approved brand other than the exclusive and highly restrictive Yamaha brand?

I do understand that they make high quality line arrays and performance speakers, but for these ceiling distribution loudspeakers and amplifier can you please list an acceptable alternative?

A32 **Refer to 274116 1.9.D – Substitutions.**

Q33 **Can we provide the Symetrix DSP processor, the leader in Dante audio digital processing or BiAmp?**

A33 **Refer to 274116 1.9.D – Substitutions.**

Q34 **Drawing TA-660 shows two tables with five seats.**

Are we to provide anything to the tables? Any plate requirements? Cabling from the racks?

A34 **Nothing is provided on Table. No cabling from racks are needed.**

Q35 **Can you please confirm conduit sizes going to Wiring Devices AV2 the WP2 wall plate?**

A35 **Refer to TA-640**

Q36 **Can you confirm bend radius for the fiber and the HDSDI cables?**

A36 **Conduit bend radius as per NEC standards.**

Q37 **Will Umbrella Insurance coverage of $5,000,000 cover the Colleges requirement for an auto liability limit of $1,000,000 combined single limit and a $2,000,000 aggregate limit?**

A37 **Bidders are required to provide evidence of insurance coverages as required in the bid package. A comprehensive review of the Bidders insurance policies will be reviewed by the College's Risk Manager for conformance and approval to the requirement.**

Section III. Notice of Revisions and Changes Specifications Index

The following is an index of revision to the specification in Exhibit B of the Invitation for Bid. Please refer to Attachment A of this Addendum for detail information.

Revised Specifications Issued with Addendum 4

Section	Subtitle	Revisions	Comment
27-4116	Integrated Audiovisual System	Revised	Revisions are highlighted in yellow.
087100	Door Hardware	**New issue Addendum #4**	Fixtures provided by Owner, Installed by Contractor
081416	Flush Wood Doors	**New issue Addendum #4**	This spec provided as some firms indicated they couldn't download earlier

Attachment A – Revised Specifications (27 4116 – Integrated Audiovisual Systems, 087100 – Door Hardware, and 081416 - Flush Wood Doors)

SECTION 27 4116 – INTEGRATED AUDIOVISUAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract including instructions to Bidders, General and Supplementary Conditions and Division 1 Specifications Sections apply to the work of this Section.

B. ANSI-Infocomm standards (1M :2009, 2M :2010, 3M :2011, 4 :2012, 10:2013, F501.01:2015)

C. AES 67-2015

D. 2010 ADA Standards for Accessible Design

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Power, and all conduits for both power and low voltage, shall be furnished and installed by Electrical Contractor. All back boxes to be furnished and installed by Electrical Contractor as indicated in the Schedule of Responsibility on drawing TA-001 unless otherwise noted.

B. Coordination with the Electrical Contractor is required to assure correct audiovisual conduit routing, audiovisual back box locations, and technical power circuit locations as specified in Division 26 – Electrical.

C. Requirements and materials that apply to the work of others related to audiovisual systems are listed here to define and establish audiovisual system requirements. Coordinate the work of this section with the work of other sections as required in order to maintain satisfactory progress of the work of other sections. Refer to schedule of responsibility on TA-001, UON.

1.3 WORK OF THIS SECTION

A. This section covers all audiovisual (AV) systems as described for ***SCR2000 Renovation/ 425 Fawell Blvd, Glen Ellyn, IL 60137***. The objective is to provide professional systems, installed, acceptance tested, and ready to use.

B. This written specification and the large format TA series drawings shall be collectively referred to herein as the Contract Documents. System features that show up in one part may not be shown in others. In the case of conflict between written specifications and drawings, Contractor must seek written clarification from the Architect. In the event the Contractor fails to obtain such written clarification, the interpretation of the Architect will prevail. Where conflict exists with other specifications concerning such work or materials, this specification takes precedence unless otherwise approved in writing by the owner.

C. This section includes all labor, materials, equipment, and services necessary to furnish and install the Audiovisual System in College of DuPage ***SRC2000 Renovation, Fawell Blvd, Ellyn Illinois*** as shown on the drawings, including but not limited to the following:
   1. Ceiling Mounted Speakers
   2. Amplifiers
   3. Audiovisual Networking Equipment
   4. Digital Signal Processor
   5. Control Processor
   6. Control Touch panels
   7. Projectors (furnished by College, installed by contractor)
   8. Projection Screens
   9. Video Matrix Routers
   10. Video Signal Transmitters & Receivers
   11. Video Signal Converters
   12. Equipment Racks
   13. Patch Panels

1.4 PROJECT CONDITIONS

A. All dimensions and equipment locations shall be verified in the field prior to fabrication by the Audiovisual Contractor, who shall make at least one (1) visit to the job site prior to preparation of shop drawings.

B. Coordinate conduit placement, routing, and separation with the Electrical Contractor to ensure proper installation.

C. No claims for additional compensation shall be allowed due to the Audiovisual Contractor's misunderstanding of the work involved or lack of a thorough investigation of the job site.

1.5 CONTRACTOR RESPONSIBILITY

A. It shall be the responsibility of the Audiovisual Contractor to furnish and install equipment complete in all respects and to furnish and install any additional equipment required to fulfill the intent of the Contract Documents regardless of whether or not such items are herein specified or indicated without claim for additional payment or costs.

B. The work specified herein shall be accomplished by a single Audiovisual Contractor who has complete responsibility for the systems described. The Audiovisual Contractor is required to have five (5) years' experience with systems of similar size and scope in Event Facilities and Higher Education.

C. The Audiovisual Contractor shall be responsible for coordinating with other trades a complete and suitable installation of electrical isolation equipment to meet the intent of this specification.

D. No electrical equipment (except approved equipment) shall be located within the Acoustically Sensitive Spaces or installed on walls common to Acoustically Sensitive Spaces (Refer to Part 1 Paragraph 10). The Audiovisual Contractor shall report all discrepancies between this requirement and the Contract Documents to the Architect and Electrical Engineer prior to installation of such equipment.

1.6 DESIGN INTENT

A. The Audiovisual Contractor shall furnish and install Infrastructure and Major Equipment for system including but not limited to wire, cable, equipment racks, wiring devices, and listed Major Equipment. Infrastructure, Major Equipment, and installation of Infrastructure and Major Equipment shall be bid as one portion of the project.

B. The Audiovisual Contractor shall furnish line item pricing for Infrastructure and Major Equipment List written in this specification.

1.7 FUNCTIONAL REQUIREMENTS

A. SRC2000

1. AUDIO

a. The main audio reinforcement system of the space shall be ceiling mounted loudspeakers. Amplifiers for all speakers shall live in the control booth and be connected to the digital audio network for ease of routing and management. Having the speakers on the digital audio network will allow interface with simple systems for basic control as well as advance mixing capabilities with the digital console for large productions.

b. Production wall panels shall be located throughout the space. These production wall panels shall house the analog and digital patch points specified for the project.

c. Analog patch points shall be located throughout the space for signal transmission of wired microphones and audio sources which shall be interfaced with DSP device for audio management.

d. Ethernet patch points shall be located around the space in production panels to allow for networked digital audio devices to be connected to expand input and output capabilities in key locations around the room.

e. For ADA compliance, a portable infrared assisted listening system, hereinafter ALS, shall be provided. The ALS transmitter shall be capable of accepting either a head worn microphone in cases where voice lift is not being used, or a microphone input coming from a digital mixing console in cases where voice list is being used.

2. VIDEO

a. Installation and commissioning of seven (7) permanently ceiling mounted, owner furnished, video projectors. These projectors shall be used to project video content onto permanently mounted projection screens. Use TA-212 for the mounting location of three (3) projectors. Four (4) ceiling mounted projectors shall be installed in SRC2000 at the location of the following wiring devices as noted on TA-202; AV4-A105-1, AV4-B106-1, AV4-E102-1 and AV4-F103-1. It shall be the audiovisual contractor's responsibility to coordinate the installation of theses projectors with the designer and owner's representative.

b. Nine (9) motorized, ceiling-recessed, tab-tensioned screens shall be installed.

c. A video matrix frame shall be installed in the control room for routing of various video sources to video display devices in the system. Sources shall include a PTZ camera, local and remote computers/laptops with HDMI connection ports, video cameras with 3G-SDI connection ports and a production video switcher via HD-SDI ports. There shall be a minimum of one (1) input card slot available for late a comer input card. Remote computer connections shall utilize signal transmission over twisted pair. Outputs shall include the all locations where a projector is or can be

permanently ceiling mounted. There shall be a 3G-SDI and single mode fiber optic patch panels to allow the Video Engineer to physically patch video signal to multiple locations throughout the space.

d. 3G-SDI patch points shall be located around the space in production panels to allow for digital video devices to be connected to expand input and output capabilities.

e. Single mode fiber optic patch points shall be located around the space in production panels to allow for digital video devices to be connected to expand input and output capabilities. These patch points shall have a LC termination and include a panel mounted dust cover to protect against debris and other unwanted material from interfering with the connection.

3. CONTROL

a. A control processor shall be installed in the system to monitor and control equipment in the system. This shall include video matrix switcher, all displays permanently connected to the video switcher, permanently mounted screens, audio DSP device and architectural and theatrical lighting devices.

b. Eight (8) seven-inch (7”) touch panel control shall be permanently wall mounted in key locations throughout the space.

c. One (1) ten-inch (10”) table top touch panel controller shall be provided. This control device shall have expanded control options for advanced use and room configuration. It shall have a minimum cable length of twenty-five feet (25’).

d. Several patch bays shall be provided to allow manual patching and routing of audio and video signals for various production needs. The contractor shall be responsible for furnishing patch cabling of appropriate length and assembly to meet the production needs as determined by the client. Confirm the exact quantity of patch cabling to be provided with the system with end users during training.

1.8 SCOPE OF WORK

A. Furnish shop drawings and receive approval, prior to fabrication and installation.

B. Furnish all materials and labor and any engineering services to supply a complete and professionally installed system in working order as described herein. Labor furnished shall be specialized and experienced in audiovisual system installation.

C. Furnish and install all wire and cable called out in the Contract Documents.

D. Coordinate all back box locations with the Electrical Contractor and appropriate general trades.

E. Furnish any additional items, not specifically mentioned herein, to meet system requirements as specified, without claim for additional payment. Such items may include but are not limited to hardware, transformers, line/distribution amplifiers and other devices for proper installation, interface, isolation, or gain structure.

F. Perform initial adjustments and verification tests. Submit verification test report to the Architect five days prior to commissioning.

G. Participate in acceptance testing and perform final adjustments utilizing Audiovisual contractor furnished test equipment and project engineers.

H. Furnish and participate in user training.

I. Furnish system documentation including copies of all relevant drawings and equipment manuals in compliance with the Contract Documents.

J. Furnish maintenance services for the specified period from the date of acceptance.

K. Guarantee all new equipment, software, hardware, components, and workmanship for the specified period from the date of acceptance.

L. Refer to drawing TA-001 Audiovisual General Notes for the Schedule of Responsibility.

1.9 SUBMITTALS

A. Bid Submittals:
1. Contractors shall examine all drawings and read all divisions of this specification in order to avoid omissions and duplications and to ensure a complete job. No allowances shall be made for failure to read and understand the Contract Documents. Discrepancies between drawings and the specifications or obvious omissions shall be referred to the Architect prior to the bid date. Where discrepancies occur and pre-bid instructions have not been obtained, the Contractor agrees to abide by the Architect's decisions.
2. Bid proposals shall include all work and all equipment as specified, as well as any additional equipment and materials not listed here, to be used in assembling the system to fulfill the design intent.
3. (deleted in Addendum 4)

B. Post-bid Submittals:
1. After review of bids, the apparent lowest responsible bidder must demonstrate competency of their firm's ability to perform the work described in this specification. Evidence of qualifications as listed below will be reviewed by the College and the Architect to determine competency.
   a. Credential for project manager, project engineer, and lead installer which must include NICET, EST, and/or CTS-I certifications.
   b. Proof of the AV Contractor's membership in NSCA or Infocomm International. Indicate current AVSP level.
   c. Proof that the AV Contractor has been continuously engaged in the installation and service of AV equipment for at least five (5) years in systems of similar size, scope, and project type.
   d. Documentation proving a positive work history such which shall include:
      Three (3) to (5) five projects not affiliated with College of DuPage of similar size and complexity, including Executive summary of project and scope, list of all equipment provided for project, reference and contact information for owner/owner's representative, end user and general contractor if applicable.
      Optional: photos showing completed work done by waiver seeking party
         a) Finished installation of equipment racks
         b) Finished installation of speakers
         c) Finished installation of projectors
2. After review of bids, the lowest responsible bidder shall provide the the following:
   a. Infrastructure and Major Equipment List and installation bid.
   b. Major Equipment List line item pricing.

1) Installation costs for General Equipment including hardware and labor shall be furnished.
2) Pricing shall include in-bound freight, shipping, and all delivery charges.

3.

C. Shop Drawings Submittals:
1. Within thirty (30) days of contract award, submit four (4) copies of detailed shop drawings to the Architect for approval. All shop drawings shall be marked with the related drawing number when submitted.
2. System installation and fabrication shall not begin without written approval from the Architect.
3. Review of shop drawings shall not constitute final approval of system function. Said review does not in any way relieve the Contractor from the responsibility of furnishing material or performing work as required by the Contract Documents.
4. Failure of the Contractor to submit shop drawings in ample time for the evaluation shall not entitle the contractor to an extension of contract time, and no claim for extension by reason of such default will be allowed.
5. At a minimum, shop drawings shall include:
   a. Table of Contents
   b. Itemized list of all equipment and materials to be used in assembling the system.
   c. Catalog cut sheet or data sheet for each listed item.
   d. One line Signal Flow diagrams for all sound reinforcement systems, visual systems, and auxiliary systems showing point to point wiring interconnections of all equipment with wire run numbers and patch bay designations. Show all transformers, switches, relays, control circuits, and modifications to equipment. Show all equipment items which are required for realization of the functions described herein.
   e. Complete lists of all wire run numbers along with the termination location of each end of each wire run.
   f. Schematic diagrams for any custom circuitry and all typical connections between audio lines, patch bays, visual system lines and rack mounted equipment.
   g. Drawings of all items which are to be custom fabricated or modified. Drawing shall be in scale suitable for fabrication. They shall show materials, finishes, hardware, back boxes, connectors, and panel/control markings. Submit samples of lettering/label size and typeface to be employed on custom plates, panels, and other equipment.
   h. Submit samples of custom work, finishes, or other materials as required by the Architect to verify appearance and quality. All costs for shipping samples shall be the responsibility of the Contractor.
   i. Full size drawings illustrating the physical layout and labeling of patch bays.
   j. Mechanical drawings of all assemblies, major and sub-assemblies, racks, cabinets, and enclosures, indicating provisions for proper cable management, power management, and thermal management.
   k. Mechanical drawings showing all proposed mounting details of all major equipment (e.g. loudspeakers, cameras, projectors, video displays, projection screens), and associated rigging and interface with adjacent architecture.
   l. Vibration and noise control information shall be included and coordinated with the Electrical Contractor.

m. Conduit Routing Plan, to be coordinated with electrical contractor prior to cable pull.
n. Cabling schedule providing information as detailed in Infocomm Standard F501.01:2015 to be coordinated with the Architect and Owner prior to cable pull and termination.

6. The above listed drawings shall be produced on AutoCAD 2004 min. or similar computer drafting program. Scans or photocopies of the Contract Documents are not acceptable.
7. The use of electronic files from other sources (e.g. Architect's backgrounds, Architect's drawings, vendor-supplied panel drawings) shall not absolve the Contractor of the responsibility for ensuring that the Shop Drawings represent a completely engineered coordinated system. The Contractor has final responsibility for providing systems that conform to all requirements in the Contract Documents.
8. The Contractor shall review Electrical Contractor shop drawings for all vibration and noise control equipment and systems information.
9. Proposed Touchpanel Graphical User Interface (GUI) layouts shall be submitted for approval prior to the commencement of control system programming.

D. Substitutions:
1. Substitutions shall be submitted as per the General Conditions of the Contract Documents.
2. The proposed substitutes must be equivalent or superior to the specified products in quality, performance, construction, function, conformance to system objectives and not affect system functionality, signal type, distribution, and features.
3. All substitutions must receive the express written consent of the Architect and Owner.
4. The Architect reserves the right to substitute new products which become available subsequent to the issuance of the Contract Documents, provided that:
a. The contractor has not yet purchased the originally specified equipment.
b. The substitute equipment shall not materially increase the Contractor's cost.

1.10 JOB CONDITIONS

A. Keep the job adequately staffed at all times. Unless illness, loss of personnel, or other circumstances beyond the control of the Contractor intervene, keep the same individual charge throughout.

B. Cooperate with all appropriate parties in order to achieve well coordinated progress with overall construction completion schedule and satisfactory results.

C. Watch for conflicts with work of other contractors on the job and execute, without fair claim for extra payment, moderate moves or changes as are necessary to accommodate other equipment or to preserve acoustic or visual performance, symmetry, and pleasing appearance.

D. Immediately report to the Architect any design or installation irregularities, particularly architectural elements that interfere with the intended coverage angles of loudspeakers, camera, or projection equipment, so that appropriate action may be taken.

E. Perform any and all cutting, patching, and painting for proper and finished installation of the system and repair any damage done as a result of such installation.

F. Audiovisual System work areas are to be maintained in a clean and orderly condition. Clean up and dispose of trash from all audiovisual system work areas.

1.11 ACOUSTICALLY SENSITIVE SPACES

A. The following areas have been designated as “Acoustically Sensitive Spaces:
   1. SRC2000
   2. Control Rooms
   3. Amplifier Rack Rooms
   4. Electrical Equipment Spaces
   5. Mechanical Equipment Spaces

B. An acoustically sensitive space is defined as a room or space, which requires special construction consideration to meet room acoustic, acoustic isolation, and noise control or vibration control requirements.

C. All conduit runs penetrating acoustically sensitive spaces shall have both ends sealed by means of removable closed cell neoprene foam after all cables have been run to prevent sound transmission from adjacent spaces.

D. All audiovisual wiring devices in acoustically sensitive spaces shall have a gasket sealing the faceplate to the back box to prevent sound transmission from adjacent spaces.

1.12 DELIVERY AND HANDLING

A. The Audiovisual Contractor shall be responsible for all deliveries of material to the construction site. The Owner will not accept deliveries.

B. The Audiovisual Contractor shall coordinate delivery and installation of all equipment with the Construction Manager and/or Electrical Contractor.

C. If required by the Construction Manager or Electrical Contractor, audiovisual equipment shall be delivered in a minimum of three (3) separate shipments that shall include:
   1. Shipment #1: All items in which conduit is terminated which includes backboxes, wiring device faceplates with receptacles, projection screen cases, etc.
   2. Shipment #2: All items which require structural backing such as rigging components, monitor and projector mounts, etc.
   3. Shipment #3: All items that are not required until the building/area of work is secure and ready for electronic equipment. This shall include equipment racks, wiring device face plates, portable equipment, etc.

D. Audiovisual Contractor shall deliver all material to the job site suitably crated, packed, and protected and bearing the label and the nomenclature of the product(s) found in each carton or crate.

E. Audiovisual equipment shall be stored according to manufacturer's recommendations at a minimum. Equipment must be stored in a location protected from vandalism and weather. Manufacturer’s storage specifications - in particular, those relating to temperature - shall be followed. All storage costs shall be included in Contract price.

1.13 QUALITY ASSURANCE

A. Parts listed shall be complete and equipment furnished shall conform to manufacturer's specifications.

B. All materials shall be new and shall conform to the applicable provisions of Underwriter's Laboratories (ULEQ) and American Standards Association (ASA).

C. Procure and pay for all permits, licenses, and inspections, and observe any requirements stipulated therein. Conform in all trades with all local regulations and codes.

D. Comply with federal, state, and local labor regulations and applicable union regulations.

E. Installation shall conform to the latest federal, state, and local electrical safety codes of authorities having jurisdiction. Where conflict exists, the most stringent code or regulation shall apply.

1.14 GUARANTEE AND SERVICE

A. The Audiovisual system shall conform to all applicable code requirements and shall be in conformance with industry standards of operation and practice.

B. All new systems and components shall be guaranteed free of defects in materials and workmanship for a period of one (1) year from the date of acceptance and shall be repaired or replaced within forty-eight (48) hours following report of such defects by the owner.

C. Installation of relocated existing equipment shall be guaranteed free of defects in materials and workmanship for a period of one (1) year from the date of acceptance and shall be repaired or replaced within forty-eight (48) hours following report of such defects by the owner.

D. All audiovisual system software updates shall be automatically issued to the Owner free of charge during the warranty period.

E. The Contractor shall be available on call and on eight (8) hour notice during the first month following acceptance of the system, to assist the Owner's representatives in any problems which may arise during the initial period of operation.

F. The Contractor shall provide same day response to service requests, via 24/7 phone support.

G. If during guarantee period any component is out of service for more than seven (7) consecutive days due to unavailability of parts or service, the contractor shall furnish and install identical new component. If an identical component is not available, the contractor will substitute equivalent equipment with written approval of the owner.

H. During the course of the guarantee period, the Contractor shall provide a minimum of three (3) service visits to the site for inspection and adjustment of equipment and programming. Contractor shall submit proposed schedule for these visits and shall notify Owner and Architect in writing at least one (1) month in advance of each visit.

1.15 INSURANCE

A. All equipment and materials shall be fully insured against loss or damage up until acceptance of the system by the Owner or until the Owner relieves the Contractor in writing of this responsibility, whichever is earlier.

PART 2 - EQUIPMENT

2.1 GENERAL

A. Whenever any equipment is specified by manufacturer and model number, it is for the purposes of establishing a standard of quality, performance, construction, and function.

B. All materials and equipment shall be new and of the latest design or model offered for sale by the manufacturer.

C. Equipment models furnished shall operate at the required AC line voltage (i.e. 120 Volts) and frequency (i.e. 60 Hz)

D. Contractor shall furnish at minimum, quantities as indicated in the Contract Documents as required for complete installation.

E. Audiovisual Wire and Cable:
   1. Approved manufacturers:
      a. Belden
      b. Berk-Tek
      c. Liberty
      d. Crestron
      e. Extron
      f. West-Penn
      g. Panduit
   2. All wire numbers listed in the Contract Documents are Belden unless otherwise noted.
   3. Where required, install plenum rated cable listed and labeled for plenum installation.

F. Electrical Wire and Cable (including ground conductors)
   1. Where conflict exists with any codes or ordinances, such codes and ordinances shall take precedence.
   2. Where conflict exists with Electrical Specifications, the higher standard or more stringent requirement shall apply.

G. Wiring Devices:
   1. Specifications – Duplex Receptacles
      a. Grade: Specification, Hubbel IG5362 or equal
      b. Type: NEMA 5-20R
      c. Color: Orange
   2. Specifications – Plug Mold
      a. Grade: Wiremold V/G 2000 Series or equal
      b. Size: As specified or required.

3. Specifications – Outlet Strips
    a. Grade: UL Listed, Wiremold or equal.
    b. Size: As specified or required.
4. Approved Manufacturers:
    a. Waber
    b. Wiremold
    c. Hubbell
    d. Bryant
    e. GE
    f. Leviton

H. Electrical Plates and Panels:
1. Specifications – Rack mount panels
    a. Material: 11 gauge steel or 1/8” aluminum, minimum thickness.
    b. Finish: Black or to match adjacent equipment.
    c. Size: 19” wide, standard EIA mounting hole spacing, height as specified or required.
2. Specifications – Back Box Enclosures
    a. Material: Code grade steel.
    b. Finish: Black or Galvanized.
    c. Size: As specified or required.
3. Specifications – Plug Box and Termination Panels
    a. Material: 11 gauge steel or 1/8” aluminum, minimum thickness.
    b. Finish: Black (unless otherwise noted by the Architect).
4. Any and all recessed face plates shall have a minimum ¾” reveal beyond the back box to hide the intersection between the wall material and the back box excluding standard decora-style plates.
5. Approved Manufacturers:
    a. Hoffman
    b. Whirlwind
    c. Pro-Co
    d. Wireworks.

I. Any equipment to be located outdoors or in damp locations must carry a NEMA 3R rating and be labeled accordingly.

J. Audio Transformers:
1. All transformers shall be selected for proper installation and load of the circuits as required by as-built conditions and per manufacturer’s recommendations.

K. Control System Programming:
1. Control system installation shall be performed by AV Contractor.
2. All control system programming, testing, and debugging to be performed by a manufacturer certified programmer, supplied the Contractor via a manufacturer authorized and certified independent programmer.
3. Contractor shall furnish complete control system programming, including all source code and on-site coordination, testing, and debugging.
4. Contractor shall furnish all programming of control system equipment including:
    a. Nightly system shut down.
    b. Janitorial/Off-hour maintenance control.

c. Emergency Life/Safety override.
d. Audiovisual source equipment selection (e.g. Audio Source, Video Source, Display Selection)
e. Audiovisual source equipment transport control (e.g. play, pause, stop, forward, reverse).
f. Master Volume control

5. Touchpanel interfaces shall have two (2) modes of operation:
   a. User Mode:
      1) Basic controls of all system components
      2) Streamlined user interface.
      3) Room modes available via single button presets
   b. Tech Mode:
      1) Advanced control and configuration of system components.
      2) Setup of presets
6. Pushbutton interfaces shall have the following control options:
   a. Presentation Mode:
      1) Display of presenter's computer through an audiovisual wiring device to the display
      2) Presenter's microphone through the system to the loudspeakers.
      3) Audio from the presenter's computer through the system to the loudspeakers.
   b. Video Mode:
      1) Display of a video source through the audiovisual system to the display.
      2) Audio from the same video source through the audiovisual system through the system to the loudspeakers.
   c. Aux Mode:
      1) Display of a video source through the system via an auxiliary input.
      2) Audio from the same video source though the system via and auxiliary input to the loudspeakers.
   d. Source Selection Control, which provides the ability to:
      1) Select any source equipment to be displayed on any video display in the system and routing audio from that source through the system to the loudspeakers.
   e. Source Transport Control, which at minimum provides the ability to:
      1) Play, pause, stop, forward, reverse and source equipment in the system.
   f. Master Volume Control of the system.
7. In rooms where a volume control system and digital signal processor (DSP) exist, the control system shall be programmed such that:
   a. The appropriate preset on the DSP system and display system shall be selected based on that activity taking place.
8. Provisions for control from a computer via web interface (e.g. XPanel) shall be included.
9. Control system programming shall accommodate future addition of touchpanels and mobile applications (e.g. Crestron Mobile Pro) for Apple iPhone/iPad and Android devices.
10. AV Contractor to schedule meeting with owner and Architect to review control system functionality and operational requirements prior to the commencement of work.

L. Audio DSP System:
   1. Audio Inputs
      a. All system audio inputs shall be programmed with limiters.

b. It shall be possible to matrix any input to any output within the system.

2. Audio Outputs:
   a. All audio outputs shall be programmed with high pass filters, parametric equalization, delay, and limiters.
   b. It shall be possible to matrix any input to any output within the system.
3. Assistive Listening or Hearing assistance System (HA):
   a. HA shall receive the same signal as being heard via the loudspeakers.
   b. HA shall be set up in accordance with ADA requirements.
4. The DSP software shall be installed on the digital audio work station (DAW) specified in the Major Equipment List.

M. Equipment furnished shall be that specified herein.

N. Detailed performance specifications shall be those published by the manufacture effective on the date of this document for all equipment specified herein.

O. The AV Contractor shall verify all projection screen dimensions, surface type, and frame style with the Contract Documents and submit the information with the required shop drawings for approval by the architect prior to ordering any material. Failure to coordinate screen information shall not result in additional costs to the Owner.

P. The AV Contractor shall verify all projector lenses for appropriate focal length and intended image size with the Contract Documents, based on field measurements of actual throw distance. Failure to coordinate lens information shall not result in additional costs to the Owner.

Q. All miscellaneous materials including brackets, pole extensions, mounting hardware, electrical connectors, and other items to properly install the equipment specified shall be included as part of this project whether it is listed or not.

R. Existing structural mounting to be reused as conditions permit.

S. If required, Cost Reduction and/or Value Engineering shall be conducted by the Architect and Owner based on final bid amounts.

2.2 MAJOR EQUIPMENT

A. Vendor Quotes:
1. Contractor shall be responsible to coordinate with owner to verify if the project is eligible for specialty pricing do to, but not limited by quantities, project registration or specialty promotions from all equipment manufactures equipment for this project, as well as the associated soft costs and misc. hardware and cabling costs with those products in this project.
2.

B. Major Equipment List:
1. The major equipment list itemizes major system components and their quantities to provide the systems as shown in the contract documents. It is the responsibility of the contractor to provide any additional accessories, patch cabling, interfaces, and other miscellaneous equipment not described herein to provide a working system as called out in the functional

requirements section of this specification (1.7), unless otherwise noted as owner furnished or future equipment. For items not given specific quantities in these documents, it is the responsibility of the contractor to verify those quantities with the owner and architect prior to system installation

Manufacturer	Model/Part#	Description	Qty	Notes
Blackmagic Design	HD optical mini converter	bi-directional fiber optic mini-converter	6	
Blackmagic Design	SDI D.A.	SDI mini-converter distribution amp	4	
Epson	ProL1505UHNL	12,000 Lumen projector	7	Owner Purchased
Epson	ELPMB48	High ceiling mount for projector	7	Owner Purchased
Epson	ELPLW06/W04	Zoom lens for projector	7	Owner Purchased

Manufacturer	Model/Part#	Description	Qty	Notes
Cisco	SG300-28P	28-Port Gigabit PoE Managed Switch	2	
corning	CCH-04U	Closet Connector Housing (CCH), Black, Empty, Four Rack Unit High (4 RMU), Holds Twelve CCH Connector Panels	1	
corning	CCH-CP08-A9	Closet Connector Housing (CCH) Panel, LC adapters, Duplex, UPC, 8 fiber, Single-mode (OS2)	12	
custom patch panels		See TA-550 thru TA-552	12	
Draper Inc.	143030	Ultimate Access V, matt white XT100V ceiling mounted tab tensioned 165" diagonal motorized screen (87.5”x140”)	6	KEYNOTE 1B
Draper Inc.	145003	Ultimate Access XL V, matt white XT100V ceiling mounted tab tensioned 226" diagonal motorized screen (120”x192")	3	KEYNOTE 1C
Extron	70-971-01	BB710M Back box for 720M	8	
Extron	60-1434-01	IPCP Pro 555 control processor	1	
Extron	60-1341-02	TLP Pro 1220TG 12" tabletop TouchLink Pro Touchpanel	1	
Extron	30-1394-03	TLP Pro 720M 7" touch panel	8	KEYNOTE 4D
Extron	60-1545-01	16x16 multi input Matrix Router XTP II CrossPoint 1600 Frame. Modular Digital Matrix Switchers from 4x4 to with SpeedSwitch® Technology	1	
Extron	70-1050-01	Four Input Board, 3G-SDI with Stereo Audio	1	
Extron	70-1113-01	Four Output Board, HDMI 4K/60 with Stereo Audio	1	

Extron	70-939-01	Blank Plate for XTP Matrix	8	
Extron	70-940-21	Four Input Board, XTP 4K with IR/RS-232 Insertion	2	
Extron	70-943-21	Four Output Board, XTP 4K with IR/RS-232 Insertion	2	
Extron	60-1304-01	DSC HD-3G A, HDMI to 3G-SDI Scaler with Audio Embedding	4	
Extron	60-1298-01	Four Port XTP Power Injector	6	
Extron	60-1199-01	XTP CATx Scaling Receiver for HDM	7	
Extron	60-1216-12	XTP T UWP 202, two Input XTP Transmitter for HDMI and VGA - Decorator-Style Wall plate Black	8	
Extron	60-1558-01	Sharelink 250	7	
Listen Technologies	LKS-2	Listentalk Base-8 System	1	
Middle Atlantic	PDLT-815RV-RN	Rackmount power/lighting 8 outlet, 15A, 2-Stage surge	2	
Middle Atlantic	FD-44	Front door for equipment rack	2	
Middle Atlantic	WRK-44SA-32	44 RU equipment rack	2	KEYNOTE 6A
Yamaha	XMV8280-D	8 channels x 280 watts (4/8Ω) or 250 watts (70/100V). Dante digital audio network input	1	KEYNOTE 5A
Yamaha	MTX5-D	Digital signal processor with Dante	1	
Yamaha	VXC6	2-way, 6.5" woofer with 0.75" tweeter. 150W program at 8Ω. 60/30/15/7.5W 70V taps. Black grill. Priced AS SINGLE UNIT SOLD IN PAIRS	17	

PART 3 - EXECUTION

3.1 INSTALLATION OF SYSTEMS

A. Locate all apparatus requiring adjustments, cleaning, or similar attention so that it will be accessible for such attention. Equipment racks shall be positioned to permit full access for operation and service.

B. Furnish and install brackets, braces, and supports. Minimum fastening or support safety factor shall be at least five (5). Design shall be approved by the Architect.

C. All supporting structures supplied by the Contractor not having standard factory paint finish shall be painted. Paint specifications shall be supplied by the architect or indicated herein.

D. Provide custom color or finish for any equipment or materials supplied which are exposed to public view. Color and finish of all such equipment or materials shall be approved in writing by the Architect. This does not exclude equipment or materials where standard colors or finishes may be specified herein.

E. Finish of blank panels and custom assembly panels shall match adjacent equipment panels.

F. Switches, connectors, jacks, receptacles, outlets, cables, and cable terminations shall be logically and permanently marked. Custom panel nomenclature shall be engraved, etched, or screened. Markings for these items are detailed in the contract documents to ensure consistency and clarity. Verify any changes in working type size and/or placement with the Architect prior to marking.

G. The equipment specified herein is designed to operate in environments of normal humidity, dust, and temperature. Protect equipment and related wiring where extreme environmental conditions can occur.

H. Coordinate with millwork fabricator for installation of audiovisual equipment into credenzas, lecterns, etc..

I. XTP© System:
1. The XTP System shall be installed and tested by an XTP Systems Design certified technician and/or engineer, in accordance with the guidelines set forth in the XTP System Design Certification Program.
2. The Contractor shall provide an Extron Control Specialist to program and configure the XTP Matrix Router.

J. AV Control System:
1. The IPCP Control Processor and AV Control system shall be installed and tested by an Extron Certified technician and/or engineer, in accordance with the guidelines set forth in the Extron Control Specialist Certification Program.
2. The Contractor shall provide an Extron Control Specialist to program and configure the IPCP Control Processor and AV Control system.
3. The Audiovisual Contractor shall coordinate with College of DuPage to install and test emergency override setting in Yamaha MTX-5D digital signal processor.

3.2 CONDUIT

A. Review and coordinate audio installation with the Electrical Contractor to ensure proper operation of the audio system.

B. All wiring shall be in conduit unless authorized by the Architect, approved by the Architect in writing, and permitted by code. Exceptions are short runs at equipment terminations where there is no means of connecting conduit to the equipment.

C. Where installed exposed, conduits shall be parallel with or at right angles to walls or ceiling and /or follow surface contours and shall be supported from walls or ceilings by means of approved clamps or hangers. Conduit connections to equipment racks shall be insulated.

D. Minimum size conduit shall be trade size ¾". All conduits shall be sized for maximum 40% fill or less if required by code.

E. Conduits carrying high voltage or high amperage wiring serving equipment subject to abrupt start-up and possible slapping of wiring within conduit shall not pass through Acoustically Sensitive Spaces.

F. Conduits connected to dimmer racks or to transformers shall not pass directly into Acoustically Sensitive Spaces. Conduits connected to dimmer racks or transformers shall not penetrate walls, floors, or slabs of Acoustically Sensitive Spaces within thirty (30) feet of those equipment room walls or slabs. All penetrations in the path of conduits within thirty (30) feet of electrical rooms containing dimmer racks or transformers shall be resilient penetrations.

G. Large numbers of conduits penetrating walls of Acoustically Sensitive Spaces shall be individually sleeved and shall pass through walls, floors, slabs, and ceilings perpendicularly.

H. Conduits shall not be installed to connect or contact rigidly other non-electrical equipment or building systems which are vibration isolated.

I. Coordinate all conduit sizes, locations, and quantities with the Electrical Contractor to provide proper routing, signal separation, and wire group type. Failure to do so shall not allow for additional compensation. Provide a conduit routing plan for approval by the Architect prior to installation. Routing plan shall include intended sizes, separation, and cable fill chart.

J. Existing conduit and cabling infrastructure to be reused is to be done so to the maximum extent possible without compromising audiovisual system performance.

3.3 RESILIENT PENETRATIONS OF WALLS AND SLABS

A. All conduit and cable penetrations shall be sleeved, packed, and caulked airtight to form a resilient penetration at the following locations:
   1. Mechanical Equipment Rooms
   2. Electrical and Dimmer Equipment Rooms
   3. Acoustically Sensitive Spaces
   4. Rooms with Acoustically Isolated Construction.

B. Openings shall be oversized and sleeved to provide an inner diameter of one (1) to two (2) inches greater than the outside diameter of the duct or pipe. The conduit shall be centered in the opening and shall not rigidly contact the wall, floor, or ceiling. The resulting gap shall be packed with glass fiber packing material and foam rod. The gap shall be caulked to an airtight seal using permanently flexile acoustical sealant.

C. Acoustical sleeves may be used in lieu of resilient penetrations described above. Multiple conduit penetrations may be constructed following the detail for multiple penetrations identified in the Contract Documents.

3.4 ELECTRICAL POWER

A. Review and coordinate electrical power system installation including grounding with the Electrical Contractor to ensure proper operation of the audiovisual system.

B. Verify that All AC power circuits designated for audio equipment are wired with the correct polarity and ground. Report in writing any discrepancies found to the Architect for corrective action.
   1. Provide distribution of electrical power within the equipment racks with a minimum of one space AC receptacle for each four (4) in use per branch circuit.
   2. The Electrical Contractor shall ensure that all audio grounding does not intersect with any building ground except at earth.

3.5 STEEL SUPPORTS

A. Fabricate and install any supports so that the installation does not weaken or overload the building structure. Do not impose the weight of equipment or fixtures on supports provided for other trades or systems. No drilling or cutting of concrete beams, joists, or structural steel, nor welding to structural steel, shall be permitted except as authorized in writing by the Architect.

3.6 SEISMIC RESTRAINTS

A. All hanging or free-standing equipment and cabinets furnished, including but not limited to racks, loudspeakers, projection screens, and mounts shall be secured to substantial building structures. The equipment described herein shall resist seismic acceleration in any direction up to a limit of the greater of 1.0G or the limit prescribed by the local governing codes.

B. Loudspeaker hanging details, rack bracing, and other seismic restraints may not be shown on the Contract Documents. The Contractor is responsible for development of these drawings to be submitted and approved by the Structural Engineer.

3.7 BOXES

A. With the exception of portable equipment, all boxes, conduits, cabinets, equipment, and wiring shall be held in place and the mounting shall be plumb and square.

B. All boxes shall be securely mounted to building structure. All boxes shall be installed so that wiring contained in them is accessible. Install blanking devices or threaded plugs in all unused holes.

C. Wiring groups and circuits shall be isolated as indicated herein. Common pull or junction boxes are not permitted except as authorized in writing by the Architect.

D. Clean all box interiors prior to installing plates, panels, or covers.

3.8 WIRING METHODS AND PRACTICES

A. Furnish and install all audiovisual wire and cable ensuring proper pulling tension, bend radius, quantities, types, lengths, routing, wire group separation, and identification.

B. Spare wire runs of each group and type shall be pulled to each termination location. The number of spares shall be ten (10) percent of those in actual use or one, whichever is greater

C. Splicing of cables is not permitted between terminations of specified equipment.

D. Do not pull wire or cable through any box fitting or enclosures where change of raceway alignment or direction occurs; do not bend conductors to less than recommended radius. Employ temporary guides, sheaves, and rollers to protect cables from excess tension, abrasion, or damaging bending during installation.

E. Use wire pulling lubricants and pulling tensions in accordance with the wire and cable manufacturer's recommendations.

F. All wires shall be permanently identified at each wire end by marking with adhesive on crimp-on markers and a chart kept of each wire's function. This applies to wire within a rack assembly as well as wire running in conduit.

G. Wire ends shall be wrapped with appropriate heat shrink tubing. Each shield or drain wire shall be covered with heat shrink to avoid unintentional connections.

H. Use ring or tongue lugs on all barrier strip terminals. Do not exceed two (2) lugs per terminal. Use crimping tools that are designed for the application or solder. Do not cut strands from conductors to fit lug terminals. Spare terminal blocks, equivalent to ten percent (10%) of those in actual use shall be furnished.

I. Form in an orderly manner all conductors in enclosures and boxes, wire ways, and wiring troughs, furnishing circuit and conductor identification. Tie using tie wraps of appropriate size and type. Limit spacing between ties to twelve (12) inches and furnish and install circuit and conductor identification at least once in each enclosure.

J. When the audiovisual cables are pulled, leave a five foot (5') tail at each end to all field locations and a fifteen foot (15') tail at all equipment rack locations. Temporary labels shall be applied at both ends of each cable. Permanent labels shall be applied when the cables are cut back and terminated.

K. All labeling of audiovisual cables shall comply with Infocomm standard F501.01:2015. The numbering system used in compliance with this standard shall be verified with the owner prior to implementation. A schedule of all cabling and its labels shall be provided to the owner and Architect for review prior to pulling and termination of cables.

3.9 GROUNDING

A. Audiovisual system wiring shall conform to the following procedures:
   1. Audio equipment AC ground pins shall connect to AC ground.
   2. Audio equipment chassis shall connect to rack frames.
   3. Audio rack frames shall connect to AC ground bus in panel board by means of #2 gauge (minimum) conductor
   4. Audio shields between AC powered pieces of equipment shall be connected to ground at one end only. Terminate capacitance as required.

5. Audio signal paths between AC powered pieces of equipment shall be connected using balanced lines and/or transformer isolation as required.
6. No unbalanced signal paths may be connected to patch bays.
7. Isolate all audiovisual system wiring from racks, back boxes, and conduit.
8. Isolate all audiovisual system racks from conduit and other conductive surfaces. Use insulated bushings for conduit connections and a dielectric plinth between racks and conductive flooring.
9. AC isolated ground system shall be isolated from all other facility grounds.

B. All metallic conduit, boxes, and enclosures shall be grounded in accordance with the current National Electric Code (NEC).

C. Metallic enclosures containing active equipment shall be grounded with due regard for the minimization of electrical noise. This may include the provisions of grounding conductors separate from AC ground.

3.10 EQUIPMENT RACKS

A. The equipment racks shall be considered as custom assemblies and shall be assembled, wired, and tested in the Contractor's shop. Final assembly of racks shall take place on site after transportation but will conform to the same test results achieved in the shop.

B. Placement of equipment in equipment racks, as shown in the drawings, is for maximum operator convenience. The insertion of additional equipment not indicated herein or any changes of placement of the equipment must be indicated in writing to the architect before assembly.

C. Racks shall be installed plumb and square without twists in the frame or variations in level between adjacent racks.

D. All wire, cable, terminal blocks, rack mounted equipment, and active slots of card frame systems shall be clearly and logically labeled as to their function, circuit, or system. Labeling on manufactured equipment shall be by engraved plastic laminate or by thermal printer on adhesive tape, with white lettering on black background or dark background that is similar to panel finish.

E. Provide stiffeners to custom panels to prevent panel deformation during normal plugging or switching operations.

F. All field termination shall enter the rack via a bulkhead panel(s) mounted to the rear-rails of the equipment rack.

G. All wires and cable used in assembling custom panels and equipment racks shall be formed into harnesses which are tied and supported in accordance with accepted engineering practice.

H. Harnessed cables shall be combed straight, tie wrapped every eight (8) to twelve (12) inches, and attached to the structure as necessary. Each cable that breaks out from the harness for a termination shall be provided with ample service loop to permit equipment removal from the racks without disconnecting.

I. Harnessed cables shall be formed in either a vertical or horizontal relationship to equipment, controls components, or terminations.

J. Cables shields shall be connected to the isolated ground system with due regard for the ground loops.

K. All system components and related wiring shall be located with due regard from the minimization of induced electromagnetic and electrostatic noise, for the minimization of wiring length, for proper ventilation, and to provide reasonable safety and convenience of the operator.

L. All rack mounted equipment with front panel controls, shall be furnished with security covers to avoid tampering with preset levels. If specific security covers are not included in the equipment list, the Contractor will furnish the manufacturers suitable alternate.

M. Every device shall be installed with regard for proper polarity. Absolute polarity shall be maintained through the entire audio chain.

3.11 INITIAL ADJUSTMENT

A. Verify all circuits and extensions for correct connection, continuity, and polarity. Absolute polarity shall be maintained between all points in the system.

B. Connector polarity shall be maintained except for terminations at equipment manufactured to other standards. Verify that polarity connections are consistent throughout the system.

C. Verify that the audio system is operational and the system gain structure is within the recommendations of major component manufacturers.

D. Verify that the all video sources (cameras, players, etc.) and that all video destinations (Projectors, displays, recorders, etc.) are sending and receiving video signals. EDID parameters for all digital video devices shall be reviewed with the owner to verify resolution requirements at all video output devices. Confirm all equipment managed by the audiovisual control system can receive and send control signal as applicable, and that all control parameters and functionality as requested by the owner in the meeting prior to the beginning of work identified in section 2.1.K.9 of this specification have been implemented.

3.12 VERIFICATION TESTS

A. Confirm that each individual wire and cable run has been labeled and documented in compliance with Infocomm standard F501.01:2015.

B. Confirm that all system outputs are free of spurious signals including oscillations and radio frequency signals. Contractor shall furnish a wide band oscilloscope in order to verify this condition.

C. Confirm that the system is free of audible clicks, pops, hums, and other noises when any operating control is activated, with or without an input signal

D. For all audio and video lines, confirm:

1. Proper circuits appear at each termination location.
2. Proper circuits appear at each jack bay location.
3. Continuity of all conductors.
4. Proper polarity is maintained.
5. Absence of shorts between conductors within each circuit.
6. Absence of shorts between circuit conductors and conduit.

E. Confirm that the loudspeakers and mountings are free of buzzes and rattles when the speaker is swept with sine wave tones over its rated bandwidth at one-half (1/2) its maximum rated power.

F. For all permanently mounted loudspeaker terminations, furnish impedance measurement of each pair of loudspeaker lines with all loudspeakers connected and all amplifiers disconnected. These measurements shall be documented in a table listing impedance for each third octave from 20 Hz to 20 kHz and shall be accurate to the nearest 0.1Ω.

G. For each installed data network cable or fiber optic cable, verify that performance conforms to the relevant TIA/EIA specifications.

H. For all electronic devices mounted in racks and connected to patch bays confirm:
1. Every audio input and output is balanced.
2. Proper polarity is maintained throughout the entire audio signal path.

I. Confirm that there are no short circuits between the neutral and isolated ground conductors for each clean power circuit.

J. Confirm every input and output for video system including:
1. Proper signal to displays.
2. Proper sync to playback and recording equipment.

3.13 VERIFICATION TEST REPORT

A. Submit five (5) copies of a written report detailing the results of Initial Adjustments and Verification Test including all relevant drawings, charts, test instrument data and photographs. This report shall be completed and submitted to the Architect for review a minimum of five (5) days prior to Acceptance Testing and final tuning. With this report, submit written certification that the installation conforms to the requirements stated herein, is complete in all respects, and is ready for inspection, testing, and tuning.

3.14 ACCEPTANCE TESTING

A. Acceptance Testing shall be performed by the Architect during a period designated by the Architect. Contractor shall furnish a minimum of two (2) technicians for the acceptance testing period.

B. All systems shall be compliant with Infocomm standard 1M:2009 Uniform Distributed Audio Standard as applicable.

C. The minimum time required for Acceptance Testing is two (2) working days of dedicated quiet. Coordinate this time period so that free access, work lighting, and electrical power are available on site.

D. The AV Contractor shall bear any costs incurred for additional Architect's time and expenses due to failure to have the system functioning in accordance with specification requirements at the time scheduled for Architect's Acceptance Testing and Tuning.

E. Ensure that audiovisual areas are in a clean and orderly condition ready for Acceptance Testing.

F. At the time of Acceptance Testing, submit one (1) copy of the operation and maintenance manual to the Architect (refer to Paragraph 3.15).

G. Furnish test equipment meeting the following minimum specifications on site, at all times during the Acceptance Testing. Prior to Acceptance Testing, provide the Architect with a listing of the equipment model numbers and their software versions (if applicable) to be made available.
1. Oscilloscope: 1GHz bandwidth sensitivity – 1mV/cm
2. Digital Multi-meter: 1% accuracy
3. Function Generator: 1GHz bandwidth, distortion <1%
4. Real Time Analyzer: 1/3 octave with microphone.
5. Pink Noise Source: 20 Hz – 20 kHz
6. Impedance Sweep Meter: 20 Hz – 1 kHz range, 1Ω - 50Ω.
7. Polarity Checker: Microphone level, Line Level, and Loudspeaker Level.
8. NTSC bar graphs and other test patterns for video verification.
9. Ultra High definition (4K60) Video test generator with VGA, DVI, HDMI 2.0, SDI, and 3G-HDSDI outputs

H. Be prepared to verify the performance of any portion of the system by demonstrations, listening, and viewing tests, and instrumented measurements.

I. Make additional mechanical and electrical adjustments within the scope of the work which may be deemed necessary by the Architect as a result of the Acceptance Test. This may include realigning and re-aiming of video or audio systems, changes in system gain structures, grounding, filtering, or interfaces.

J. Final acceptance will be contingent upon issuance by the Architect of a letter of acceptance stating that the work has been completed and is in accordance with the Contract Documents. The warranty period will begin upon issuance of said letter.

3.15 SYSTEM DOCUMENTATION

A. Within fifteen (15) days of the Acceptance Testing, prepare and submit five (5) neatly bound copies of the operations and maintenance manuals to the Owner. Manuals shall be placed in an orderly fashion into a three-ring binder with spine labels indicating contents. These copies are in addition to the one (1) copy furnished to the Architect during Acceptance Testing.

B. Manual shall include but not be limited to the following:
1. Table of contents
2. Written Guarantee and Service Policy

3. Basic power on/off and operational procedures.
4. All Available manufacturer's operation and service literature for each major system component
5. A one-line signal flow diagram with all cable runs and patch points identified by alphanumeric characters
6. A copy of the Verification Test Report
7. Two (2) copies of as-built conduit riser diagram obtained from the Electrical Contractor
8. A copy of the final tuning settings as furnished by the Architect
9. Electronic versions of all documents included in the manual and electronic back up of all software, firmware, and files to restore initial install presets for all applicable devices copied on to (2) USB storage devices.

C. Furnish a framed copy of the as-built signal flow diagram to be mounted in the control room, room 109 on TA documents**.** This diagram shall have all cable runs and patch points identified by alphanumeric characters.

3.16 TRAINING

A. The AV Contractor shall provide up to forty-eight (48) hours instruction in the safe and proper operation of the equipment, in particular the audio DSP, sound console, and control systems, to the owner's designated representatives.
1. AV Contractor shall schedule instruction with the Owner's designated representatives.
2. Instruction shall not necessarily follow immediately after the system commissioning.
3. Instruction shall be independent of the system check-out and activation. Duration of system commissioning shall not affect the length of instruction time.
4. Instruction, at Owners discretion, may occur in multiple time blocks of less than eight (8) hours each.
5. AV Contractor shall be responsible for making and furnishing video documentation of instruction for future viewing to the Owner. Video documentation can be requested by the owner up to the entire (48) hours of instruction as detailed in this section, and shall be furnished to the owner as individual .mp4 files per training session. Files shall be labeled by the contractor indicating the date of training and a brief description of the content of the video. All files shall be furnished to the owner on a USB storage device provided by the contractor.

END OF SECTION 27 41 16

SECTION 087100 – DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Door Hardware Schedule”.
2. Division 08 Section “Hollow Metal Doors and Frames”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards:

1. ANSI/BHMA Certified Product Standards - A156 Series
2. UL10C – Positive Pressure Fire Tests of Door Assemblies

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

    a. Type, style, function, size, label, hand, and finish of each door hardware item.
    b. Manufacturer of each item.
    c. Fastenings and other pertinent information.
    d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    e. Explanation of abbreviations, symbols, and codes contained in schedule.
    f. Mounting locations for door hardware.
    g. Door and frame sizes and materials.
    h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

D. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

D. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

E. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

F. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

G. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

H. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:

1. Ten years for mortise locks and latches.
2. Five years for exit hardware.
3. Twenty five years for manual surface door closer bodies.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity, unless otherwise indicated:

    a. Two Hinges: For doors with heights up to 60 inches.
    b. Three Hinges: For doors with heights 61 to 90 inches.
    c. Four Hinges: For doors with heights 91 to 120 inches.
    d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

    a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
    b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

    a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
    b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

    a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Acceptable Manufacturers:

    a. Hager Companies (HA).
    b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).
    c. Stanley Hardware (ST).

2.3 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

5. Acceptable Manufacturers:

    a. Door Controls International (DC).
    b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
    c. Trimco (TC).

2.4 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.

C. Cylinders: Original manufacturer cylinders complying with the following:

1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
5. Keyway: Match Facility Standard.

D. Patented Cylinders: ANSI/BHMA A156.5, Grade 1, certified patented cylinders employing a utility patented and restricted keyway requiring the use of a patented key. Cylinders are to be protected from unauthorized manufacture and distribution by manufacturer's United States patents. Cylinders are to be factory keyed with owner having the ability for on-site original key cutting.

1. Acceptable Manufacturers:

    a. Medeco (MC) Verify with owner which keyway and type of cylinder.

E. Keying System: Each type of lock and cylinders to be factory keyed.

1. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.

3. Existing System: Key locks to Owner's existing system.

F. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

G. Construction Keying: Provide construction master keyed cylinders.

H. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.5 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.

1. Acceptable Manufacturers:

a. Schlage (SC) – L9000 Series.
b. No Substitution.

2.6 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.7 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.

2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.

3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.

4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.

5. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

6. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.

7. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.

8. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.

9. Rail Sizing: Provide exit device rails factory sized for proper door width application.

10. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.

1. Acceptable Manufacturers:

a. Von Duprin (VD) - 35A/98 XP Series.
b. No Substitution.

C. Tube Steel Removable Mullions: ANSI/BHMA A156.3 removable steel mullions with malleable-iron top and bottom retainers and a primed paint finish.

1. Provide keyed removable feature where specified in the Hardware Sets.

2. Provide stabilizers and mounting brackets as required.

3. Provide electrical quick connection wiring options as specified in the hardware sets.

4. Acceptable Manufacturers:

a. Von Duprin (VD) - 9954 Series.

2.8 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.

2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.

4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.

5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and

fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.

1. Acceptable Manufacturers:

    a. LCN Closers (LC) - 4040XP Series.
    b. No Substitution.

2.9 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.

2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.

4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:

    a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.

6. Acceptable Manufacturers:

    a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

2.10 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Acceptable Manufacturers:

    a. Ives (IV).
    b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Acceptable Manufacturers:

    a. Glynn Johnson (GJ).
    b. Rixson Door Controls (RF).

2.11 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Acceptable Manufacturers:

1. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).

2.12 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.13 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

Hardware Sets

Set: 1.00
Doors: 100, 101, 102, 103, 110

6	Hinge (heavy weight)	T4A3786 4-1/2" x 4-1/2"	US26D	MK
1	Removable Mullion	KRM200	600	YA
2	Fire Rated Rim Exit	99NL-OP-F 110MD-NL	US26D	VD
2	Door Closer	4040XP EDA	AL	LC
2	Kick Plate	K1050 12" high BEV CSK	US32D	RO
2	Wall Stop	400	US26D	RO
1	Gasketing	S88BL 20'		PE
1	Astragal	S772BL 8'		PE

Set: 1.01
Doors: 108, 109

3	Hinge (heavy weight)	T4A3786 4-1/2" x 4-1/2"	US26D	MK
1	Fire Rated Rim Exit	99L-F 03 -2 996L(Std)	US26D	VD
1	Door Closer	4040XP EDA	AL	LC
1	Kick Plate	K1050 12" high BEV CSK	US32D	RO
1	Wall Stop	400	US26D	RO
1	Gasketing	S88BL 20'		PE

Set: 2.00
Doors: 104, 105, 106

6	Hinge (heavy weight)	T4A3786 4-1/2" x 4-1/2"	US26D	MK
1	Flush Bolt	555	US26D	RO
1	Dust Proof Strike	570	US26D	RO
1	Mortise Lock	L9080 03C	626	SC
2	Surf Overhead Stop	9-X36	630	RF
2	Silencer	608-RKW		RO

END OF SECTION 087100

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Solid core doors with wood veneer faces.
2. Factory finishing wood doors.
3. Factory fitting wood doors to frames and factory machining for hardware.
4. Louvers installed in flush wood doors.
5. Light frames and glazing installed in wood doors.

B. Related Sections:
1. Division 08 Section “Door Schedule”.
2. Division 08 Section "Glazing".
3. Division 08 Section "Door Hardware".

C. Standards and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ANSI A208.1 – Wood Particleboard.
3. Intertek Testing Service (ITS Warnock Hersey) - Certification Listings for Fire Doors.
4. NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
5. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
6. UL 10C - Positive Pressure Fire Tests of Door Assemblies; UL 1784 - Standard for Air Leakage Tests of Door Assemblies.
7. Window and Door Manufacturers Association - WDMA I.S.1-A Architectural Wood Flush Doors.

1.3 SUBMITTALS

A. Product Data: For each type of door indicated. Include details of core and edge construction, louvers, trim for openings, and WDMA I.S.1-A classifications. Include factory finishing specifications.

B. Shop Drawings shall include:

1. Indicate location, size, and hand of each door.
2. Indicate dimensions and locations of mortises and holes for hardware.
3. Indicate dimensions and locations of cutouts.
4. Indicate requirements for veneer matching.
5. Indicate location and extent of hardware blocking.
6. Indicate construction details not covered in Product Data.
7. Indicate doors to be factory finished and finish requirements.
8. Indicate fire protection ratings for fire rated doors.

C. Samples for Initial Selection: For factory finished doors.

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

2. Corner sections of doors, 8 by 10 inches, with door faces and edges representing actual materials to be used.

   a. Provide samples for each species of veneer and core material.
   b. Finish veneer faced door samples with same materials proposed for factory finished doors.

3. Frames for light openings, 6 inches long, for each material, type, and finish required.

D. Warranty: Provide sample of manufacturer’s warranty.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, latest edition, "Industry Standard for Architectural Wood Flush Doors’.

C. Fire Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing at positive pressure according to NFPA 252 (neutral pressure at 40” above sill) or UL10C.

1. Oversize Fire Rated Door Assemblies: For units exceeding sizes of tested assemblies provide manufacturer’s construction label, indicating compliance to independent 3rd party certification agency’s procedure, except for size.

2. Smoke Control Door Assemblies: Comply with NFPA 105.

   1) Smoke "S" Label: Doors to bear “S” label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for receiving, handling, and installing flush wood doors.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package pre-finished doors individually in plastic bags and wrap bundles of doors in plastic sheeting.

C. Mark each door on top rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
b. Telegraphing of core construction in wood face veneers exceeding 0.01 inch in a 3-inch span.

2. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

3. Warranty Period for Solid Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 DOOR CONSTRUCTION – GENERAL

A. WDMA I.S.1-A Performance Grade: Extra Heavy Duty; Aesthetic Grade: Premium.

B. Fire Rated Doors: Provide construction and core as needed to provide fire ratings indicated.

1. Category A Edge Construction: Provide fire rated door edge construction with intumescent seals concealed by outer stile (Category A) at 45, 60, and 90 minute rated doors. Comply with specified requirements for exposed edges.

2. Pairs: Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

    a. Provide fire retardant stiles that are listed and labeled for applications indicated without formed steel edges and astragals.

    b. Where required for concealed hardware, provide formed steel edges and astragals with intumescent seals. Finish steel edges and astragals with baked enamel.

2.2 CORE CONSTRUCTION

A. Particleboard Core Doors:

1. Particleboard: Wood fiber based materials complying with ANSI A208.1 Particleboard standard. Grade LD-2.

2. Adhesive: Fully bonded construction using Polyurethane (PUR) glue.

3. Blocking: As indicated under article “Blocking”.

B. Fire Resistant Composite Core Doors:

1. Core: Non-combustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire protection rating indicated.

2. Blocking: As indicated under article “Blocking”.

3. Edge Construction: At hinge stiles, provide laminated edge construction with improved screw holding capability and split resistance. Comply with specified requirements for exposed edges.

2.3 VENEERED DOORS FOR TRANSPARENT FINISH

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ASSA ABLOY Wood Doors (GR): GPD Series.
2. Eggers Industries (EG): Premium Series.
3. Marshfield-Algoma (MF): Signature Series.

B. Interior Solid Core Doors:

1. Grade: Premium.

2. Faces: Veneer grades as noted below; veneer minimum 1/50-inch (0.5mm) thickness at moisture content of 12% or less.

    a. Plain Sliced Select White Maple, AA grade faces.

3. Match between Veneer Leaves: Book match.

4. Assembly of Veneer Leaves on Door Faces:

    a. Balance match.

5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.

6. Transom Match: Continuous match.

7. Vertical Edges: Matching same species as faces. Wood or composite material, one piece, laminated, or veneered. Minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors.

8. Horizontal Edges: Solid wood or structural composite material meeting the minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors

9. Construction: Five plies. Stiles and rails are bonded to core, then entire unit sanded before applying face veneers.

10. At doors over 40% of the face cut-out for lights and or louvers, furnish engineered composite lumber core.

2.4 LIGHT FRAMES AND GLAZING

A. Wood Beads for Light Openings in Wood Doors up to and including 20-minute rating:

1. Wood Species: Same species as door faces.
2. Profile:
    a. M1 Flush Bead.
    b. At wood core doors with 20-minute fire protection ratings, provide wood beads and metal glazing clips approved for such use.

B. Metal Frames for Light Openings in Fire Rated Doors over 20-minute Rating: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated.

1. Manufacturers:

    a. Air Louver (LV).
    b. All Metal Stamping (AP).
    c. Anemostat (AN).
    d. Pemko (PE).

C. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with the flush wood door manufacturer's written instructions.

2.5 FABRICATION

A. Factory fit doors to suit frame opening sizes indicated.
   1. Comply with requirements in NFPA 80 for fire rated doors.
   2. Undercut: As required per manufacturer’s templates and sill condition.

B. Factory machine doors for hardware that is not surface applied. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

   1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
   2. Metal Astragals: Factory machine astragals and formed steel edges for hardware for pairs of fire rated doors.

C. Openings: Cut and trim openings through doors in factory.

   1. Light Openings: Trim openings with moldings of material and profile indicated.
   2. Glazing: Comply with applicable requirements in Division 08 Section "Glazing."
   3. Louvers: Factory install louvers in prepared openings.

D. Electrical Raceways: Provide flush wood doors receiving electrified hardware with concealed wiring harness and standardized Molex™ plug connectors on both ends to accommodate up to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electrified hardware and the through wire transfer hardware or wiring harness specified in hardware sets in Division 08 "Door Hardware". Wire nut connections are not acceptable.

2.6 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

   1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Transparent Finish: Provide a clear protective coating over the wood veneer allowing the natural color and grain of the selected wood species to provide the appearance specified. Stain is applied to the wood surface underneath the transparent finish to add color and design flexibility.

   1. Finish: Meet or exceed WDMA I.S. 1A TR8 UV Cured Acrylated Polyester finish performance requirements.
   2. Staining:

      a. Custom stain to match architect’s sample.

   3. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Division 8 Section "Door Hardware."

B. Installation Instructions: Install doors and frames to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

1. Install fire rated doors in corresponding fire rated frames according to NFPA 80.

C. Factory Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

E. Field modifications to doors shall not be permitted, except those specifically allowed by manufacturer or fire rating requirements.

3.3 ADJUSTING

A. Operation: Re-hang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

2018-B0031 Student Resource Center (SRC) 2000 Event Space Upgrade

ADDENDUM # 4

January 19, 2018

This signed Addendum is required to be returned with your Bid no later than the due date set forth for this Invitation to Bid. If you have already submitted your Bid, please submit this signed form via email to purchasing@cod.edu.

You can submit this completed addendum to the Purchasing Office by one of the means below:

All issued addenda must be signed and returned to the College as per the instructions in the addenda or bid will not be accepted.

SECTION IV ACKNOWLEDGMENT

You can submit this completed addendum to the Purchasing Office by one of the means below:

1. If you have not yet submitted your bid, please sign this addendum and include with your sealed bid**.**
2. If you have already submitted your bid, please sign and return to the Purchasing office via email at purchasing@cod.edu no later than the scheduled bid deadline. We will make sure it accompanies your bid.

You also have the option of withdrawing your proposal, if necessary.

ACKNOWLEDGEMENT:

I HAVE RECEIVED THIS ADDENDUM #_____

Company Name: _____

Address: _____

Authorized Signature: _____