



**ADDENDUM NUMBER SEVEN
TO THE PLANS AND SPECIFICATIONS
FOR
GROVE PUBLIC SCHOOLS
NEW PERFORMING ARTS CENTER
ARCHITECT'S PROJECT NUMBER T14054**

10 February 2016

The following items, applicable to the work designated, shall be understood to be an Addendum, and as such, shall be included in the Contract Documents.

General Contractors to inform all subcontractors and suppliers of the Addendum items as appropriate or applicable to their portion of the work.

SPECIFICATIONS

- I. Specification Section 00 0110 – Table of Contents:** Replace previously issued Specification Section 00 0110 – Table of Contents with the attached, revised, Specification Section 00 0110 – Table of Contents.
A. Division 27 and 28 Specification Sections added.
- II. Specification Section - MEP Table of Contents:** Replace previously issued MEP Table of Contents with the attached, revised, MEP Table of Contents.
A. Division 27 and 28 Specification Sections added.
- III. Specification Section 26 2416 – Panelboards:** Replace previously issued Specification Section 26 2416 – Panelboards with the attached, revised, Specification Section 26 2416 – Panelboards.
A. Updated Section.
- IV. Specification Section 26 4313 – Surge Protection for Low-Voltage Electrical Power Circuits:** Replace previously issued Specification Section 26 4313 – Surge Protection for Low-Voltage Electrical Power Circuits with the attached, revised, Specification Section 26 4313 – Surge Protection for Low-Voltage Electrical Power Circuits.
A. Updated Section.
- V. Specification Section 27 0526 – Grounding and Bonding for Communication Systems:** Add Specification Section 27 0526 – Grounding and Bonding in its entirety.
- VI. Specification Section 27 0528 – Pathways for Communications Systems:** Add Specification Section 27 0528 – Pathways for Communications Systems in its entirety.
- VII. Specification Section 27 0544 – Sleeves and Sleeve Seals for Communications Pathways and Cabling:** Add Specification Section 27 0544 – Sleeves and Sleeve Seals for Communications Pathways and Cabling in its entirety.
- VIII. Specification Section 27 1500 – Communications Horizontal Cabling:** Add Specification Section 27 1500 – Communications Horizontal Cabling in its entirety.

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- IX. Specification Section 27 5116 – Public Address Systems, Intercom, Clocks & Class Change Signal:** Add Specification Section 27 5116 – Public Address Systems, Intercom, Clocks & Class Change Signal in its entirety.
- X. Specification Section 28 0500 – Common Work Results for Electronic Auxiliary Systems:** Replace previously issued Specification Section 28 0500 – Common Work Results for Electronic Auxiliary Systems with the attached, revised, Specification Section 28 0500 – Common Work Results for Electronic Auxiliary System.
 - A. Updated Section.
- XI. Specification Section 28 0555 – Cabinets and Enclosures:** Replace previously issued Specification Section 28 0555 – Cabinets and Enclosures with the attached, revised, Specification Section 28 0555 – Cabinets and Enclosures.
 - A. Updated Section.
- XII. Specification Section 28 2300 – Video Surveillance:** Replace previously issued Specification Section 28 2300 – Video Surveillance with the attached, revised, Specification Section 28 2300 – Video Surveillance.
 - A. Updated Section.
- XIII. Specification Section 28 3112 – Digital Addressable Fire Alarm with Voice Alarm for Auditorium:** Add Specification Section 28 3112 – Digital Addressable Fire Alarm with Voice Alarm for Auditorium in its entirety.

DRAWINGS

- XIV. Drawing Sheet 2E1 – Electrical Symbol List:** Replace previously issued Drawing Sheet 2E1 – Electrical Symbol List with the attached, revised, Drawing Sheet 2E1 – Electrical Symbol List.
 - A. Light Fixture Schedule Revised.
 - B. Proposed Light Fixture Substitution Package from Bell & McCoy Lighting and Controls is approved for bidding with the following exceptions:
 - 1. Proposed Fixture D is too large in size for the application.
 - 2. Proposed Fixtures F and FE shall be equipped with a wire guard.
 - 3. Proposed Fixture G shall have a wet label.
 - 4. Proposed Fixture S is too large in size for the application. Refer also to revised Light Fixture Schedule.
 - 5. Proposed substitution list attached for information purposes.
 - C. Proposed Light Fixture Substitution Package from Premier Lighting is approved for bidding with the following exceptions:
 - 1. Proposed Fixture C is unacceptable. Replace with a wall mounted cylinder.
 - 2. Proposed Fixture S is too large in size for the application. Refer also to revised Light Fixture Schedule.
 - 3. Proposed substitution list attached for information purposes.
 - D. Proposed Light Fixture Substitution Package from Triple C Lighting is approved for bidding with the following exceptions:
 - 1. Proposed Fixture F & FE fixtures are unacceptable. Replace with a conventional LED strip light with wire guard, chain suspended.
 - 2. Proposed Fixture G shall have a wet label.

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3. Proposed Fixture S is too large in size for the application. Reer also to revised Light Fixture Schedule.
 4. Proposed substitution list is attached for information purposes.
- E. These preliminary review comments do not constitute final acceptance and do not release the suppliers from their responsibility to provide final submittals for final approval after contract award. All substitutions will be required to meet all project requirements of the originally specified fixtures.

END OF ADDENDUM



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TABLE OF CONTENTS**DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS****INTRODUCTORY INFORMATION**

Document	00 0101	Project Title Page
Document	00 0103	Project Information
Document	00 0110	Table of Contents
Document	00 0115	List of Drawings

**PROCUREMENT REQUIREMENTS**

Document	00 1100	Bid Solicitation
Document	00 2113	Instructions to Bidders AIA Document A701 - Instructions to Bidders with modifications thereto
Document	00 2218	Additional Instructions to Bidders
Document	00 2513	Pre-Bid Meeting
Document	00 3143	Permit Application
Document	00 4113	Bid Form-Stipulated Sum
Document	00 4313	Bid Security Form AIA Document A310 "Bid Bond"
Document	00 4519	Non-Collusion Affidavit
Document	00 4521	Business Relationship Affidavit

01.12.16

CONTRACTING REQUIREMENTS

Document	00 5213	Agreement-Stipulated Sum AIA Document A101 "Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum"
Document	00 5313	Contract Affidavit
Document	00 5315	Tobacco-Free Affidavit
Document	00 5317	Drug-Free Affidavit
Document	00 6100	Bonds Defect Bond AIA Document A312 "Performance Bond" and "Payment Bond"
Document	00 7213	General Conditions AIA A201 – 2007 General Conditions of the Contract for Construction with modifications thereto.
Document	00 7316	Insurance Requirements
Document	00 7375	Felony Compliance Felony and Sex Offenders Affidavit – Contractor Felony and Sex Offenders Affidavit – SubContractor
Document	00 7385	Determination and Extension of Contract Time

00 0110 - 1

CONSTRUCTION PRODUCTS AND ACTIVITIES**DIVISION 1 – GENERAL REQUIREMENTS**

Section	01 1100	Summary
Section	01 2100	<u>Allowances (Addendum No. 2)</u>
Section	01 2200	Unit Prices
Section	01 2300	Alternates
Section	01 2600	Contract Modification Procedures
		CSI Form 13.6A "Change Order Request"
		CSI Form 13.6D "Proposal Worksheet Summary"
		CSI Form 13.6C "Proposal Worksheet Detail"
Section	01 2613	Requests for Interpretation
		CSI Form 13.2A "Request For Interpretation"
		CSI Form 13.2B "Request for interpretation log"
Section	01 2900	Payment Procedures
		Affidavit of Payment of Debts and Claims and Release Of Liens
		Non-Kickback Statement
		Document G702 - Application and Certification for Payment form.
		Document G703 - Continuation Sheet form for AIA Document G702.
		CSI Form 2.5A - Stored Material Summary.
Section	01 2973	Schedule of Values
		Document G703 - Schedule of Values Sample Form
Section	01 3100	Project Management and Coordination
Section	01 3119	Project Meetings
Section	01 3216	Construction Progress Schedule
Section	01 3300	Submittal Procedures
		AIA Document G810 - Transmittal Letter.
		CSI Form 12.1B - Submittal Log.
		CSI Form 12.2A - Submittal Checklist.
Section	01 4200	References
Section	01 4500	Quality Control
Section	01 4523	Testing and Inspection Services
Section	01 4525	Geotechnical Engineer Inspection Services
Section	01 5000	Temporary Facilities and Controls
Section	01 5100	Temporary Utilities
Section	01 5213	Field Offices and Sheds
Section	01 5800	Project Identification
Section	01 6200	Product Options
		CSI Form 1.5A - - Subcontractors and Major Material Suppliers List
Section	01 6211	Asbestos Prohibition for Public Works Projects - Schools & Public work
		Federal Asbestos "Statement" Alternative to Inspection
		Federal Subcontractors or Material Suppliers Certification of
		Compliance With Asbestos Restrictions
		Federal General Contractors Certification of Compliance with
		Asbestos Restrictions
Section	01 6213	Product Substitution Procedures
		CSI Form 1.5C - Substitution Request (During the Bidding Phase).

		CSI Form 13.1A - Substitution Request (After the Bidding Phase).
Section	01 6400	Owner Furnished Products
Section	01 7123	Field Engineering
Section	01 7300	Execution
Section	01 7329	Cutting and Patching
Section	01 7700	Closeout Procedures
		AIA Document G706 "Contractor's Affidavit of Payment of Debts and Claims"
		AIA Document G706A "Contractor's Affidavit of Release of Liens"
		AIA Document G707 "Consent of Surety to Final Payment"
Section	01 7800	Closeout Submittals

DIVISION 2 – EXISTING CONDITIONS

Section	02 4113	Site Demolition
Section	02 4119	Selective Demolition

DIVISION 3 – CONCRETE

Section	03 0586	Vapor Barrier
		Product Detail
		ASTM E 1643
Section	03 1100	Concrete Forming
Section	03 1513	Waterstops
Section	03 2000	Concrete Reinforcement
Section	03 3000	Cast-In-Place Concrete
Section	03 3500	Concrete Finishing
Section	03 3520	Dyed and Polished Concrete Finishing
Section	03 3900	Concrete Curing
Section	03 3906	Moisture Emission and Acidity Control System
Section	03 4816	Pre-cast Concrete Splash Blocks
Section	03 5216	Lightweight Insulating Concrete Roof Deck

DIVISION 4 - MASONRY

Section	04 2200	Concrete Masonry Units
Section	04 2204	Masonry Veneer

DIVISION 5 – METALS

Section	05 1200	Structural Steel
Section	05 2100	Steel Joists
Section	05 3100	Metal Deck
Section	05 3123	Metal Roof Deck
Section	05 4000	Cold-Formed Metal Framing
Section	05 5000	Metal Fabrications
Section	05 5100	Metal Stairs
Section	05 5134	Fixed Access Ladders

00 0110 - 3

Grove Public Schools
New Performing Arts Center

Project No. T14054
12 January 2016

Section	05 5213	Pipe and Tube Railings
Section	05 7113	Fabricated Metal Spiral Stairs

DIVISION 6 – WOOD, PLASTIC AND COMPOSITES

Section	06 1000	Rough Carpentry
Section	06 4102	Custom Architectural Wood Casework
Section	06 4219	Plastic Laminate Faced Paneling

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

Section	07 1300	Sheet Waterproofing
Section	07 2106	Foundation Perimeter Insulation
Section	07 2115	Thermal and Air Barrier Wall System
Section	07 2116	Blanket Insulation
Section	07 2119	Masonry Foamed-In-Place Insulation
Section	07 4211	Perforated Metal
Section	07 4213	Dry Joint Type Aluminum Composite Architectural Wall Panel System (ACM)
Section	07 5400	Thermoplastic Membrane Roofing (TPO)
Section	07 6100	Preformed Metal Wall Panels
Section	07 6200	Sheet Metal Flashing and Trim
Section	07 7106	Gutters and Downspouts
Section	07 7233	Roof Hatches
Section	07 7236	Smoke Vents
Section	07 8116	Cementitious Fireproofing
Section	07 8123	Intumescent Mastic Fireproofing
Section	07 8400	Firestopping
Section	07 9000	Joint Sealers
Section	07 9513	Expansion Joint Cover Assemblies

DIVISION 8 – OPENINGS

Section	08 1213	Hollow Metal Frames
Section	08 1313	Hollow Metal Doors
Section	08 1416	Flush Wood Doors
Section	08 3100	Access Doors and Panels
Section	08 3323	Overhead Coiling Doors
Section	08 3473	Sound Control Door Assemblies
Section	08 3906	Tornado Resistant Doors
Section	08 4313	Aluminum Framed Storefronts
Section	08 5658	Aluminum Ticket Window
Section	08 7100	Door Hardware
Section	08 8300	Mirrors
Section	08 8800	Glazing
Section	08 8823	<i>Fire Rated Glass (Addendum No. 2)</i>
Section	08 9119	Wall Louvers

00 0110 - 4

Grove Public Schools
New Performing Arts Center

Project No. T14054
12 January 2016

DIVISION 9 – FINISHES

Section	09 2116	Gypsum Board Assemblies
Section	09 2117	Shaft Wall Assemblies
Section	09 3013	Ceramic Tiling (<u>Addendum No. 2</u>)
Section	09 5113	Acoustical Panel Ceilings
Section	09 5406	Three Dimensional Ceiling System
Section	09 6466	Wood Stage Flooring
Section	09 6506	Rubber Cove Base
Section	09 6508	Rubber Stair Treads and Risers
Section	09 6519	Resilient Tile Flooring
<u>Section</u>	<u>09 6723</u>	<u>Resinous Flooring (<u>Addendum No. 2</u>)</u>
Section	09 6816	Carpet
Section	09 8206	Acoustical Panels
Section	09 9000	Paints and Coating

DIVISION 10 – SPECIALTIES

Section	10 1200	Display Cases
Section	10 1416	Plaque
Section	10 1419	Dimensional Letters Signage
Section	10 1421	Tornado Shelter Exterior Signage
Section	10 1422	Interior Signage
Section	10 2115	Plastic Toilet Compartments
Section	10 2625	Impact Resistant Wall Protection
Section	10 2813	Toilet Accessories
Section	10 2814	Baby Accessories for Public Washrooms
Section	10 4415	Fire Extinguishers and Cabinets
Section	10 7300	Aluminum Canopy

DIVISION 11 – EQUIPMENT

Section	11 5213	Projection Screen
Section	11 6113	Acoustical Shell System
Section	11 6123	Portable Staging Systems
Section	11 6133	Theatrical Rigging Systems
Section	11 6143	Stage Draperies
Section	11 6162	Theatrical Lighting and Controls

DIVISION 12 – FURNISHINGS

Section	12 4814	Entrance Mats and Grids
Section	12 6100	Fixed Audience Seating

00 0110 - 5

Grove Public Schools
New Performing Arts Center

Project No. T14054
12 January 2016

DIVISION 21 – FIRE SUPPRESSION

Section	21 0000	General Requirements for Fire Protection
Section	21 0004	Fire Protection Coordination with Other Trades
Section	21 0500	Basic Mechanical Materials and Methods for Fire Suppression
Section	21 1313	Wet Pipe Sprinkler System
Section	21 2600	Standpipe and Hose System
Section	21 3113	Electric Drive Fire Pumps

DIVISION 22 – PLUMBING

Section	22 0500	Common Work Results for Plumbing
Section	22 0516	Expansion Fittings & Loops Plumbing Piping
Section	22 0517	Sleeves and Sleeve Seals for Plumbing Piping
Section	22 0518	Escutcheons for Plumbing Piping
Section	22 0519	Meters and Gages for Plumbing Piping
Section	22 0523	Valves for Plumbing Piping
Section	22 0529	Hangers and Supports for Plumbing Piping and Equipment
Section	22 0553	Identification for Plumbing Piping and Equipment
Section	22 0719	Plumbing Piping Insulation
Section	22 1113	Facility Water Distribution Piping
Section	22 1116	Domestic Water Piping
Section	22 1120	Natural Gas Piping System
Section	22 1313	Facility Sanitary Sewers
Section	22 1314	Sanitary Waste, and Vent Piping
Section	22 3400	Fuel Fired Water Heaters
Section	22 4000	Plumbing Fixtures
Section	22 4019	Plumbing Specialties
Section	22 4700	Electric Water Coolers

DIVISION 23 – HEATING, VENTILATING, AND AIR-CONDITIONING

Section	23 0100	Coordinated with Other Trades
Section	23 0500	General Requirements for HVAC
Section	23 0510	Basic HVAC Materials and Methods
Section	23 0512	Electrical Requirements for HVAC
Section	23 0529	Hangers and Supports for HVAC Piping and Equipment
Section	23 0548	Vibration Controls for HVAC Piping & Equipment
Section	23 0553	Identification for HVAC Piping and Equipment
Section	23 0593	Testing, Adjusting, and Balancing For HVAC
Section	23 0700	HVAC Insulation
Section	23 0993	Sequence of Operation
Section	23 3113	Metal Ducts
Section	23 3300	Air Duct Accessories
Section	23 3301	Duct Silencers
Section	23 3423	HVAC Power Ventilators
Section	23 3713	Diffusers, Registers, & Grilles
Section	23 3720	Louvers
Section	23 7413	Packaged Rooftop Air Conditioning
Section	23 8126	Ductless Split-System Air-Conditioners

00 0110 - 6

Section	23 8239	Unit Heaters
Section	23 8413	Humidifiers

DIVISION 26 – ELECTRICAL

Section	26 0130	Outlet Boxes
Section	26 0132	Pull and Junction Boxes
Section	26 0170	Equipment Connections
Section	26 0405	Temporary Power and Lighting
Section	26 0420	Electrical Service – Utility
Section	26 0501	Basic Electrical Requirements
Section	26 0505	Basic Electrical Materials and Methods
Section	26 0510	Coordination with Other Trades
Section	26 0519	Low-Voltage Electrical Power Conductors and Cables
Section	26 0526	Grounding and Bonding for Electrical Systems
Section	26 0529	Hangers and Supports for Electrical Systems
Section	26 0533	Raceway and Boxes for Electrical Systems
Section	26 0544	Sleeves and Sleeve Seals for Electrical Raceways and Cabling
Section	26 0553	Identification for Electrical Systems
Section	26 0572	Overcurrent Protective Device Short-Circuit Study
Section	26 0573	Overcurrent Protective Device Coordination Study
Section	26 0574	Overcurrent Protective Device Arc-Flash Study
Section	26 2200	Low-Voltage Transformers
Section	26 2413	Switchboards
Section	26 2416	Panel Boards
Section	26 2726	Wiring Devices
Section	26 2813	Fuses
Section	26 2816	Enclosed Switches
Section	26 2985	Motor Power and Control Wiring
Section	26 4113	Lightning Protection for Structures
Section	26 4313	Surge Protection for Low-Voltage Electrical Power Circuits
Section	26 5110	Interior Lighting
Section	26 5600	Exterior Lighting

DIVISION 27 – COMMUNICATIONS

<u>Section</u>	<u>27 0526</u>	<u>Grounding and Bonding for Communications System</u> <u>(Addendum No. 7)</u>
<u>Section</u>	<u>27 0528</u>	<u>Pathways and Communications Systems (Addendum No. 7)</u>
<u>Section</u>	<u>27 0544</u>	<u>Sleeves and Sleeve Seals for Communications Pathways and Cabling (Addendum No. 7)</u>
<u>Section</u>	<u>27 1500</u>	<u>Communications Horizontal Cabling (Addendum No. 7)</u>
Section	27 4116	Audio Video Systems
<u>Section</u>	<u>27 5116</u>	<u>Public Address Systems, Intercom, Clocks and Class Change Signal</u> <u>(Addendum No. 7)</u>

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

Section	28 0500	Common Work Results for Electronic Auxiliary Systems
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00 0110 - 7

Section	28 0555	Cabinets and Enclosures
Section	28 2300	Video Surveillance
Section	28 3111	Digital Addressable Fire Alarm System
Section	28 3112	<u>Digital Addressable Fire Alarm System for Auditorium with Voice Alarm (Addendum No. 7)</u>

DIVISION 31 – EARTHWORK

Section	31 1000	Site Clearing
Section	31 2000	Earth Moving
Section	31 2314	Building Area Sub-grade Pad Preparation
Section	31 2316	Excavation - Spread and Continuous Footings
Section	31 2317	Rock Excavation
Section	31 2324	Fill and Backfill
Section	31 2333	Trenching and Backfilling
Section	31 2500	Erosion and Sedimentation Control
Section	31 3116	Termite Control
Section	31 3200	Soil Stabilization
Section	31 3216	Excavation

DIVISION 32 – EXTERIOR IMPROVEMENTS

Section	32 1216	Asphalt Paving
Section	32 1313	Concrete Paving
Section	32 1373	Concrete Paving Joint Sealants
Section	32 1723	Pavement Markings
Section	32 9200	Turf and Grasses

DIVISION 33 – UTILITIES

Section	33 0500	Common Work Results for Utilities
Section	33 1305	Disinfection of Water Distribution
Section	33 4100	Storm Utility Drainage Piping
Section	33 4600	Subdrainage
Section	33 5100	Natural Gas Distribution

ATTACHMENTS

Geotechnical Report

END OF DOCUMENT

00 0110 - 8

Grove Public Schools
New Performing Arts Center

Project No. T14054
12 January 2016

MSTR 0315

Addendum No. 7

TABLE OF CONTENTS

TABLE OF CONTENTS
SPECIFICATIONS (Per AD#7)

DIVISION 21 – FIRE SUPPRESSION

SECTION 210000	General Requirements for Fire Protection
SECTION 210004	Fire Protection Coordination with Other Trades
SECTION 210500	Basic Mechanical Materials and Methods for Fire Suppression
SECTION 211313	Wet Pipe Sprinkler System
SECTION 212600	Standpipe and Hose System
SECTION 213113	Electric Drive Fire Pumps

DIVISION 22 - PLUMBING

SECTION 220500	Common Work Results for Plumbing
SECTION 220516	Expansion Fittings & Loops Plumbing Piping
SECTION 220517	Sleeves and Sleeve Seals for Plumbing Piping
SECTION 220518	Escutcheons for Plumbing Piping
SECTION 220519	Meters and Gages for Plumbing Piping
SECTION 220523	Valves for Plumbing Piping
SECTION 220529	Hangers and Supports for Plumbing Piping and Equipment
SECTION 220553	Identification for Plumbing Piping and Equipment
SECTION 220719	Plumbing Piping Insulation
SECTION 221116	Domestic Water Piping
SECTION 221120	Natural Gas Piping System
SECTION 221314	Sanitary Waste, and Vent Piping
SECTION 223400	Fuel Fired Water Heaters
SECTION 224000	Plumbing Fixtures
SECTION 224019	Plumbing Specialties
SECTION 224700	Electric Water Coolers

DIVISION 23 - MECHANICAL

SECTION 230100	Coordinated with Other Trades
SECTION 230500	General Requirements for HVAC
SECTION 230510	Basic HVAC Materials and Methods
SECTION 230512	Electrical Requirements for HVAC
SECTION 230529	Hangers and Supports for HVAC Piping and Equipment
SECTION 230548	Vibration Controls for HVAC Piping & Equipment
SECTION 230553	Identification for HVAC Piping and Equipment
SECTION 230593	Testing, Adjusting, and Balancing For HVAC
SECTION 230700	HVAC Insulation
SECTION 230993	Sequence of Operation
SECTION 233113	Metal Ducts
SECTION 233300	Air Duct Accessories
SECTION 233301	Duct Silencers
SECTION 233423	HVAC Power Ventilators
SECTION 233713	Diffusers, Registers, & Grilles
SECTION 233720	Louvers
SECTION 237413	Packaged Rooftop Air Conditioning
SECTION 238126	Ductless Split-System Air-Conditioners
SECTION 238239	Unit Heaters



Grove Public Schools
New Performing Arts Center

Project No. 15163
January 12, 2016
AD#7 02.10.16

DIVISION 26 – ELECTRICAL

SECTION 260130	Outlet Boxes
SECTION 260132	Pull and Junction Boxes
SECTION 260170	Equipment Connections
SECTION 260405	Temporary Power and Lighting
SECTION 260420	Electrical Service – Utility
SECTION 260501	Basic Electrical Requirements
SECTION 260505	Basic Electrical Materials and Methods
SECTION 260510	Coordination with Other Trades
SECTION 260519	Low-Voltage Electrical Power Conductors and Cables
SECTION 260526	Grounding and Bonding for Electrical Systems
SECTION 260529	Hangers and Supports for Electrical Systems
SECTION 260533	Raceway and Boxes for Electrical Systems
SECTION 260544	Sleeves and Sleeve Seals for Electrical Raceways and Cabling
SECTION 260553	Identification for Electrical Systems
SECTION 260572	Overcurrent Protective Device Short-Circuit Study
SECTION 260573	Overcurrent Protective Device Coordination Study
SECTION 260574	Overcurrent Protective Device Arc-Flash Study
SECTION 262200	Low-Voltage Transformers
SECTION 262413	Switchboards
SECTION 262416	Panel Boards (AD#7)
SECTION 262726	Wiring Devices
SECTION 262813	Fuses
SECTION 262816	Enclosed Switches
SECTION 262985	Motor Power and Control Wiring
SECTION 254113	Lightning Protection for Structures
SECTION 264313	Surge Protection for Low-Voltage Electrical Power Circuits (AD#7)
SECTION 265110	Interior Lighting
SECTION 265600	Exterior Lighting

DIVISION 27 – COMMUNICATIONS

SECTION 270526	Grounding and Bonding for Communications System (AD#7)
SECTION 270528	Pathways and Communications Systems (AD#7)
SECTION 270544	Sleeves and Sleeve Seals for Communications Pathways and Cabling (AD#7)
SECTION 271500	Communications Horizontal Cabling (AD#7)
SECTION 275116	Public Address Systems, Intercom, Clocks, and Class Change Signal (AD#7)

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

SECTION 280500	Common Work Results for Electronic Auxiliary Systems (AD#7)
SECTION 280555	Cabinets and Enclosures (AD#7)
SECTION 282300	Video Surveillance (AD#7)
SECTION 283111	Digital Addressable Fire Alarm System
SECTION 283112	Digital Addressable Fire Alarm System for Auditorium with Voice Alarm (AD#7)

SECTION 26 24 16

PANELBOARDS (Per AD #7)

PART 1. GENERAL

1.1 SCOPE OF WORK

- A. Panelboards shall consist of a box, front, interior, and circuit protective devices and shall be manufactured in accordance with NEMA standards and bear applicable Underwriters Laboratories labels.

PART 2. PRODUCTS

2.1 BOX

- A. The box shall be fabricated from code gauge galvanized sheet steel in accordance with the latest UL Standards and shall have a turned edge around the front for rigidity and for clamping on front. Standard knockouts shall be provided. The front shall be fabricated from sheet steel and finished with baked on gray enamel over a rust inhibitor. Each front shall have a door mounted on semi-concealed hinges with a cylinder lock, index card and card holder. All panelboard locks shall be master keyed.

2.2 INTERIOR

- A. The interiors shall consist of a factory assembled rigid frame supporting the rectangular bus, the mains, ground bar, and neutral bar. The bussing shall be copper or aluminum arranged for sequence phasing throughout. The neutral and ground bar shall be located at the opposite end of the structure from the mains and shall have numbered terminals. The mains shall be either solderless lugs or a main circuit protective device as scheduled.
- B. The dead front interior shall have a maximum of 42-poles of branch circuit mounting space. The panel main, when required, shall be located at the top of panel and shall be separated from branch circuit mounting space.
- C. A metal nameplate shall be attached to the dead-front cover by manufacturer which identifies the name of panel manufacturer, the manufacturer ship order number, panelboard type, system voltage, ampacity, and short circuit withstand rating. Panelboards for use as service entrance equipment shall be so labeled.

2.3 CIRCUIT PROTECTIVE DEVICE

- A. The circuit protective devices shall be molded case circuit breakers of the quick-make, quick-break, trip-free thermal magnetic type. Multi-pole breakers shall be common trip. The number of poles and ampere rating of devices shall be as scheduled.
- B. The short circuit rating shall be in accordance with NEMA standards for sizes required. Ampere rating of devices shall be as scheduled. The short circuit rating of all devices shall be the integrated equipment short circuit rating scheduled on the contract drawings as a minimum.
- C. All panelboards and protective devices shall be fully rated. Series rating shall not be acceptable.

- D. The ampere rating of all devices shall be visible without removal of dead front cover.

2.4 MANUFACTURER/MODEL

- A. Branch circuit and lighting panels designed for 10,000 AIC, 120/208 volt, 3-phase, 4-wire service shall be Siemens Sentron Series with BL frame, bolt-in branch breakers.
- B. Branch circuit and lighting panels for 14,000 AIC, 277/480 volt, 3-phase, 4-wire service shall be Siemens Sentron Series with BQD bolt-in branch circuit breakers.
- C. Consult manufacturer for circuit breaker type if higher AIC rating is scheduled on contract drawings.
- D. Acceptable manufacturers shall be as follows:
 - 1. Siemens Company
 - 2. Square D Company
 - 3. Eaton Cutler Hammer
 - 4. **General Electric**

- E. A single source manufacturer is required for all electrical equipment.

PART 3. EXECUTION

3.1 INSTALLATION

- A. Refer to Specification Section 26 0000.
- B. Splices within panelboards shall be prohibited.

3.2 TESTING AND LOAD BALANCING

- A. Refer to Specification Section 26 0000.

3.3 PANEL IDENTIFICATION

- A. All panelboards shall be identified with an engraved plastic laminate sign to match designation used in contract drawings. The laminated sign shall also identify the power source serving respective panel, i.e., "Panel P Fed from Distribution Panel DPA."
- B. Refer to Specifications for requirements of sign.

END OF SECTION

SECTION 26 43 13

SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS (per AD#7)

PART 1. GENERAL

1.1 SCOPE OF WORK

- A. This section of the specification consists of performance requirements of SPD or TVSS devices suitable for protection of electronic equipment and electrical systems 600 volts and less.
- B. The following definitions shall apply to the application of the SPD units:
 - 1. Category C: Outdoor overhead lines, service entrance.
 - 2. Category B: Major feeders, short branch circuits, service panel (indoor).
- C. Install surge protection unit in Main Panel.

1.2 QUALITY ASSURANCE

- A. Surge suppression, grounding and bonding shall effectively protect within tested limits, the systems to which applied against lightning transients, internal and external switching transients, and other surge transients throughout the useful life of the system. Surge protective devices (SPD) and related grounding and bonding systems shall be designed and installed in such a manner that normal operation, performance ratings, and listing of the system is not impaired by the installation of such devices, wiring, or connections.
- B. Any SPD which shows evidence of failure or incorrect operation during the warranty period shall be repaired or replaced at no expense to Owner including labor and materials. Since "acts of nature" or similar statements include the lightning threat to which these suppression devices shall be exposed, any such general clause limiting warranty responsibility in the general conditions of this specification shall not apply to this section. The warranty shall cover the entire device not just the modules.
- C. Installation of SPD in or on electrical or electronic distribution systems and equipment shall in no way compromise or violate equipment listing, function, labeling, or warranty of the distribution equipment.
- D. All surge protective devices (SPD) and supporting components shall be guaranteed by the installing contractor to be free of defects in materials and workmanship for a period of seven (7) years from the date of substantial completion for the system to which the SPD is attached. Suppressors or components damaged prior to substantial completion shall be replaced at no cost to the Owner.

1.3 SUBMITTALS

- A. Refer to basic electrical requirements for submittal requirements.
- B. Submit installation details for all suppressors demonstrating mechanical and electrical connections to equipment being protected.

- C. Submit specific test data for the actual method of installation proposed. Submittals will not be reviewed unless they include proper project related data. Interpretation of standard manufacturers published data will not be acceptable unless the data coincides with the actual testing and installation procedure.
- D. A performance specification shall be provided. The specification shall provide the minimum information as listed below:
 - 1. Complete data for each suppressor type indicating conductor sizes, conductor types, connection configuration, lead lengths and all appropriate dimensions.
 - 2. Dimensions for each suppressor type indicating mounting dimensions and required accessory hardware.
 - 3. Certified test data from a nationally recognized independent testing laboratory indicating the ability of the product to meet or exceed all requirements of this specification. Tested units shall survive all testing and be fully functional without damage.
 - 4. If requested, a sample, which will be returned, of each suppressor type to be used shall be submitted.
 - 5. Drawings shall be provided indicating suppressor mounting arrangement and lead length configuration, and mounting arrangement of remote diagnostic equipment and assemblies.
 - 6. List and detail all protection systems such as fuses, disconnecting means and protective materials. The overcurrent devices shall also include the rated surge current capacity.
 - 7. Documentation of type of suppression Components utilized within the TVSS to perform the rated and tested purpose. Documentation provided to UL for listing purposes is acceptable. Confidentiality agreements will be signed as required for access to this documentation.
 - 8. Listing to UL 1449, 2nd Edition and include UL 1449 2nd Edition listing/classification page verifying UL clamping voltage stated on catalog data as a complete unit.
 - 9. Conformance to appropriate referenced standards and publications listed in paragraph 102A.
 - 10. The submittal shall include a listed comparison and proof of compliance with each paragraph of these specifications.
- E. Submitted components shall comply through verified testing to the minimum and maximum values listed and shall be equal to or better than the characteristics specified herein.

1.4 PROJECT CLOSEOUT SUBMITTALS

- A. Record actual locations of suppressors, grounding terminations, bonding connections, and routing of system conductors in project record documents.
- B. After installation, the manufacturer or manufacturer's representative shall furnish a letter indicating that the installation was inspected by a factory authorized representative, the date of inspection, date equipment was put into service, and that it meets all of the manufacturer's wiring and installation requirements. Submit three (3) copies to the Engineer for review.

1.5 APPLICABLE PUBLICATIONS

- A. The latest edition of the following standards and publications shall apply to the work of this section:
 - 1. ANSI/IEEE C62.33 IEEE Standard Test Specifications for Varistor Surge Protective Devices.
 - 2. ANSI/IEEE C62.36 IEEE Standard Test Methods for Surge Protectors Used in Low-Voltage AC Power Circuits.

3. ANSI/IEEE C62.41 IEEE Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits.
4. ANSI/IEEE C62.45 Guide on Surge Testing for Equipment Connected to Low Voltage AC Power Circuits.
5. IEEE Standard 142 - Recommended Practice for Grounding.
6. IEEE Standard 518 Recommended Guide on Electrical Noise.
7. UL-1283 Standard for Safety - Electromagnetic Interference Filters.
8. UL-1449, 2nd Edition Standard for Safety - Transient Voltage Surge Suppressors.
9. NFPA 70 National Electrical Code.
10. NFPA 75 Standard for Protection of Electronic Computer Systems.
11. NFPA 780 Standard for the Installation of Lightning Protection Systems.
12. Military Standard (MIL Std.) 220A.
13. NEMA LS-1 Low Voltage Surge Protective Devices.

1.6 SYSTEM DESCRIPTION

- A. Transient voltage surge suppressor (TVSS) or surge protective device (SPD) is the equipment required for the protection within specified and tested limits of AC electrical circuits and electronic equipment from the effects of lightning induced voltages, external switching transients and internally generated switching transients. Individual suppressors shall be provided where shown on the drawings.

1.7 QUALIFICATIONS

- A. Company specializing in surge suppression equipment of the type herein specified with minimum ten (10) years documented experience.
- B. Installation shall be by the manufacturer or a duly licensed electrical contractor.

1.8 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings.

PART 2. PRODUCTS

2.1 MANUFACTURERS

- A. The intent of this specification is to allow manufacturers with similar equipment to provide transient voltage surge suppression which will adequately protect equipment within the guidelines set forth herein.
- B. The surge protective devices manufacturer shall offer factory repair service and replacement for all units. The manufacturer shall provide this service within five (5) working days, and provide replacement components shipped to the Owner for installation within the allocated response time.

C. Manufacturers: Subject to compliance with requirements, provide AC power suppressors (SPD) products by one of the following:

1. **Advanced Protection Technologies, Inc.**
2. **Atlantic Scientific.**
3. **Cutler-Hammer, Inc.: Eaton Corporation**
4. **EFI Electronics Corp.**
5. **General Electric Company**
6. **Leviton Mfg. Company Inc.**

- | | |
|----|------------------------------|
| 7. | Square D SurgeLogics. |
| 8. | Phoenix. |

2.2 COMPONENTS

- A. The AC voltage surge protective devices shall be a high speed, solid state device designed to protect electronic equipment and electrical systems from transient over voltages. It shall limit the magnitude of a transient over voltage present on the AC service or distribution power lines. The suppressor shall provide continuous bipolar, bidirectional, non-interrupting protection and shall be capable of instant automatic reset with no degradation in protection capabilities. Gas tubes are not acceptable. The suppressor shall be solid state, utilizing silicon junction avalanche diodes or MOVs. It shall start to suppress the transient at a minimum of 115% of the peak voltage of the sine wave. This is the minimum voltage protection level. At maximum surge current dissipation, the device shall not exceed the maximum voltage protection level. The suppressor assembly shall be installed in parallel with the service main disconnect, distribution or branch panel main lugs as shown. Connect suppressor to over current protection sized as shown with an AIC rating equal to panel rating. The over current protection shall also be sized to handle the full surge current (8 x 20 usec) capacity of the suppressor. The suppressor shall be contained in an enclosure appropriate for the environmental application. In addition, it shall have status indicator lights, dry contacts with remote alarm capabilities, and an audible alarm. Suppressors shall be assembled as modular units to permit quick, easy replacement of failed components. Provide one spare module of each type suppressor for Owner's use. If entire suppressor is one module, provide one complete spare.
- B. Category B: Distribution and Branch Panelboards – Medium Exposure:
1. Surge suppression filter system shall meet the following requirements. All specifications are per test and evaluation procedures outlined in NEMA LS-1 guidelines. MOVs shall be individually fused. Fuses are UL 248-1 recognized and tested at 200k AIC. All circuitry - copper bus construction. Plug-in modules in surge current path are not acceptable.
 - a. Each suppression element shall be individually fused such that the failure of a single component or the operation of a single fuse element remains isolated and does not render the entire mode, or product.
 - b. For systems utilizing a hybrid technology, each element type shall be individually fused.
 - c. Every electrical current carrying conductor shall be fused such that every fault is isolated at the point of the fault or at the device level.
 - d. Fusing shall be present in all modes, including Neutral-to-Ground.
 - e. All overcurrent/fault current protection shall be UL 248-1 recognized as a stand-alone fuse.
 - f. All fusing must be UL 248-1 recognized and tested at 200k AIC. Testing shall be inclusive of all available product voltages.
 - g. The device shall be capable of withstanding the full single pulse surge current capacity for every mode without the operation or failure of overcurrent/fault protection or fuses.
 2. Repetitive Surge Current Capacity: >4,000 tested impulses per mode at IEEE Category C3, 20KV, 10KA.
 3. UL 1449 Second Edition Listed, UL 1283 Listed (for EMI/RFI Filtering) Clamp Voltage Ratings:

	Mode	UL 1449-2
120/240	L-N	400 / 400

120/208	L-L	700 / 700
277/480	L-N	900 / 900
	L-L	1800 / 1800

4. The suppression filter system shall function in conjunction with other suppression filter devices of the same manufacturer via coordinated filters within the facility to provide minimum noise attenuation as follows:

Attenuation Frequency	50 KHz	100 KHz	500 KHz	1 MHz	5 MHz	10 MHz	50 MHz	100 MHz
Attenuation	47	50	37	37	37	38	47	53

Note: Standardized insertion loss data obtained utilizing MIL-STD-220A 50 ohm insertion loss methodology, based on a minimum of 100 ft. of #4 AWG conductor between the two devices. Noise source = 100' to model maximum average circuit distance, filter connection distance = 6".

5. Warranty: Seven (7) year warranty.
6. Termination Method: Standard parallel.
7. Test point to verify operational integrity.
8. Manufacturer's representative shall be on-site for startup and test procedures. Factory trained representative shall test the installed unit with a portable surge generator to verify that the unit suppresses voltage within factory guidelines - in all modes. Also, test shall verify the integrity of the neutral to ground bond. Additionally, testing shall be done to verify 100% suppression capability per phase of the MOV's. Test report shall be sent to specifying engineer to verify performance.
9. Submittal shall include independent test data on maximum single and repetitive surge current per NEMA LS-1 Standard.
10. The device shall have an optionally available, NEMA designed and certified, safety interlocked integral disconnect switch located within the unit. The manual operator for the disconnect switch shall be externally located.
11. The product shall be provided with an integral, multifunction power monitor analyzer. The monitoring system shall provide real-time product performance data along with distribution system power analysis via multiport, visual status indicators (LEDs), and a touch pad accessible LED data display. It shall include the following features:
 - a. Enhanced status indicators.
 - b. Dual form "C" contacts.
 - c. Display event counter.
 - d. Battery powered alarm.
 - e. % protection available per phase.
 - f. Neutral-to-ground fault indication.
 - g. Neutral-to-ground current sensing.
 - h. True RMS voltage monitor.
 - i. Voltage sag detection.
 - j. Voltage swell detection.
 - k. Power dropout detection.
 - l. Power outage detection.

PART 3. EXECUTION

3.1 INSTALLATION OF DISTRIBUTION PANEL SUPPRESSORS

- A. Suppressors shall be installed at distribution equipment where shown as close as practical to equipment to be protected consistent with the available space. Where installation space permits and where no code restrictions apply, suppressors may be installed within protected

equipment. Suppressors installed in this manner shall utilize the equipment ground bus or enclosure as a medium for bonding of their ground terminals. Bonding jumpers not exceeding two inches in length shall be installed between the ground bus or enclosure and suppressor ground terminals. Bolted connections with star washers shall be used to insure electrical and mechanical integrity of connections to the ground bus or enclosure. Remove paint where connections are made to the enclosure.

- B. Suppressors shall be installed in a neat, workmanlike manner. Lead dress shall be consistent with recommended industry practices for the system on which these devices are installed. Connected lead length not to exceed 2 feet. If 2 feet is impossible due to physical restraints, engineer must be contacted immediately.
- C. All system wiring shall be classified into protected and non-protected categories. Wiring on the exposed side of suppression devices shall be considered unprotected. Surge suppressor grounding and bonding conductors shall also fall into this category.
- D. All wiring between surge suppressors and protected equipment shall be considered protected and connected in accordance with the latest edition of the NEC.

3.2 FIELD QUALITY CONTROL

- A. Disconnect suppressor prior to megger testing of service entrance distribution equipment and panelboards.
- B. Supply certified test reports for all tested parts, elements and/or systems or where required by the Owner to substantiate published ratings of claims.

END OF SECTION

SECTION 27 05 26

GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS (Per AD#7)

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. Grounding conductors.
 - 2. Grounding connectors.
 - 3. Grounding busbars.
 - 4. Grounding rods.

1.3 DEFINITIONS

- A. BCT: Bonding conductor for telecommunications.
- B. EMT: Electrical metallic tubing.
- C. TGB: Telecommunications grounding busbar.
- D. TMGB: Telecommunications main grounding busbar.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For communications equipment.

PART 2 - PRODUCTS

2.1 SYSTEM COMPONENTS

- A. Comply with J-STD-607-A.

2.2 CONDUCTORS

- A. Comply with UL 486A-486B.
- B. Insulated Conductors: Stranded copper wire, green or green with yellow stripe insulation, insulated for 600 V, and complying with UL 83.

1. Ground wire for custom-length equipment ground jumpers shall be No. 6 AWG, 19-

2.3 CONNECTORS

- A. Compression Wire Connectors: Crimp-and-compress connectors that bond to the conductor when the connector is compressed around the conductor. Comply with UL 467.
 1. Electroplated tinned copper, C and H shaped.
- B. Busbar Connectors: Cast silicon bronze, solderless compression type, mechanical connector; with a long barrel and two holes spaced on 5/8- or 1-inch (15.8- or 25.4-mm) centers for a two-bolt connection to the busbar.

2.4 GROUNDING BUSBARS

- A. TGB: Predrilled rectangular bars of hard-drawn solid copper, 1/4 by 2 inches (6.3 by 50 mm) in cross section, length as indicated on Drawings. The busbar shall be for wall mounting, shall be NRTL listed as complying with UL 467, and shall comply with J-STD-607-A.
 1. Predrilling shall be with holes for use with lugs specified in this Section.
 2. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the ac grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of the electrical system.
- B. Inspect the test results of the ac grounding system measured at the point of BCT connection.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with connection of the BCT only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Bonding shall include the communications cable entrance, and the grounding electrode system. The bonding of these elements shall form a loop so that each element is connected to at least two others.
- B. Comply with NECA 1.
- C. Comply with J-STD-607-A.

3.3 APPLICATION

- A. Conductors: Install solid conductor for No. 8 AWG and smaller and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
 - 1. The bonding conductors between the TGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.
- B. 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.
- C. Conductor Support:
 - 1. Secure grounding and bonding conductors at intervals of not less than 36 inches (900 mm).
- D. Grounding and Bonding Conductors:
 - 1. Install in the straightest and shortest route between the origination and termination point, and no longer than required. The bend radius shall not be smaller than eight times the diameter of the conductor. No one bend may exceed 90 degrees.
 - 2. Install without splices.
 - 3. Support at not more than 36-inch (900-mm) intervals.
 - 4. Install grounding and bonding conductors in 3/4-inch (21-mm) PVC conduit until conduit enters a telecommunications room. The grounding and bonding conductor pathway through a plenum shall be in EMT. Conductors shall not be installed in EMT unless otherwise indicated.
 - a. If a grounding and bonding conductor is installed in ferrous metallic conduit, bond the conductor to the conduit using a grounding bushing that complies with requirements in Section 270528 "Pathways for Communications Systems," and bond both ends of the conduit to a TGB.

3.4 CONNECTIONS

- A. Bond metallic equipment in a telecommunications equipment room to the grounding busbar in that room, using equipment grounding conductors not smaller than No. 6 AWG.
- B. Stacking of conductors under a single bolt is not permitted when connecting to busbars.
- C. Assemble the wire connector to the conductor, complying with manufacturer's written instructions and as follows:

1. Use crimping tool and the die specific to the connector.
 2. Pretwist the conductor.
 3. Apply an antioxidant compound to all bolted and compression connections.
- D. Primary Protector: Bond to the TMGB with insulated bonding conductor.
- E. Rack- and Cabinet-Mounted Equipment: Bond powered equipment chassis to the cabinet or rack grounding bar. Power connection shall comply with NFPA 70; the equipment grounding conductor in the power cord of cord- and plug-connected equipment shall be considered as a supplement to bonding requirements in this Section.

END OF SECTION

SECTION 27 05 28

PATHWAYS FOR COMMUNICATIONS SYSTEMS (Per AD#7)

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 and fittings.
 - 2. Metal wireways and auxiliary gutters.
 - 3. Boxes, enclosures, and cabinets.
- B. Related Requirements:
 - 1. Section 260533 "Raceways and Boxes for Electrical Systems" for conduits, wireways, surface raceways, boxes, enclosures, cabinets, handholes, and faceplate adapters serving electrical systems.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

- A. General Requirements for Metal Conduits and Fittings:
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. Comply with TIA-569-B.
- B. EMT: Comply with ANSI C80.3 and UL 797.
- C. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

2.2 BOXES, ENCLOSURES, AND CABINETS

- A. General Requirements for Boxes, Enclosures, and Cabinets:
 - 1. Comply with TIA-569-B.
 - 2. Boxes, enclosures and cabinets installed in wet locations shall be listed for use in wet locations.
- B. Sheet-Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

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

PART 3 - EXECUTION

3.1 PATHWAY APPLICATION

- A. Indoors: Apply pathway products as specified below unless otherwise indicated:
 - 1. Exposed, Not Subject to Physical Damage: EMT.
 - 2. Concealed in Ceilings and Interior Walls and Partitions: EMT.
- B. Minimum Pathway Size: 3/4-inch (21-mm) trade size.
- C. Pathway Fittings: Compatible with pathways and suitable for use and location.
 - 1. EMT: Use setscrew or compression, steel or cast-metal fittings. Comply with NEMA FB 2.10.
- D. Install surface pathways only where indicated on Drawings.

3.2 INSTALLATION

- A. Comply with NECA 1, NECA 101, and TIA-569-B for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.
- B. Keep pathways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.
- C. Complete pathway 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. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within 12 inches (300 mm) of changes in direction.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- H. Support conduit within 12 inches (300 mm) of enclosures to which attached.
- I. Stub-ups to Above Recessed Ceilings:
 - 1. Use EMT for pathways.
 - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- J. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- K. 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.
- L. Cut conduit perpendicular to the length. For conduits of 2-inch (53-mm) trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.
- M. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground pathways designated as spare above grade alongside pathways in use.
- N. Install pathway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, 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 pathway sealing fittings according to NFPA 70.
- O. Install devices to seal pathway 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 pathways at the following points:
- P. 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] [top] [bottom] of box unless otherwise indicated.
- Q. 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 surface to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
- R. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- S. 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.

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

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR COMMUNICATIONS PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways 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 or 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

SECTION 27 05 44

SLEEVES AND SLEEVE SEALS FOR COMMUNICATIONS PATHWAYS AND CABLING (Per AD#7)

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 pathway and cable penetration of non-fire-rated construction walls and floors.
 - 2. Sleeve-seal systems.
 - 3. Silicone sealants.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

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.
- B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.
- C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- D. Sleeves for Rectangular Openings:
 - 1. Material: Galvanized-steel sheet.
 - 2. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and with no side larger than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).

- b. For sleeve cross-section rectangle perimeter 50 inches (1270 mm) or more and one or more sides larger than 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.
 - 1. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Carbon steel.
 - 3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 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.

2.4 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 content of 250 g/L or less 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. 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 pathway 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. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 3. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pathway or cable unless sleeve seal is to be installed.
 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
 5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level. Install sleeves during erection of floors.
- C. 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.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at pathway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 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

SECTION 27 15 00

COMMUNICATIONS HORIZONTAL CABLING (Per AD#7)

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. UTP cabling.
 - 2. 62.5/125-micrometer, optical fiber cabling.
 - 3. Multiuser telecommunications outlet assemblies.
 - 4. Telecommunications outlet/connectors.
 - 5. Cabling system identification products.
 - 6. Cable management system.

1.3 DEFINITIONS

- A. BICSI: Building Industry Consulting Service International.
- B. Consolidation Point: A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.
- C. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
- D. EMI: Electromagnetic interference.
- E. IDC: Insulation displacement connector.
- F. LAN: Local area network.
- G. MUTOA: Multiuser telecommunications outlet assembly, a grouping in one location of several telecommunications outlet/connectors.
- H. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.
- I. RCDD: Registered Communications Distribution Designer.

- J. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate layout and installation of telecommunications cabling with Owner's telecommunications and LAN equipment and service suppliers.
- B. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
 - 2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
 - 3. Wiring diagrams to show typical wiring schematics, including the following:

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site.
 - 1. Test optical fiber cables to determine the continuity of the strand end to end. Use optical loss test set.
 - 2. Test optical fiber cables while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector; including the loss value of each. Retain test data and include the record in maintenance data.
 - 3. Test each pair of UTP cable for open and short circuits.

PART 2 - PRODUCTS

2.1 HORIZONTAL CABLING DESCRIPTION

- A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called a "permanent link," a term that is used in the testing protocols.
 - 1. TIA/EIA-568-B.1 requires that a minimum of two telecommunications outlet/connectors be installed for each work area.

2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
 3. Bridged taps and splices shall not be installed in the horizontal cabling.
 4. Splitters shall not be installed as part of the optical fiber cabling.
- B. A work area is approximately 100 sq. ft. (9.3 sq. m), and includes the components that extend from the telecommunications outlet/connectors to the station equipment.
- C. The maximum allowable horizontal cable length is 295 feet (90 m). This maximum allowable length does not include an allowance for the length of 16 feet (4.9 m) to the workstation equipment or in the horizontal cross-connect.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1 when tested according to test procedures of this standard.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index: 25 or less.
 2. Smoke-Developed Index: 50 or less.
- 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. Grounding: Comply with J-STD-607-A.

2.3 BACKBOARDS

- A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches (19 by 1220 by 2440 mm). Comply with requirements in Section 061000 "Rough Carpentry" for plywood backing panels.

2.4 UTP CABLE

- A. Description: 100-ohm, four-pair UTP, formed into 25-pair, binder groups covered with a blue thermoplastic jacket.
1. Comply with ICEA S-90-661 for mechanical properties.
 2. Comply with TIA/EIA-568-B.1 for performance specifications.
 3. Comply with TIA/EIA-568-B.2, Category 6.
 4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:

- a. Communications, General Purpose: Type CM or CMG.
- b. Communications, Plenum Rated: Type CMP complying with NFPA 262.
- c. Communications, Riser Rated: Type CMR complying with UL 1666.
- d. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.

2.5 UTP CABLE HARDWARE

- A. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.
- B. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
 - 1. Number of Jacks per Field: One for each four-pair UTP cable indicated, plus spares and blank positions adequate to suit specified expansion criteria.
- C. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.
- D. Patch Cords: Factory-made, four-pair cables in 48-inch/1200-mm lengths; terminated with eight-position modular plug at each end.
 - 1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
 - 2. Patch cords shall have color-coded boots for circuit identification.

2.6 OPTICAL FIBER CABLE

- A. Description: Multimode, 62.5/125]-micrometer, 24 -fiber, nonconductive, tight buffer, optical fiber cable.
 - 1. Comply with ICEA S-83-596 for mechanical properties.
 - 2. Comply with TIA/EIA-568-B.3 for performance specifications.
 - 3. Comply with [TIA-492AAAB] [TIA-492AAAA-A] for detailed specifications.
 - 4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:
 - a. General Purpose, Nonconductive: Type OFN or OFNG.
 - b. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.
 - 5. Maximum Attenuation: 3.50 dB/km at 850 nm; 1.5 dB/km at 1300 nm.

6. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.
- B. Jacket:
1. Jacket Color: Orange for 62.5/125-micrometer cable.
 2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-C.
 3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches (1000 mm).

2.7 OPTICAL FIBER CABLE HARDWARE

- A. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.
1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.
- B. Patch Cords: Factory-made, dual-fiber cables in 36-inch (900-mm) lengths.
- C. Cable Connecting Hardware:
1. Comply with Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA-604-2-B, TIA-604-3-B, and TIA/EIA-604-12. Comply with TIA/EIA-568-B.3.
 2. Quick-connect, simplex and duplex, Type SC or Type ST or Type LC or Type MT-RJ as necessary, connectors. Insertion loss not more than 0.75 dB.
 3. Type SFF connectors may be used in termination racks, panels, and equipment packages.

2.8 TELECOMMUNICATIONS OUTLET/CONNECTORS

- A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-B.1.
- B. Workstation Outlets: Four -port-connector assemblies mounted in single faceplate.
1. Plastic Faceplate: High-impact plastic. Coordinate color with Section 262726 "Wiring Devices."
 2. For use with snap-in jacks accommodating any combination of UTP, optical fiber, and coaxial work area cords.
 - a. Flush mounting jacks.
 3. Legend: Factory labeled by silk-screening or engraving plastic faceplates.
 4. Legend: Machine printed, in the field, using adhesive-tape label.

5. Legend: Snap-in, clear-label covers and machine-printed paper inserts.

2.9 GROUNDING

- A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.
- B. Comply with J-STD-607-A.

2.10 IDENTIFICATION PRODUCTS

- A. Comply with TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- B. Comply with requirements in Section 260553 "Identification for Electrical Systems."

2.11 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test UTP and optical fiber cables on reels according to TIA/EIA-568-B.1.
- C. Factory test UTP cables according to TIA/EIA-568-B.2.
- D. Factory test multimode optical fiber cables according to TIA-526-14-A and TIA/EIA-568-B.3.
- E. Cable will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

- A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

3.2 WIRING METHODS

- A. Install cables in pathways except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal pathways and cables except in unfinished spaces.
 1. Install plenum cable in environmental air spaces, including plenum ceilings.
 2. Comply with requirements in Section 270528 "Pathways for Communications Systems."
- B. Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures:

1. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
2. Install lacing bars and distribution spools.
3. Install conductors parallel with or at right angles to sides and back of enclosure.

3.3 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Consolidation points may be used only for making a direct connection to telecommunications outlet/connectors:
 - a. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to workstation equipment.
4. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
5. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
6. **Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.**
7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
8. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
10. In the communications equipment room, install a 10-foot- (3-m-) long service loop on each end of cable.
11. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

- C. UTP Cable Installation:
 - 1. Comply with TIA/EIA-568-B.2.
 - 2. Do not untwist UTP cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.
- D. Optical Fiber Cable Installation:
 - 1. Comply with TIA/EIA-568-B.3.
 - 2. Cable may be terminated on connecting hardware that is rack or cabinet mounted.
- E. Open-Cable Installation:
 - 1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
 - 2. Suspend UTP cable not in a wireway or pathway a minimum of 8 inches (200 mm) above ceilings by cable supports not more than [60 inches (1524 mm)] <Insert dimension> apart.
 - 3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.
- F. Separation from EMI Sources:
 - 1. Comply with BICSI TDMM and TIA-569-B for separating unshielded copper voice and data communication 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 Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
 - 3. 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 Rating Less Than 2 kVA: No requirement.
 - 4. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
 - 5. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.4 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 Systems" Article.

3.5 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
 - 1. Color-code cross-connect fields. Apply colors to voice and data service backboards, connections, covers, and labels.
- B. Using cable management system software specified in Part 2, develop Cabling Administration Drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable and label cable, jacks, connectors, and terminals to which it connects with same designation. At completion, cable and asset management software shall reflect as-built conditions.
- C. Comply with requirements in Section 099123 "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.
- D. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 2 level of administration, including optional identification requirements of this standard.
- E. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- F. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606-A. Furnish electronic record of all drawings, in software and format selected by Owner.
- G. Cable and Wire Identification:
 - 1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
 - 2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
 - 3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m).
 - 4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

- a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.
 - b. Label each unit and field within distribution racks and frames.
- 5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
- 6. Uniquely identify and label work area cables extending from the MUTOA to the work area. These cables may not exceed the length stated on the MUTOA label.
- H. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA-606-A.
 - 1. Cables use flexible vinyl or polyester that flex as cables are bent.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Visually inspect UTP and optical fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
 - 2. Visually confirm Category 6, marking of outlets, cover plates, outlet/connectors, and patch panels.
 - 3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 - 4. Test UTP backbone copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement

Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

5. Optical Fiber Cable Tests:
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
 - b. Link End-to-End Attenuation Tests:
 - 1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in 1 direction according to TIA-526-14-A, Method B, One Reference Jumper.
 - 2) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.
6. UTP Performance Tests:
 - a. Test for each outlet and MUTOA. Perform the following tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.2:
 - 1) Wire map.
 - 2) Length (physical vs. electrical, and length requirements).
 - 3) Insertion loss.
 - 4) Near-end crosstalk (NEXT) loss.
 - 5) Power sum near-end crosstalk (PSNEXT) loss.
 - 6) Equal-level far-end crosstalk (ELFEXT).
 - 7) Power sum equal-level far-end crosstalk (PSELFEXT).
 - 8) Return loss.
 - 9) Propagation delay.
 - 10) Delay skew.
7. Optical Fiber Cable Performance Tests: Perform optical fiber end-to-end link tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.3.
8. Coaxial Cable Tests: Conduct tests according to Section 274133 "Master Antenna Television System."
9. Final Verification Tests: Perform verification tests for UTP and optical fiber systems after the complete communications cabling and workstation outlet/connectors are installed.

- a. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.
 - b. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.
- D. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.
- E. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

3.7 SOFTWARE SERVICE AGREEMENT

- A. Technical Support: Beginning with Substantial Completion, provide software support for two years.
- B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.
 - 1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

END OF SECTION

SECTION 27 51 16

PUBLIC ADDRESS SYSTEMS, INTERCOM, CLOCKS & CLASS CHANGE SIGNAL (Per AD#7)

Part 1 – GENERAL

1.1 SUMMARY

- A This section and associated drawings define a communications system for an intercom, public address, and master clock system. The bidder shall provide infrastructure, cable, hardware, and equipment, as defined, to provide a complete and operational communications system.
- B The Public Address System is Existing- Connect to Existing System & Extend into the expansion area as shown on the plans and specified. The existing master is a Telecor II and has a dual channel system with (2) 125 watt amplifiers. The contractor shall add the following cards (1) THI to support (25) phones and (2) OBU-4X2 for (25) speakers and call-ins. The classrooms shall have a wall mount speaker clock combination, part number 2400 and recessed back-can, part number 2453. The back-can shall have (2) conduits, one for 120vVAC and one for the synchronization cable. Speakers shall be Telecor no. STB_11. Room phones shall be Telecor no. HS-1301 – all rooms shall be equipped with a wall mounted administrative telephone.
- C Where applicable visit the site, verify all existing items shown on plans, or specified, and be familiar with the working conditions, hazards, and local requirements involved; submission of bids shall be deemed evidence of such visit. All proposals shall take these existing conditions into consideration before bidding.
- D All materials, unless otherwise specified, shall be new, free from any defects, and of the best quality of their respective kinds. All like materials shall be of the same manufacture, model, and quality, unless otherwise specified.
- E Contractor shall do all necessary cutting and drilling of present walls, floors, ceilings, etc., for the installation of new work; but no structural work shall be cut, unless specifically shown on drawings and/or approved by the Owner. All exposed building surfaces damaged by installation or removal of electrical work shall be patched and finished in the same materials and manner as adjacent areas by this Contractor.
- F If, applicable, contractor shall co-ordinate his work with the Owner for times which changeover, removal of existing equipment, and new connections of existing systems can be completed.

PART 2 – PRODUCTS

2.1 RACEWAYS AND CABLES

- A Electrical work will conform to the National Electric Code and applicable local ordinances.
- B All 125-volt electrical conductors shall be installed in galvanised electrical metallic tubing with compression type fittings and couplings, minimum 1/2" size conduit.

- C All low-voltage wires and cables concealed in walls shall be run in EMT conduit from flush outlet boxes to above accessible ceilings. Provide conduit where cables penetrate firewalls above ceilings.
- D All EMT entering boxes shall be served with insulating throat connectors and locknuts.
- E No raceway shall be located in proximity of hot water lines or excessive heat.
- F Where raceways cannot be run concealed in walls, use Wiremold Series surface raceway complete with all fittings, box extension rings, and required accessories. Co-ordinate routing of surface raceways with the Owner.
- G Use Cast "C" clamps, "U" straps, or ring hangers attached to rods, and/or brackets fastened to structure.
- H No perforated straps or tie wires permitted for supporting raceways.
- I Use wire ties for supporting low voltage cables run concealed above ceilings. Do not run cables loose on ceiling tiles. Support from structure above. Group cables in bundles.
- J Tie mounts, plates, and anchors shall be used.
- K Ground all electrical apparatus in accordance with the National Electric Code.

2.2 QUALITY ASSURANCE

- A Manufacturers must be regularly engaged in the manufacture of integrated communication systems, master clock systems, and ancillary equipment, of types and capacities required. Approved products shall have been in satisfactory use in similar service for not less than five years.
- B Installer's Qualifications: Firms with at least five years of successful installation experience with projects utilizing integrated communications systems and equipment similar to that required for this project.
- C All items of equipment including wire and cable shall be designed by the manufacturer to function as a complete system and shall be accompanied by the manufacturer's complete service notes and drawings detailing all interconnections.
- D The Contractor shall be an established communications and electronics Contractor that has had and currently maintains a locally run and operated business for at least five years. The Contractor shall be a duly authorised distributor of the equipment supplied with full manufacturer's warranty privileges.
- E The Contractor shall show satisfactory evidence, upon request, that he maintains a fully equipped service organisation capable of furnishing adequate inspection and service to the system. The Contractor shall maintain at his facility the necessary spare parts in the proper proportion as recommended by the manufacturer to maintain and service the equipment being supplied.
- F Except where specifically noted otherwise, all equipment supplied shall be the standard product of a single manufacturer of known reputation and experience in the industry. The Contractor shall have attended the manufacturers installation and service school and upon request must show proof of attending such a school.

- G Installing contractor must have a service office within 75 miles of the site and be expected of providing service within a 24-hour period of time.

2.3 SCOPE OF WORK

- A Furnish and install all materials, labor, equipment, permits, etc., to provide communications system as described herein and illustrated on the drawings for a complete operating system.
- B All manufactured articles, material, and equipment shall be applied, installed connected, erected, used, cleaned, adjusted, and conditioned as recommended by the manufacturers, or as indicated in their published literature, unless specifically herein specified to the contrary.
- C All work shall be performed by competent workmen and executed in a neat and workmanlike manner providing a thorough and complete installation. Work shall be properly protected during construction, including the shielding of soft or fragile materials. At completion, the installation shall be thoroughly cleaned and all tools, equipment, obstructions, or debris present as a result of this portion of work shall be removed from the premises.
- D Program the operational characteristics matching the operation described herein, adjusting for call routing, transfers, priorities, and volume levels.
- E Remove all existing conduit, wire device, etc., being abandoned due to relocation.
- F The Contractor shall provide a minimum of eight hours of in-service training with this system. These sessions shall be broken into segments, which will facilitate the training of individuals in the operation of this system. Operator Manuals and User Guides shall be provided at the time of this training.

2.4 SUBMITTALS

- A Submit the shop drawings, product data, and quality control submittals specified below at the same time as a package.
- B Shop Drawings: Composite wiring and/or schematic diagrams of the complete system as proposed to be installed. Drawing shall include relative position of all major components, typical connections, field components, accessories, and cable types.
- C Product Data: Include catalog cutsheets, manufacturers default specifications, Users operation guide, and bill of materials.

Quality control shall include the following:
 - 1. Submit the Name, address, and telephone number of the nearest fully equipped service organization.
 - 2. Submit a certificate of completion of installation and service training from the system manufacturer.
- D Program the operational characteristics matching the operation described herein, adjusting for call routing, transfers, priorities, and volume levels.
- E Remove all existing conduit, wire device, etc., being abandoned due to relocation.

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

2.5 ACCEPTABLE MANUFACTURERS

- A The existing system is Telecor II. All new equipment shall be Telecor or be 100% compatible with Telecor Master.
- B Manufacturer's names are listed herein to establish a standard. The products of other manufacturers will only be acceptable if approved by the specifying architect and the Owner 10-days prior to the bid. The substitute material must be of a quality as good or better than the material specified, and will serve with equal efficiency and dependability, the purpose for which the items specified were intended.
- C Final approval of these alternates shall be determined at the time of completion. Failure to provide the "functional equivalent" shall result in the removal of the alternate system and installation of the specified system at the contractor's cost.
- D The intent is to establish a standard of quality, function and features. It is the responsibility of the bidder to insure that the proposed product meets or exceeds the intent of these specifications.
- E The functions and features specified are vital to the operation of this facility and therefore inclusion in the list of acceptable manufacturers does not release the contractor from compliance with the requirements of this specification.

2.6 PRODUCT OVERVIEW

- A Furnish and install all equipment, accessories, and materials in accordance with the specifications and drawings to provide a complete and operating Communication system as outlined below.
- B Following is an outline of the basic functions required, set as a minimum standard. These functions must be included in the bid. Any exceptions to these functions must be listed and submitted as part of the bid. If several manufacturers are required to provide these functions proof must be provided that they will function as one integrated system to the user.
- C Intercom Features/Public Address Features
1. Individual intercom circuit for every Classroom
 2. Urgent Call Placement
 3. Monitor Areas of the building during a crisis from the rescue team or on site security officer.
 4. All Call announcements
 5. Emergency Announcements
 6. Automatic Page
 7. Urgent Call-In Page
 8. 32 Zones of Audio Program Distribution
 9. 32 Zones of Paging
 10. Monitor Areas of the building during a crisis from the rescue team or on site security
 11. Page areas of the building during a crisis from the rescue team or on site security

officer.

12. Temporary Speaker Exclusion for Special Events
13. Complete System Programming and diagnostics from LAN, WAN or Internet

D Time Control and Event Scheduler

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

2.7 INTERCOM/PA FEATURES AND PRODUCT DESCRIPTION

A Supply and install a complete microprocessor based Public Address, Intercom, and master clock system using 25-volt speakers and horns.

- B** The system shall consist of the Central Control Unit, Administrative Control Console(s), Integrated Master Clock and Rack Equipment. All other necessary devices that are required by this specification to create a complete and operational system such as Staff Phones, Call Buttons, Speakers, Horns, Amplifiers, Program Sources and Secondary Clocks must be supplied under this contract.
- C** The system shall be capable of multiple open voice intercom paths used for intercom, paging, program distribution, or emergency paging. The system shall be initially equipped with minimum of one intercom speech path.
- D** Provide a separate circuit for each classroom and administrative office so each room can be individually addressed.
- E** Corridor speakers, classrooms and outside horns shall be combined into groups of owners preference. There must be 32 independent software paging zones that each circuit may be a part of. Each individually point must also have the ability to be paged independent of the software zones.
- F** The system will have the ability to utilize VOIP intercom stations in addition to industry standard 25 volt speakers. The VOIP stations will operate in the same manner as the conventional speakers. The system must be a hybrid system having the capability of using either or both types of stations wherever it is deemed necessary and practical by the owner. The VOIP stations must have the ability to incorporate a call switch and must be capable of operating on the existing school LAN/WAN network.
- G** The system specified is based on the Telecor II system providing at least the following features and functions. It shall be installed and programmed by an authorized and certified Telecor dealer.
- The central control unit shall have the capacity for expanding the system to 1200 stations and 32 Administrative Consoles with the addition of plug in modules, as required.
- H** It shall be complete with circuitry for accomplishing all functions for signalling and communications to all stations, page zones, and administrative control consoles. The unit

shall contain all required electronics on modular, plug-in type boards for ease of service and future expansion.

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

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

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

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

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

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

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

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

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

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

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

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

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

- M Provide automatic gain control on intercom speech to assure constant speech level.
- N System shall have the capabilities of interfacing with a local Gym or Auditorium Sound System, providing automatic bridging of the local system, whenever it is accessed from the console. The system shall automatically track the local system, controlling the audio program as programmed from the control console.
- O System will provide emergency and All Call paging and a minimum of 32 zones of group paging. The paging zones shall be independent of the time tone and audio program distribution zones. Systems sharing zones for both paging and time tone shall not be acceptable.
- P 32 different sections of the building can be monitored either on or off the premises from a control console or telephone.
- Q System shall support up to 5 low-impedance microphones, which can be individually programmed to announce in any individual room or assigned to any of the 32 paging zones. The microphone(s) shall be software programmable for control and distribution thus eliminating the need to go to the central electronics for set-up.
- R Distribution of paging announcements can be made from any administrative control console, telephone, or dedicated microphone set-up.
- S Emergency announcements shall have the highest priority over any other system function.
- T System shall support general announcements made from a conventional microphone to facilitate reading a script and the participation of multiple announcers.

Keying the microphone shall automatically mute all other audio programs at a lower priority in the system and transmit the microphone audio to All Rooms or specific speaker zones, as programmed into the system software.
- U The system must have the capability of distributing audio program sources from any administrative control console, telephone system phone or intercom system DTMF phone. Program distribution shall be accomplished on an all rooms basis, selected rooms basis or an individual room.
- V Classroom phones, if required, must have the ability to add or remove themselves from an ongoing program from their room phone.
- W Inputs shall be provided from at least 3 different line level sources and 5 different low impedance sources. Available inputs include microphones, tuners, tape players, or auxiliary sources.

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

The control console shall be able to selectively monitor program sources being distributed.
- X Any area of the building shall be software programmable into 32 zones for easy selection of receiving audio programs. These zones shall be independent from the page and time tone zones. Individual rooms shall also be included or excluded independently from receiving audio programs.

- Y Systems whose only method of distributing an audio program is by the use of mechanical switch banks shall not be accepted.
- Z Systems, which cannot support the distribution of program material by at least two separate methods, will not be acceptable.
- AA The Central Control Unit shall provide a 0 dB signal for connections to an external amplifier for distribution of program audio, time signals and paging announcements.
- BB The system shall provide capability for multiple open voice intercom paths used for intercom, paging, program distribution, or emergency paging (Minimum of two). These paths shall be global, non-blocking circuitry. Systems offering multiple-speech paths, which are restricted to a single speech path per group of room stations or circuit card, due to hardware constraints, will not be accepted. The intercom channels shall be universal allocating channels on demand.
- CC The system shall support the automatic distribution of user programmable, class change time signals (Bell Schedule) to all selected areas:
- The system shall support a minimum of 1536 events and 16 schedules.
- Building time zones shall be used to select which areas receive the tone. They must be totally independent from page zones and program zones.
- Ability to produce 8 different tone signals for classroom time changes or emergency signals selected from a combination of over 1500 tones.
- All time signal programming shall be accomplished from a control console or a PC utilizing a standard web browser program.
- Facilities for displaying console clock in 24-hour or 12-hour format, selectable at the control console.
- The duration of the tone, as well as frequency, burst length and output level shall be software programmable from the console or a web browser.
- The system shall support running all time schedules concurrently.
- All system tones shall be user programmable for the following durations in seconds: 2, 3.5, 5, 6, 8, 10, 12.
- The system shall provide the ability to have music on class change allowing any source to be distributed to specific program zones.
- DD The intercom channel(s) must be equipped with an auto call back function allowing callers to simply request call back in the event that a channel is busy alleviating the need to repeatedly call the system.

2.8 TELEPHONY FEATURES AND PRODUCT DESCRIPTION

- A The system shall support direct-dialling, two-way communications between all locations equipped with Administrative Control Consoles or telephones to any location equipped with a speaker.
- B The system shall provide full duplex communications between telephone and public address/ intercom system. Systems providing broadcast only and are not capable of listening to rooms are not acceptable.
- C The system shall support Staff Telephones for intercom communications between Classrooms. The system shall provide for the capacity of 500 phones. The following staff telephone and linkage features shall be provided:
1. Provide at least 32 simultaneous, full-duplex private telephone links in the system. These paths shall be global allowing communications between multiple adapter cards.
 2. Staff telephones shall be carbon type with built-in networks. Systems which modify a standard DTMF (such as electronic ringers) in order to function with their system thus not permitting the owner to purchase a standard telephone from the local telephone store and use it on the system shall not be acceptable.
 3. The staff phone shall provide for direct dialling communications to all other staff phones, Administrative Control Console(s) or intercom station(s). They shall be capable of selectively calling these devices by merely selecting the number 2,3,4, etc. followed by the pound key.
 4. The staff telephones shall be equipped for speed dialling. Each telephone can store up to 13 frequently dialled numbers. Each station user can program their own personal numbers using these buttons.
- D Room stations equipped with DTMF staff phones as described above shall be capable of integrating with the school phone system providing the following:
1. Selectively initiate calls to the telephone system console, and establish duplex telephone communications.
 2. Make and receive outside calls.
 3. Ability to group hunt for available interface lines.
 4. Phones can be restricted from any of above features.
- E The system shall integrate to the facility phone system to allow any authorized telephone system extension to:
1. Place intercom calls to any classroom or work area
 2. Make paging announcements to any of the 32 zones
 3. Initiate system tones to any area of the facility
 4. Distribute programs to any zones and zone monitor any area of the building
- F The system shall allow the facility phone system to answer any calls from call switches or intercom handsets. When the phone system is equipped with standard Caller-ID support,

all information about the caller such as room number and call priority will be available on the display of the telephone.

- G The integration to the phone system will utilize unused CO ports from the KSU/PBX or VOIP Hybrid System. This system is described in another section of the project documents. Coordinate with the phone system vendor to ensure the availability of these ports. Up to 2 ports may be required.

2.9 MASTER CLOCK FEATURES AND PRODUCT DESCRIPTION

- A The system shall provide for automatic clock correction for Daylight Savings Time, Spring Ahead/Fall Back. Daylight savings shall not require the use of any user input at the time of daylight savings.
- B The master clock system shall support a minimum of 16 schedules and 1536 events as outlined in the Intercom/PA Features section.
- C The system shall support Electronic Message Displays. These displays are integral to the emergency notification needs of the facility. At least two of these displays are required for this project. Provide where indicated on the project drawings. Consult with project engineer if more detail is needed.
 - 1. The display shall accommodate the normal messaging provided on other Telecor digital clocks. Additionally, the display shall accommodate full alphanumeric character support along with other grammatical symbols to provide complete message display capability. Messages of up to 127 characters in length shall be supported through the use of scrolling. Scroll speed shall be user adjustable through the use of an infrared handheld remote control.
 - 2. The display shall provide enhanced timekeeping capabilities. The display shall provide the ability to perform count-up and countdown timing, lap timing, start, stop, reset and pause. All timing shall be displayed, in days, hours, minutes, seconds and tenths of seconds. Activation of timer functions shall be available through the use of a handheld remote or external pushbutton. There is the ability of sounding a buzzer at the EMD speaker when the timer elapses. In addition, a custom message can be displayed when the timer elapses, such as Class Change Over or Test Over
 - 3. The display can be programmed to be part of the bell schedule of the school allowing the timer feature to be used for class change periods. The display can be used for visual confirmation of bell tone descriptions such as "End of Period 1", "Start of Period 2" or any other customized information that can be schedule set.
 - 4. The displays are hardware addressable and can be assigned to one of eight software "Message" Zones for the display of different messages in select areas of a facility.
 - 5. In the event of an Emergency Call from a classroom, the origin of the Emergency Call is displayed on multiple Electronic Message Displays, giving the opportunity for school staff to respond more quickly. In addition, a console or room telephone has the ability to activate a specific message for display on a group of EMDs. This allows an emergency procedure such as school lock down to be activated from any telephone, quickly and efficiently.

2.10 ADMINISTRATIVE TELEPHONES

- A The intercom/paging system control console shall be microcomputer based, desk top console, occupying no more than 75 sq. inches of desk space and weighing 2 lbs. It shall be manufactured of high impact, molded plastic with a standard 12 button keypad. It shall be Model MCC-300.
- B The console shall provide selected, two-way voice communications and signalling between the console and room stations as well as between other control consoles in the system. The console shall be equipped with a telephone handset with a retractable cord to allow private conversations. A built-in microphone and speaker shall provide for push-to-talk intercom conversations.
- C Incoming calls shall be annunciated on a two line 20-character LCD backlit digital display by room number and priority level. The display shall be angle adjustable to ensure the clearest viewing of console information.
- D All incoming calls shall be held in memory and displayed sorted by priority and order received. Each of the six levels of priority shall be displayed by a unique priority prefix and call-in tone. The console shall also have facilities for reviewing all incoming calls stored in memory
- E The distribution of program material shall be controlled from the administrative control console, room selector switch or DTMF intercom handset. System shall support distribution to any of 31 distribution zones, individual rooms or combination thereof.
- F Paging announcements shall be distributed from the control console on an Emergency All Call, All Call, All-Call multiple zone, or individual basis to classroom speakers.

Any control console in the system shall have the ability to be designated as the current console and have the incoming calls from room stations, enunciate at that specific console. This function shall be programmed from the control console and shall allow for simple transfer of the current console assignment to any other console in the system.
- G The console shall also provide the ability for the operator to place on hold, or clear any incoming calls registered in the system from the console keypad.
- H Facilities for activating and controlling remote devices from the control console keypad. The system shall control the operation of external bells, utilizing the internal time clock within the system.
- I Capabilities for user programming of alphanumeric architectural room numbers from the control console. The system shall be capable of using 2, 3, 4 digit number, or a letter (A = I) and a 3 digit number. The number for both the classroom speaker and the telephone shall be the same.
- J The console shall retain the last room number dialled until another room number is dialled or previous call is cancelled.
- K Ability to manually distribute tone signals on an all-call basis from the keypad of the Administrative Control Console cabinet.
- L The console shall have the ability to program or change all of the operational characteristics of the Intercom/PA system.

2.11 PROGRAM SOURCES

- A Provide an AM/FM CD player, Telecor model T-CDP or approved equal. The unit shall be equipped with a LCD information display, front panel indicators and controls, clock, bass, treble, bass enhance, mute and digital signal processing.

1. The AM section shall be tuned over a range of 531 to 1602 KHz. The FM section shall be tuned over a range of 87.5 to 108.0 MHz. The unit shall be equipped to accommodate storage of up to 12 memory selections, six from each band. Storage can be manually accomplished or automatically performed by the unit based on the strongest signals.

2. The CD player shall provide utilize a sampling frequency of 44.1 KHz. The unit shall provide controls for play, stop, fast forward, rewind, track forward, track reverse, pause and eject. The unit shall provide a preview function, which will play the first 10 seconds of each track on the CD. The unit shall allow for random track play mode by the push of a single button

- B Amplifiers

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

The amplifiers shall be capable of producing an audio output of 60, 125 or 250 watts RMS at less than 1% distortion with a balanced output.

They shall be designed to operate on a line voltage of 115 AC. One amplifier shall be provided for each audio channel.

- D Equipment Racking

- E The central electronics equipment shall be contained in an upright rack, Telecor model 242, 261 or 277 or approved equal. The rack must be sized by the contractor to house all compenents required by this specification plus 20% spare for additions.

The rack shall be 21.9" wide and 18.5" deep. It shall be constructed of CRS, using 16 gauge material for the top and bottom of the rack and 14 gauge material for the sides. The rack shall be equipped with both front & rear mounting rails,punched on standard EIA centres. The rack shall be complete with a hinged, locking rear door. The rack shall be finished in Black Baked Enamel.

- F The rack must be supplied with locking castors to enable movement if neccessary

- G **Classroom Telephones**

- H The Classroom/Workroom Telephone shall be a Telecor model HS-1301 or approved equal. Furnish and install as indicated on the plans.

1. The HS-1301 shall be a standard utility grade instrument, equipped with automatic side tone balancing networks, electret transmitters and dynamic receivers. A receiver Volume control shall be provided on the side of the telephone base allowing for the adjustment of the handset listen level. The telephone housing and handset shall be manufactured from a high impact plastic which will be available in either charcoal (B) or grey(G) colors. Each telephone shall be supplied with a 5 ft. (1.53 m) retractable handset cord and a 7 ft. (2.14

m) connecting cord. The HS-1301 shall be suitable for use as a desk telephone or shall be wall mounted using the modular ST-8/4 wall plate.

2. The HS-1301 shall be equipped with a standard 12-Button Dial Keypad, along with 4 special function buttons (Store, Recall, Save and Flash), 3 one touch Priority Dial buttons and a re-dial button. The HS-1301 shall be designed to be used with a Telecor II, or Telecor XL System that is equipped with the required DTMF receive unit, and the THI/THP Telephone Handset Interface Unit.

I Speakers

J The loudspeaker/transformer/baffle assembly shall be a Telecor model STB-11 or approved equal. It shall be used for flush mounting on ceilings. Furnish and install as indicated on the plans.

1. The loudspeaker size shall be 8 inches in diameter and have a power handling capacity of 15 watts. The voice coil shall be of high-temperature bonded construction, be one inch in diameter and have an impedance of 8 ohms. The speaker shall have a frequency range of at least 50 Hz to 15,000 Hz and an axial sensitivity of 91dB at 4 ft, with a 1 watt input signal @ 1000Hz.

2. The loudspeaker shall be equipped with a factory wired 25/70 volt line-matching transformer. The transformer shall have the primary taps at , , 1, 2, and 4 watts. The insertion loss shall be no greater than 1.0 dB. The transformer shall be mounted to the speaker with the secondary leads soldered to the speaker terminals.

3. The assembly shall include a baffle constructed of 22 gauge, cold-rolled steel finished with a mar-resistant white, semi-gloss, epoxy coating. The baffle shall have a diameter of 13". The STB-11 shall mount to a T8 support bridge, used to attach the assembly to suspended ceilings. The support bridge will accept an enclosure, model H8, to provide a protective enclosure. The H8 enclosure shall attach to the support bridge with appropriate mounting screws.

K The loudspeaker/transformer/baffle and enclosure shall be Telecor models S8T2570, B25 and SH-20SB. It shall be used for surface mounting on walls or ceilings. Furnish and install as indicated on the plans.

1. The speaker/transformer assembly shall be a Telecor model S8T2570 or approved equal. The loudspeaker size shall be 8 inches with a ceramic magnet and seamless cone. The ceramic magnet shall weigh no less than 6 oz. The speaker shall have a frequency range of at least 50 Hz to 15,000Hz at a 10 watt handling capability, and an axial sensitivity of at least 95 dB at 4 feet, with a 1 watt input. The voice coil shall be 1.0 inch in diameter with an 8 impedance. The loudspeaker shall be equipped with a factory wired 25/70 volt line-matching transformer. The transformer shall have the primary taps at , , 1, 2, and 4 watts. The insertion loss shall be no greater than 1.0 dB. The transformer shall be mounted to the speaker with the secondary leads soldered to the speaker terminals.

2. The baffle shall be a Telecor Model B25 or approved equal. It shall be constructed of 22 gauge, coldrolled steel and finished with a mar-resistant, white, semi-gloss, epoxy coating. Speaker studs shall be concealed. The baffle shall measure 12 " square, and shall mount a standard 8" loudspeaker. It shall mount to a Telecor H20 or SH20-SB enclosure.

3. The enclosure shall be a Telecor Model SH20-SB or approved equal suitable for the surface installation of 8" speaker/baffle assemblies. The enclosure shall be suitable

for ceiling or wall installation. It shall be a welded assembly, constructed of 18 gauge, coldrolled steel and finished with a mar-resistant, white, semi-gloss, epoxy coating. The interior shall be coated to prevent mechanical and acoustical resonances. The enclosure is furnished with four "J" clips to facilitate screw mounting of the baffle.

- L The loudspeaker/transformer/ baffle assembly shall be a Telecor model WB-11 or approved equal. It shall be used for surface mounting on walls. Furnish and install as indicated on the plans.
1. The baffle/enclosure shall be constructed of 1/2" medium density fiberboard, glued in all 4 joints and using a corner bead of adhesive to add structural integrity. The construction shall be of a miter-fold design and covered in a walnut-grain vinyl, with a black cloth grill.
 2. The front baffle shall be sloped, providing directional sound dispersion. The loudspeaker shall have a diameter of 8 inches and a power handling capacity of 15 watts. The voice coil shall be of high-temperature bonded construction, be one inch in diameter and have an impedance of 8 ohms. The speaker shall have a frequency range of at least 50 Hz to 15,000 Hz and an axial sensitivity of 91dB at 4 ft, with a 1 watt input signal @ 1,000Hz.
 3. The loudspeaker shall be equipped with a factory wired 25/70 volt line-matching transformer. The transformer shall have the primary taps at 1, 2, and 4 watts. The insertion loss shall be no greater than 1.0 dB. The transformer shall be mounted to the speaker, with the secondary leads soldered to the speaker terminals.
 4. The enclosure shall measure 9" wide and 10" high with a projection of 5" at the top and 3" at the bottom. A mounting bracket shall be located on the rear of the enclosure to facilitate installation.
- M Horn Loudspeakers
- N The horn style loudspeaker shall be a Telecor model A-15T or approved equal. Furnish and install as indicated on the plans.
1. The horn shall be a double re-entrant type, with a flared bell and an integral compression driver rated for 15 watts of continuous audio power. The frequency response shall be 375 -14,000Hz. Nominal sensitivity shall be such that a sound pressure level of 110 dB at 1000 Hz (on axis) at distance of one meter is produced with an input of one watt. Sound dispersion shall be no less than 100 degrees, regardless of the mounting position.
 2. The horn shall contain a weatherproof, built-in, 25/70 volt line matching transformer. Power taps shall be at 0.48, 0.94, 1.8, 7.5 or 15 watts for a 25V line and 1, 2, 3.8, 7.5 or 15 watts for a 70 V line. The power taps shall be screwdriver adjustable. Impedance selection shall be 5,000, 2500, 1300, 666, 333, 87, or 45 ohms.
 3. The unit shall include a die-cast universal mounting bracket, allowing the horn to be positioned both in the vertical and horizontal planes with a single adjustment. The wiring terminals and the screwdriver power tap shall be enclosed by a clear plastic cover for security and weather protection.
 4. The horn shall be finished in a grey epoxy. Dimensions shall be 9 1/4" deep with a diameter of 8

- O The horn style loudspeaker shall be a Telecor model A-30T or approved equal. Furnish and install as indicated on the plans.
 - 1. The horn shall be a double re-entrant type, with a flared bell and an integral compression driver rated for 30 watts of continuous audio power. The frequency response shall be 275 -14,000Hz. Nominal sensitivity shall be such that a sound pressure level of 115 dB at 1000 Hz (on axis) at distance of one meter is produced with an input of one watt. Sound dispersion shall be no less than 90 degrees, regardless of the mounting position.
 - 2. The horn shall contain a weatherproof, built-in, 25/70 volt line matching transformer. Power taps shall be at 0.94, 1.8, 7.5, 15 or 30 watts for a 25V line and 2, 3.8, 7.5, 15 or 30 watts for a 70 V line. The power taps shall be screwdriver adjustable. Impedance selection shall be 5,000, 2500, 1300, 666, 333, 168, 87, or 45 ohms.
 - 3. The unit shall include a die-cast universal mounting bracket, allowing the horn to be positioned both in the vertical and horizontal planes with a single adjustment. The wiring terminals and the screwdriver power tap shall be enclosed by a clear plastic cover for security and weather protection.
 - 4. The horn shall be finished in a grey epoxy. Dimensions shall be 10 " deep with a diameter of 10

END OF SECTION

SECTION 28 05 00

COMMON WORK RESULTS FOR ELECTRONIC AUXILIARY SYSTEMS (per AD#7)

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.
- B. Limits and scope of work under the vendor accountable for each section shall be defined in these specifications and correspondingly shown on the drawings.
- C. Provide materials, labor, equipment, and services necessary to furnish, deliver, and install a completely functional integrated system.
- D. All equipment and work shall comply with all applicable codes.

1.2 SUMMARY

- A. Vendors
 - 1. The vendor accountable for each system shall submit an aggregate bid for work described in the following specification sections.
 - 2. The vendor accountable for each system shall be responsible for performing the coordination required between the existing school equipment system, detention equipment, commercial hardware, Fire Alarm, Communication Infrastructure, and the Electrical work.
 - a Security Electronic Systems Work required by, but not specified in, this Section includes the following:
 - 1) Division 28, Section 282300 "Video Surveillance"
 - 2) Division 27, Section 275116 "Public Address System: Intercom, Clock, and Class Change Signal"
 - 3) Division 27, Section 271500 "Communications Horizontal Cabling"
 - 3. Approved vendor firms must base their bid on the equipment and products specified herein. Design changes or substitutions will not be allowed unless approved prior to bidding. Value engineering proposals will not be considered. Substitutions on the specified software will not be approved.

4. The vendor accountable for a system shall have in their employ a superintendent to supervise the work of this section. The superintendent's sole responsibility shall be to supervise and coordinate the scope of work of the vendor. The superintendent shall be at the site at all times when the work is being performed.
 5. If any portion of the work listed in paragraph 1.2.A.2.a above is subcontracted, the responsibility for system coordination and integration remains with the vendor accountable for the system.
 6. The vendor accountable for a system shall be fully responsible for reviewing the conduit routing for the system and devices and notify the Architect and Engineer of any modifications that are required prior to any conduit installation. The conduit is provided under another subcontractor's scope of work and the vendor accountable for the system shall meet with the Contractor prior to conduit installation and provide any coordination information associated with the systems and devices provided by the vendor. The vendor accountable for a system shall be responsible for providing a backbox schedule to the Contractor prior to conduit installation.
 7. The vendor accountable for a system shall be fully responsible for acquiring and paying for any and all licenses and permits required to perform their Work. If licenses are required before bidding, then the vendor shall not bid any portion of the work until the required licenses are obtained.
- B. Related Work: The vendor accountable for a system shall be fully responsible for reading and understanding all of the Contract Documents associated with Grove Public Schools. Extra care shall be paid to the following Specification Sections that apply directly to the vendor's scope of work.
1. Division 01: "General Requirements" Contract documents.
 2. Division 26: "Electrical" Equipment grounding system. All 120/208/240 VAC branch circuits including conduit, wiring and connections from power distribution panels to terminal strips and/or receptacles in electronic control panels and/or at electronic system devices. All distribution and branch circuits described above shall be connected to the emergency power source.
 3. Division 27: "Communications"

1.3 SCOPE AND RESPONSIBILITY

- A. During the testing, troubleshooting and inspection of this work the vendor accountable for a system will be required to have a knowledgeable representative present to assist in testing. Please note that the vendor must self perform their designated scope of work with their own work force unless approved in writing by the Architect/Engineer. All of the work specified in

Division 28 can be performed by a single qualified vendor.

1. Per the Owner's Request: The Vendor is the contractor that is responsible for providing the custom fabricated equipment, programming, and systems integration for a security electronic system specified in divisions 28. The Vendor accountable will be responsible for furnishing all the equipment and material as specified with the exception of conduit, wire, cable, and fiber where indicated. The termination of the wire, cable, and fiber will be performed by either the vendor accountable for the system being installed or the vendor responsible for the installation of the facility's network data cabling as indicated on the drawings. **For a complete delineation of work refer to each Division 28 specification section.** Per the Owner's request each vendor is identified as follows:
2. Additional parties responsible for work in Division 28 per the Owner's request: **(For a complete delineation of work refer to each Division 28 specification section.)**
 - a Division 26 is responsible for furnish and install all power, conduit, pull strings, and back boxes for all of Division 28 systems. It is the responsibility of each vendor to coordinate their power, conduit, and back box locations with Division 26.
 - b Telephone and Data Network Vendor (Division 27) is responsible for furnishing and installing all network telephone and data cabling and terminations. This includes all of the CAT6 cabling and terminations for the IP Video Surveillance system as well as the CAT6 data cables and terminations to the telephone and data network.
 - c Public Address System: Intercom, clock, and class change signal.

B. Vendors

1. Vendor must base their bid on the products listed herein or approved by Addendum.
2. The Vendor shall have in their employ a superintendent to supervise the work of this division. The superintendent shall be at the site at all times when the work of the vendor's system is being performed.
3. The Vendor may subcontract portions of the work to individuals approved in writing by the Architect/Engineer. The responsibility for system coordination and integration remains with the Vendor accountable for the system.
4. The Vendor accountable for a system shall be fully responsible for acquiring and paying for all licenses and permits required to perform their Work. If licenses are required before bidding, then the Vendor accountable for a system shall not bid any portion of the Work until the required licenses are obtained.

5. The Vendor accountable for a system shall furnish and install all electronic hardware, software, and programming required to provide a complete and operational system.
- C. Related Work Furnish and Installed by Others.
1. Furnishing and installing hardware for non-security doors.
 2. Casework and Millwork.
 3. Equipment grounding system.
 4. All 120/208 VAC branch circuits including conduit, wiring and connections from power distribution panels to terminal strips and/or receptacles in electronic control panels and/or at electronic system devices. All distribution and branch circuits described above shall be connected to the emergency power source.
 5. Conduit and device backboxes.
 6. Communications Telephone/Data network.
 7. Fire Alarm System

1.4 QUALIFICATION REQUIREMENTS

- A. Note: It is the intention that all work will be self performed by the vendor accountable for a system. Any and all work that is subcontracted will be required to be approved in writing by the Architect/Engineer.
- B. Note: Approval of a firm as a Vendor does not relieve that Vendor from furnishing all materials from manufactures as herein specified.
- C. Vendor Qualifications:
1. Vendors shall request approval and shall submit the following qualification data to the Architect in writing fourteen (14) days prior to bid date and, if approved, shall be acknowledged by Addendum prior to bid date. Verbal approval will not satisfy this requirement. Submit a completed AIA 305 form and all additional information herein requested. State that approval is requested for an accountable Vendor. Grounds for disqualification shall exist if in the opinion of the Architect, the information submitted is inaccurate or does not satisfy the qualification requirements.
 2. List at least five (5) projects similar to the requirements of this project. List name and location of installation, date of occupancy by Owner, and Owner's representative to contact with telephone number. Also list the Construction Manager or General Contractor. List the Architect.

D. Manufacturer's Qualifications

1. Refer to each individual specification section for a list of acceptable manufacturers.
2. Throughout the specifications and drawings, types of materials may be approved and specified by the manufacturer's name and catalog number in order to establish standards of quality and performance.

If the bidder desires to substitute, he must request the Architect/Engineer's approval in writing fourteen (14) days prior to bid date. Approval must be issued by written Addendum prior to bid date. The following paragraphs outline the submittals required by the Architect for review in order to consider approval of a substitute product.

E. Electronic Components

1. Provide electronic components from manufacturers who at present have not less than ten (10) years continuous successful experience in the design and manufacture of the type products required for this project.

1.5 SUBMITTALS

A. Submittals shall be organized into four (4) major sections as follows:

1. General data:

- a Table of contents.
- b Descriptive responsibility for all parties where the Vendor accountable for a system must interface with other trades/contractors.
- c System theory of operations that clearly defines the operating parameters of all systems being supplied.
- d A functional systems block diagram showing single-line interconnection of all integrated systems and the major components of each system and methods of integration.
- | | |
|---|---|
| e | Signed certification that the control panel has been coordinated with approved millwork shop drawings. |
| f | Table of contents. |
- g Bill of material for each system listing specification paragraph and device model number submitted.
- h Device sheets to be organized in the same order as equipment are specified.

- i Provide data sheets for additional items as required at the end of each section.
- j The product cut sheets shall be annotated to clearly identify only those specific functions and features that are applicable to this project.

2. Calculations and schedules organized by system:

- a Table of contents.
- b Calculations as specified in each section.
- c Voltage drop calculations for all circuits. Where multiple runs of the same conductor are furnished, figure worse case only. Provide certification that all other runs are shorter.
- d Schedule of points of all electronically operated devices and their functional attributes for all systems being supplied. The schedules shall be organized by system (i.e., locking, audio, duress, etc.) and shall be formatted in alphanumeric order by architectural identification number.

3. Shop Drawings

- a Complete list of drawings.
- b Data sheets for wire and installation components to be used.
- c Wiring diagrams for each device.
- d Review and coordinate conduit drawings and confirm routing locations prior to installation. Provide wiring information for each device, conduit run, and provide wire fill information along with interconnection for all security items.
- e Graphic control panel overlay layout drawings/artwork that depict configuration of the control panel. Layout shall be a color plot that indicates the final colors to be fabricated of the graphic, switches, and LED's.
- f Computer Control Station drawings/artwork that depict configuration of all new control maps. Include utility and administrative screens
- g Rack layout drawings.

h	Communication room and security electronic room layout elevations.
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- B. Submittals not organized as specified shall be considered incomplete and will be rejected.
- C. Submittals for all security electronics sections installed by a Vendor shall be submitted at one time regardless of which firm is providing equipment or installation. It is the responsibility of the Vendor accountable for a system to organize and coordinate the work of divisions **27 and** 28.
- D. The Vendor accountable for a system shall provide one set of a “draft” submittal to the Engineer as described in “A” above. When the Engineer accepts the draft submittal as sufficient for review, the Vendor shall schedule a review meeting by telephone in approximately one week with the Grove School Maintenance Department Director all comments and changes discussed during the meeting shall be noted on the “draft” submittal and given to the Vendor at the end of the meeting. The Vendor accountable for a system shall incorporate those comments and changes into his “final” submittal. The Vendor shall return the “draft” submittal along with the required number of sets of the corrected submittal for final review.
- E. Unless required otherwise in Division 1, the Vendor shall submit four (4) complete sets of documentation for final approval. These are in addition to the draft submittal. Submittals shall include items listed in “A” above.
- F. Provide electronic copies of the submittal and operation manuals in Portable Document Format (PDF). All files shall be compatible with the free Adobe Reader available from Adobe at www.adobe.com. This shall not be a single file, but multiple files on a single CD. All files shall be searchable by text through Adobe Reader. The files shall be stored in folders organized on the CD as follows:
 - 1. Table of Contents
 - a List each major specification section.
 - b Each major specification section shall be subdivided into a Bill of Material for all equipment provided in that section. In each subdivision, provide a detailed list of the equipment indicating manufacturer’s model number and quantity. Each model number shall act as a hyperlink to the datasheet for the listed equipment. Immediately after the model number in parenthesis shall be a reference and hyperlink to the Operation and Maintenance manual.
 - c The user shall be able to navigate to the correct file through the hyperlinks under the table of contents, by manually selecting folders until they find the correction file, or a text search.
 - d Miscellaneous components
 - 1) Racks and hardware

- 2) Relays
 - 3) Wire
- e Intercom, Clock and Ball System
 - 1) Data sheets
 - 2) Operation manual
- f IP Video System Cameras and Controls
 - 1) Data sheets
 - 2) Operation manual
 - 3) Programs and Licenses
 - 4) Installation and Fabrication Drawings.
- G. The submittal shall reflect the systems as they are defined by the project plans and specifications, contract and signed/documented clarifications, substitutions and changes to the above documents by the Architect/Engineer.
- H. The submittal documents shall be updated through out the project construction. These documents shall be included with the operation and maintenance manuals to provide accurate as-built documentation of all systems.

1.6 OPERATING/MAINTENANCE MANUALS

- A. Vendor accountable for a system shall furnish three (3) copies of Operation and Maintenance Manuals for all security electronics systems furnished under this specification. These manuals shall include:
 - 1. Instructions for the care and operation of the systems and materials.
 - 2. Parts list to aid the Owner with ordering replacement parts.
 - 3. As-Built conditions
 - 4. Telephone, Fax, Address, website and instructions for contacting the appropriate personnel during the warranty period as well as for service.
- B. The owner has the right to request an interactive Operation Manual in place of the printed hard copy manuals described above. The interactive manual will utilize the files described in 1.5 F above as a basis for an interactive document utilizing a web browser. All manuals, files, and data sheets would be published in format compatible with Internet Browsers equal to Microsoft Internet Explorer. Hyperlinks would link each item in a master table of contents to individual manuals, CAD drawings, and files. The Vendor shall clarify with the owner the

type of documentation required.

- C. One (1) copy of the programming and source code of the applications software on magnetic media (disk, tape or cartridge). This copy shall have all programmer comments, variable names, and mnemonics included.

1.7 Substitutions

- A. No substitutions of equipment or material will be permitted where specific trade names or a manufacturer is listed, **or where required, to match existing** unless the architect adds them by an addendum.
- B. Materials and products specified by name of manufacturer or brand trade name, **or where required, to match existing** shall be the basis of the bids received unless changed by addendum prior to the bid dates.
- C. In the event a contractor wishes to use any materials or products other than those specified, **or where required, to match existing** he shall make a written request to the Architect, naming the proposed substitution.
- D. All additional costs resulting from the use of an approved substitution shall be borne by the Vendor accountable for a system without additional expense to the Owner. Such additional costs shall include necessary modifications and alterations to structures, equipment, raceways and furnishing of all additional materials required to affect the substitution.

1.8 Coordination

- A. Coordinate with the Grove Maintenance Department Director all security electronics devices that are to be installed in the school on the ~~Level-OnGuard~~ **existing** security management system.
- B. Coordinate work to ensure efficient and orderly installation of each part of the detention work. Coordinate and schedule detention work that depends on other work for proper and timely installation, connection, and operation.
 - 1. Coordinate installation of different electronic components to ensure maximum accessibility for required maintenance, service, and repair.
 - 2. Coordinate provisions to accommodate electronic work scheduled for later installation.
- C. Coordinate selection of electronic products for compatibility.
- D. Coordinate sequencing and scheduling of electronic work. Secure time commitments for performing critical construction activities from separate entities responsible for electronic work.
 - 1. Schedule construction operations in sequence required to obtain best results where installation of one part of electronic work depends on

- installation of other components before or after its own installation.
2. Coordinate sequence of electronic work activities to accommodate tests and inspections.
- E. Coordinate installation of anchorages and embedment's for electronic work.
- F. Coordinate temporary facilities required for electronic work.
1. Arrange for a secure, dry, locked storage area or room for storing electronic equipment products prior to installation.
 2. Receive, unload and distribute products to site storage location and/or installation locations. Defective disfigured products shall be rejected.
- G. Coordinate protection of installed electronic work.
- H. Coordinate preparation of Project Record Documents for electronic work and integrate information from entities responsible for electronic work to form one combined record.
- I. Coordinate preparation of operation and maintenance manuals for electronic work and integrate information from entities responsible for electronic work to form one combined record.
- J. Defective Products: Items found to be defective, either through manufacturing, damage in transit, or by field installation shall be replaced prior to final completion. The Vendor accountable for a system shall make special manufacturing and shipping arrangements to accomplish this replacement prior to completion.
- K. Coordination Meetings: Conduct coordination meetings specifically for electronic work with Grove Public Schools IT department at weekly intervals. Coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and pre-installation conferences.

1.9 WARRANTY

- A. The Vendor accountable for a system shall warrant the systems and equipment furnished under this Section to be free from defects in material and workmanship for a period of one (1) year after substantial completion. Should the General Contractor serve written notice on the Vendor during the warranty period of any such defect (for the convenience of the General Contractor, the Vendor accountable for a system will accept such written notice directly from the Owner), the Vendor accountable for the system shall make good the defect at the vendor's expense.
- B. The Vendor must have full-time employees trained in and devoted to the maintenance and repair of systems and equipment furnished.

- C. Additional Programming: The Vendor shall include all associated costs for a three (3) month post occupancy system walk through with owner and shall allow for forty (40) hours of site specific program changes to the system.

PART 2 - PRODUCTS

- A. Not used

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Listing: All wiring and raceways shall be listed for the intended installation and installed in strict accordance with the National Electric Code as required by the conditions of where it is installed. This includes but is not limited to ratings for riser, plenum, or wet installations.
- B. Abandoned Wire: All wiring not energized shall be terminated at both ends and labeled for future use.
- C. All wiring/cabling shall be labeled with the system type and the device ID at each end. The numbering system used should match the equipment wiring plans and be similar to the following:
 - 1. C### camera CAT 6
 - 2. IC### intercom
 - 3. L### locking device
 - 4. All fiber and fiber tubes should be labeled with the system ID and identified as to which building each fiber feeds.
- D. The label shall be generated by a Brady I.D. Plus Pro Printer or equal and utilize a Brady part# WML-511-292 label or equal. The label used should allow for the clear part of the label to overlap and protect the printed portion of the label from being exposed to damage and/or being rubbed off over time. Hand written labels are not acceptable.

3.2 Inspections and Testing

- A. The Construction Manager, General Contractor and Vendor accountable for a system shall be responsible for issuing a letter to the Architect and Grove School Maintenance Director confirming that the work is complete and ready for inspection and testing. If the project is completed in phases, a letter will be submitted for each phase to be inspected. As an attachment to the letter confirming the work is "complete" and ready for inspection, the Vendor accountable for a system must attach a self generated "field test" report for each

device which confirms in detail that the Vendor has performed their own inspection and test prior to the inspection by the Architect / Engineer.

- B. The inspection shall include Systems, Subsystems, Equipment, and Components. Where these terms are used together or separately, they shall be referred to as "the system". The Vendor shall be prepared to test every point for each system.
- C. The Superintendent and Project Manager shall be present and assist in the inspection / testing of the Work.
- D. If additional inspections are required because the Work is incomplete at the time of the scheduled inspection or if any portion of the system fails to function as designed the Vendor accountable for the ~~failing system shall be responsible for paying for the time and expenses for the Architect and Security Consultant to re-schedule and re-inspect the Work. This cost shall include time and expense for all personnel of the Architectural and Security Consulting firm.~~ The "time" cost shall include an hourly rate of \$185 per hour. This time will include travel time and inspection time. An estimated amount of this time and expense must be paid prior to re-scheduling the inspection.

3.3 — Shakedown Period

- ~~A. Coordinate with the Owner and Construction Manager/General Contractor to establish a shakedown period for the security systems. This shakedown period shall not begin until after "substantial completion" is issued. The shakedown period shall be a minimum of 30 days. If functionality or programming problems occur during the first 30 day, the shakedown period shall be extended for a minimum of two weeks after the systems are functioning dependably.~~
- ~~B. The Vendor accountable for a system shall be responsible for providing a full time technician / programmer at the facility at all times during the shakedown time period to support operation of the facility by the Owner's staff.~~
- ~~C. Maintain a detailed log of all anomalies, malfunction and repairs encountered during the shakedown period. Submit log to the Architect for assessment at the conclusion of the shakedown period.~~
- ~~D. Additional training of Owner's staff may occur during the shakedown period.~~

3.4 SPARE PARTS

- A. The Vendor accountable for a system shall deliver all spare parts at the completion of the project. The spare parts shall be clearly marked as to content and packaged for ease of handling by one (1) person without the use of forklifts or other equipment. The Vendor shall obtain a signature from the owner's representative receiving the spare parts.
- B. The Vendor accountable for a system shall furnish the parts described in each

subsection and mark the specification section on the packaging for each device.

- C. Furnish 2 spare security covers of each type installed.

3.5 TRAINING

- A. The Vendor accountable for a system shall provide, without additional cost to the owner, representatives specially trained in the operation of security systems provided. The representatives shall train the Owner's personnel in operation, repair, and upkeep of each system.
- B. The Vendor accountable for a system shall be responsible for notifying the architect five (5) weeks prior to substantial completion of the total security system that training is scheduled. The Vendor will coordinate the number of owner's representatives to be trained with the owner.
- C. The length of training is directly related to the size and complexity of the system, but in no case shall the security electronics system training be less than one (1) day.
- D. Course Structure
 - 1. The Vendor accountable for a system shall prepare and present to the Architect/Engineer a detailed course outline that specifies each major training module to be covered. The training program on the security equipment shall include the sequences and instructions for proper use and maintenance of all hardware, locking devices, control and monitoring systems and panels. The material content shall be in simple layman's terminology, describe and demonstrate all step-by-step physical operations necessary for proper operation and necessary equipment adjustments. At the time of training, each trainer shall present to the trainees detailed outlines of each training module to be covered and the specific skills and knowledge which the trainee is expected to master within each training module.
 - 2. At a minimum the training program shall be subdivided into the following training modules:
 - a Operation of the System.
 - b Troubleshooting, General Maintenance, Equipment Adjustments, Repair and Replacement of System Components.
 - c Operator Controls.
 - d Descriptive modules organized by specification section.
- E. The Vendor shall videotape each training module. The videotaping does not have to include individual student practice. The Vendor accountable for a

system, in preparing the videotape, shall structure it for easy reference by the facility's training officer for future use.

F. Training Certification

1. Each facility employee shall receive at the conclusion of the security systems training program a certificate certifying his attendance of the total session or portion thereof.
2. Vendor accountable for a system shall maintain attendance records of each class.

END OF SECTION

SECTION 28 05 55

CABINETS AND ENCLOSURES (Per AD#7)

PART 1 - GENERAL

1.1 DESCRIPTION

A. General:

1. Furnish all labor, materials, tools, equipment, and services for all cabinets and enclosures as indicated in accordance with provisions of Contract Documents.
2. Completely coordinate with work of all other trades.
3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
4. See Division 1 for General Requirements.

B. Related work specified elsewhere:

- | |
|--|
| 1. Access Control System — Section 28 13 00 |
| 2. Video Surveillance System (IP) – Section 28 23 00 |

1.2 BASIS OF DESIGN

A. Cabinets and enclosures are provided for the protection and security of the equipment contained therein.

B. All cabinets and enclosures shall be rated for the environment in which they are installed unless noted otherwise.

1. Type 1: Indoor use primarily to provide protection against contact with the enclosed equipment and against a limited amount of falling dirt.
2. Type 3: Outdoor use to provide a degree of protection against windblown dust and windblown rain; undamaged by the formation of ice on the enclosure.
3. Type 3R: Outdoor use to provide a degree of protection against windblown rain; undamaged by the formation of ice on the enclosure.
4. Type 4: Either indoor or outdoor use to provide a degree of protection against falling rain, splashing water, and hose-directed water; undamaged by the formation of ice on the enclosure.
5. Type 4X: Either indoor or outdoor use to provide a degree of protection against falling rain, splashing water, and hose-directed water; undamaged by the formation of ice on the enclosure, resists corrosion.
6. Type 12: Indoor use to provide a degree of protection against dust, dirt, fiber flyings, dripping water, and condensation of non-corrosive liquids.

1.3 QUALITY ASSURANCE

A. Refer to NEC 312 for requirements associated with cabinets and enclosures.

1.4 SUBMITTALS

A. Cabinets and Enclosures:

1. Project data: Layouts of all electronic equipment rooms including floor plans and wall elevations. NEC required working clearances shall be identified.
2. Shop drawings: Assembly drawings of each **cabinet control console** arrangement including plan view, elevations, and sections.
3. Product data: Technical data sheets and specifications for each component.
4. Test results: Cabinet and enclosure temperatures.

1.5 WARRANTY

N/A

1.6 OPERATING AND MAINTENANCE DATA

N/A

PART 2 - PRODUCTS

2.1 GENERAL

A. Acceptable manufacturers:

1. Cabinets and Enclosures:
 - a. Base Electronics
 - b. Hoffman
 - c. Unity Manufacturing
 - d. Altronix
2. Other manufacturers desiring approval comply with Division 01.

2.2 CABINETS AND ENCLOSURES PARTS LIST

A.

Hoffman	Enclosure – Contractor Type 1 with hinged-cover	A48N3609
BASE Electronics	Enclosure - LVPC Low Voltage Power Cabinet 26"H x 20"W x 07"D	Model LVPC 26X20X07
	Enclosure - LVPC Low Voltage Power Cabinet 32"H x 24"W x 07"D	Model LVPC 32X24X07
Unity Manufacturing	Type 3R CT cabinet Single door powder coated color grey 36" W X 48" H X 10" D with 3-point locking t-handle and perforated back panel for mounting wire management & devices	
Altronix	BC600G Enclosure 18"H x 14.5"W x 4.625"D	BC600G

	"J" Designated Enclosure 18"H x 14.5"W x 4.625"D	
--	--	--

2.3 EQUIPMENT ENCLOSURES

- A. Provide wall mounted equipment enclosures where indicated on drawings.
- B. Equipment enclosures shall be provided with hinged door and key lock.
- C. Furnish door alarm contact switch where enclosures are installed in spaces other than dedicated electronic security equipment rooms. Connect wiring to access control system for annunciation on designated access control system display.

2.4 FABRICATION:

- A. Fabricate enclosures to easily accommodate interconnecting cables entering from above or below through the use of auxiliary gutters, cable trays, and conduits. Protect all metal cabinet edges where conductors cross and conduit ends with protective covering or bushing.
- B. Group wires and cables by types, boards and modules, and maintain National Electrical Code clearances throughout the installation, including Class 1, Class 2, communications, and branch circuit power separations. Maintain sufficient and proper separation between microphone-level audio, line-level audio, high-level audio and video cables.
- C. Uniformly organize equipment and cable routing throughout all enclosures, racks, and cabinets. Provide wiring ducts, wire ways, wire posts, D rings, wire saddles to route and secure factory and field wiring. Provide routing for all wiring from point of entry to point of termination to maintain required separation, access to all components, and general organization to the wiring. Neatly dress, route and secure wiring.
- D. Mechanically fasten cabinet raceways and cable clamps to enclosure rear panels, rack members, console members, or to other system components. The use of adhesive fasteners (without mechanical fastener) is not permitted. Furnish and install cable support posts where necessary to properly support cables.
- E. No splices are permitted in cabinet raceways. Exception: Splice to cable shield when within two inches of cable termination is permitted.
- F. Furnish and install metal grounding type outlet strips in each equipment cabinet, enclosure, and rack. Leave a minimum of two unused receptacles at each location for future expansion. Neatly shorten and dress power cords from individual equipment to the outlet strips.
- G. Provide protection from accidental contact of all terminals or exposed conductors over 25 volts within enclosures that contain Class 2 wiring. Use non-conductive barriers, heat shrink or other acceptable methods. Tape of any

kind is not permitted.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All equipment shall be mounted in cabinets and enclosures so as to provide ready accessibility for equipment and termination. All cabinets and enclosures shall be located to provide working clearance in front of accessible equipment as required by the National Electrical Code.
 - 1. Access: Locate with minimum of 36 inches clear space in front /back of each cabinet or rack.
 - 2. Other Access: Provide minimum 36 inches clear space to each side of enclosure which requires access for inspection or service.
- B. Provide wire/cable management throughout cabinets and enclosures. All wire/cable shall be physically supported within six (6) inches of termination.
- C. Bracing: Brace or anchor all free-standing cabinets using Unistrut or other approved method to building structure.
- D. Painting: Touch up all welds, scrapes and other mars in the enclosure finish with a rust inhibiting paint.

END OF SECTION

SECTION 28 23 00

VIDEO SURVEILLANCE (Per AD #7)

PART 1 - GENERAL

1.1 DESCRIPTION

- A. General:
 - 1. Furnish all labor, materials, tools, equipment, and services for all video surveillance systems as indicated, in accordance with provisions of Contract Documents.
 - 2. Completely coordinate with work of all other trades.
 - 3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation. See Division 01 for General Requirements.
- B. Related work:
 - 1. Cabinets and Enclosures – Section 28 05 55

1.2 BASIS OF DESIGN

- A. The Grove Public Schools' new video surveillance system shall be integral part of the Grove Public Schools existing video surveillance system.
- B. The electronic security system integrator shall provide all necessary software updates when needed to achieve a single system control/monitoring and presentation to the operators and staff using the system. The electronic security integrator shall inform the owner in the timely manner (30 days in advance) when the cameras are ready for network connection and integration with the existing camera system
- C. The Division 26 contractor shall provide and install all security surveillance camera wiring and cabling raceways, cable trays, enclosures, EMT conduit pathways, and electrical boxes as specified and as required for the project.
- D. All CAT6 wiring related to security systems (from cameras to network switches, ~~access control panels to network switches~~) shall be provided by the Division 27 contractor.
- E. The owner shall provide Cisco 3700 series network switches (48 port units) to support operation of ~~access control and~~ video surveillance system.
- F. The purpose of the video surveillance system is to provide visual confirmation of movement through security barriers and general surveillance of movement.
- G. Security system integrator shall be responsible for programming all cameras with the IP address, subnet mask, default gateway, DNS servers, temporary user ids, and temporary passwords. Vendor shall contact Grove

Public Schools Department of Technology Services to obtain the IP address, subnet mask, default gateway, DNS servers, temporary user ids, and temporary passwords.

- H. Grove Public Schools shall be responsible for adding and programming new cameras into the School's enterprise video software management system. The security system integrator shall be responsible for programming each camera's specific configuration settings
- I. Security system integrator shall be responsible for aiming and focusing the camera to get the best and clearest possible picture, and the correct field-of-view. Grove Public Schools shall furnish all details related to the directional aim and field-of-view specifications for each camera.
- J. Video surveillance cameras shall be provided by the security system integrator. Wiring for the cameras shall be provided by the Division 27 contractor. Cameras programming (IP address, subnet mask, default gateway, DNS servers, users ID and passwords, focus, FOV, etc) shall be performed by the security system integrator.
- K. The system shall utilize standard IP network cabling (CAT6 and fiber optic) as a transmission medium for video, to create a high performance recording and monitoring system.

1.3 QUALITY ASSURANCE

- A. Work shall be performed in accordance with the applicable national and local codes or standards current at the commencement of installation.
 - 1. IEEE, RS 170 Variable Standard
 - 2. NTSC/PAL
 - 3. IEEE 802.3 digital data network standard
 - 4. Premises cabling standard EIT/TIA 568A
 - 5. Member, MPEG-4 Industry Forum
 - 6. Member, Universal Plug and Play (UPnP) Forum
 - 7. Member, Universal Serial Bus (USB) Implementers Forum
 - 8. Compliance, ISO/IEC 14496 standard (also known as MPEG-4)
 - 9. Compliance, International Telecommunication Union (ITU) Recommendation G.711, "Pulse Code Modulation (PCM) of Voice Frequencies
 - 10. ANSI/EIA-330, Electrical Performance Standards for Closed Circuit Television Camera 525/60 Interlaced 2:1 ("RS-330"): Standards for Picture quality.
 - 11. Certifications and Regulations
 - a. CE, Class A
 - b. UL Listed
 - c. UL Listed to Canadian safety standards
 - d. FCC, Class A
 - e. C-Tick

1.4 SUBMITTALS

- A. Project data: Description of system operation indicating purpose and capabilities of each component of system with functional system diagram

Grove Public Schools
New Performing Arts Center

Project No. 15163
January 12, 2016
AD #7_02.10.16

indicating all interfaces to other systems. Description shall include, and call attention to, all variances from the contract documents.

- B. Shop drawings: Complete installation drawings including system diagrams and terminal point to terminal point wiring diagrams or schedules.
- C. Product data: Technical data sheets and specifications for each and every component.
- D. Testing: Test reports of fiber optic cable installation.
- E. Coordinate meeting with owner will be required during submittal process.

1.5 WARRANTY

~~A. See Section 28-05-10.~~

1.6 OPERATING AND MAINTENANCE DATA

~~A. See Section 28-05-10.~~

PART 2 - PRODUCTS

2.1 GENERAL

- A. Manufacturers:
 - 1. Video surveillance equipment: Avigilon System with the Enterprise License. (To match existing)
 - 2. Wire and Cable: by Division 27 contractor.
 - 3. Network Switches: by Grove Public Schools

2.2 CAMERAS AND ACCESSORIES

- A. Camera Type A: Minidome IP Camera
 - 1. The camera shall be designed for surveillance and industrial applications requiring a rugged, high-performance, color, fixed dome CCD camera with IP network capability.
 - 2. The camera shall be a 1/3-inch format, high resolution, fully automatic, color camera.
 - 3. The camera shall produce 30 images per second (NTSC).
 - 4. or 25 images per second (PAL) of DVD-quality, 4CIF MPEG-4 video over an IP network, and shall support 2CIF, ½ D1, CIF and QCIF resolution.
 - 5. Model: Axis: P-33XX Series
 - 6. Mounting and Viewing Adjustment Requirements: The camera shall include hardware to allow the camera to be surface mounted, wall mounted, interior corner mounted, pendant pipe mounted, and suspended ceiling mounted as specified or indicated on drawings

2.3 MOUNTS

- A. Provide mounts and hardware as required for installation of cameras and monitors as

indicated.

2.4 CAMERA PARTS LIST

- A. Per Manufacturer.

2.5 VIDEO WIRING SYSTEMS

- A. Cables for the video surveillance system shall be provided by Division 27 contractor.
- B. The cabling path from all exterior camera housing back plate mounting brackets to the interior of a building shall consist of a water-proof passage utilizing seal-tight flex conduit (liquid, gray) with the properly sized fitting for attachment to the camera housing back plate mounting bracket.
- C. The seal-tight flex conduit shall extend from the camera housing with a length that is sufficient to protect the patch cable from any hazards that may exist and enable the flex conduit to be sealed at the building's interior end using silicone caulk or another latex based caulk.
- D. If only a flex connector is used for the install, installer shall apply caulk to the inside of the flex connector and surround the patch cable with caulk. Installer shall insert a solid filler material (plastic, foam, paper) into the flex conduit first to provide a dam at the other end of the flex connector to prevent caulk from running and spreading throughout the connector part and accumulating on the inside of the camera's housing unit. This will seal off the inside of the camera housing and prevent the transfer of air, moisture, dirt, insects, and other unwanted materials into the interior camera housing unit.
- E. All security cameras shall be connected to the nearest network data outlet installed specifically for that camera using the specified patch cable for the project.
- F. Coordinate patch cables type with Grove Public Schools Department of Technology Services.
- G. All network data patch cables shall be installed with the factory label end terminated at the insertion point that is closest to the network data switch. The unlabeled end shall be terminated at/toward the device being installed.
- H. Installer shall make a written or electronic note indicating which network data cable port number patch cables are installed at, and deliver that information to the Grove Public Schools Department of Technology Services.
- I. The Communications Contractor of Technology Services shall be responsible for installing patch cables at the School's network communications rooms for the purpose of networking the newly installed cameras with the existing network switch.
- J. When installing patch cables, installer shall strap a piece of electrical tape onto both ends of the patch cable before performing any functions with the patch cable. This requirement is for the protection of the patch cable and the data port terminals during the installation.

- K. Installer shall carefully observe data cabling bend radius specifications when installing and dressing the patch cables. Bends in patch cables shall not be more than 4 times the diameter of the cable.
- L. Patch cables shall not be cut and re-terminated. The factory terminated ends to patch cables shall always be utilized.
- M. Patch cables shall be properly and securely dressed from the camera to the network data connection port. The use of Velcro is the preferred procedure for dressing patch cables. Standard zip cable ties shall be used only if the cable ties are not strapped on too tight.
- N. Patch cables shall be kept off of and away from all piping, HVAC works, electrical fixtures, infrastructure, and equipment, and any objects that might present a problem with electrical interference or pose a damaging hazard to the patch cable.
- O. Installer shall leave some loose slack at both ends with the patch cable installation
- P. Special tools for installing and fishing patch cables shall be utilized by the installer if such equipment is necessary to properly install the patch cables.
- Q. The repositioning of the network data cabling ports for cameras shall be done only if it is deemed necessary to bring the network data cabling ports closer to the camera installation location. Any such repositioning of any network data cabling must be approved by Grove Public Schools prior to the cabling being moved.
- R. Installers shall follow all network data cabling installation standards and specifications if the network data cabling is repositioned anywhere at any time.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install all equipment in accordance with manufacturer's recommendations.
- B. Provide rack mount equipment as required for all equipment shown rack mounted on the drawings.
- C. Make all connections to video equipment with approved connectors for cable used.
- D. Follow the numbering identification format utilized on the architectural drawings for the project.

Installers shall present a spreadsheet that incorporates all camera equipment installed device's MAC addresses, and match that data with the camera Schedule.
- E. Follow Electrical Schedule and Architectural Drawings for Installation Details.
- F. Assign Camera Number per Architectural Drawings and Camera Schedule to

each camera part box before installation begins. Camera Boxes, Camera Housings, and Cameras must be assigned a unique camera number/identifier based on the camera schedule. The Camera Numbers shall remain on the devices throughout the installation process.

- G. Substantial Coordination is required by all responsible parties involved with the installation of security cameras and related equipment. The security system integrator shall coordinate the installation with the architect, the general contractor, Grove Public Schools Construction Management Team, Grove Public Schools Department of Technology Services, the electrical contractor, and any other organization that would require involvement or consultation on the project.
- H. A pre-installation meeting consisting of the security system integrator, the architect, the general contractor, Grove Public Schools Construction Management Team, Grove Public Schools Department of Technology Services, the electrical contractor, and any other entity that would require involvement or consultation on the project shall occur prior to the installation of any cameras.
- I. For new building construction, if required, the electrical contractor shall be responsible for installing EMT conduit for designated cameras and camera system infrastructure to an accessible above ceiling space. For existing buildings, if required, unless otherwise specified, ~~the access control vendor shall be responsible for installing EMT conduit for designated cameras and camera system infrastructure to an accessible above ceiling space.~~
- J. Installation instruction sheets and templates and all parts that are packaged with installed devices and not used during the installation shall be saved and turned over to Grove Public Schools at the completion of the project.
- ~~K. If enclosures are required for special applications such as elevator camera systems, installers shall follow all enclosure installation details presented in the access control enclosure mounting instructions.~~
- L. Camera installation work shall be of exceptional quality, meeting and exceeding security industry standards.
- M. The manufacturer's installation instructions shall be read, understood, and adhered to for all camera and camera system components installed.
- N. Follow all design details for camera installations presented in the detail drawing sheets of the architectural plans. Several different types of design scenarios are presented and are to be followed.
- O. Cameras shall be mounted securely to the mounting surface and are to be installed in a manner where all cameras and camera system components are water-proof.
- P. Impact-driven power tools shall not be used for the installation of any screw type fasteners.
- Q. Electric power drills and electric screw-driver tools shall not be utilized for the installation of any machine threaded, wood, or drywall screw-type fasteners.

- R. All conduit cabling paths for exterior cameras require holes that are one-inch in diameter, unless otherwise specifically noted.
- S. Installers shall use marking tape and/or camera installation templates for pre-marking for the placement of camera mounting brackets for cameras.
- T. For camera installations onto brick, cinderblock, concrete, concrete tilt wall, or any other hardened surface, installer shall create a cabling pathway in the hardened material using a hammer drill and concrete drill bit. Installer shall drill a small starter hole all the way through the wall first before using the larger size concrete drill bits for the final hole.
- U. For camera installations onto brick, cinderblock, concrete, concrete tilt wall, or any other hardened surface, installer shall use an appropriate concrete fastener or anchor to mount the camera to the structure. Greenlee Manufacturing concrete anchors are preferred.
- V. The installation of gooseneck mounts or parapet mounts shall require the utilization of an appropriate fastener device to properly secure the camera mount.
- W. For camera installations onto metal siding, self-tapping screws shall only be utilized if the screws can be firmly secured without stripping the threads created in the metal siding material. It is highly recommended that either metal toggle bolts or a system of threaded screws with nuts and lock-nut washers be used to mount cameras for installations involving any metal siding material.
- X. For camera installations onto wood or any man-made wood-like material, screws shall only be utilized if the screws may be firmly secured to the mounting surface without stripping the threads created in the material. Pre-drilled pilot holes shall be required for the utilization of wood screws for fastening cameras to any wood or wood-like material. It is recommended that either metal toggle bolts or a system of threaded screws with nuts and lock-nut washers be used to mount cameras for installations involving any wood or wood-like material.
- Y. For camera installations into drywall or any drywall-like material, metal sheetrock anchors shall be used. Plastic anchors shall not be used for any camera installations into drywall or any drywall-like material. Metal toggle bolts shall be used if it is determined that the weight of the camera or camera system will exceed the holding force capacity of metal sheetrock anchors.
- AA. For camera installations into ceiling tiles or any ceiling tile-like material, metal toggle bolts shall be used. Plastic anchors or metal sheetrock anchors shall not be used for any camera installations into ceiling tiles or any ceiling tile-like material.
- BB. The use a metal hole-punch marking tool for indenting the surface for drill bit pilot holes is highly recommended.
- CC. Installer shall apply a coating of silicone caulk or another latex-based caulk to any penetrations that extend into the camera's housing, with the exception of cabling penetrations.
- DD. For exterior camera installations onto a building's exterior wall or any vertical

structure, installer shall apply a coating of silicone caulk or another latex-based caulk between the camera and the surface the camera is being mounted to. Caulk shall be applied a total radius of 270 degrees, 135 degrees on each side of the camera from the camera's center point located at the top of the camera.

- EE. Interior building penetrations may be required to establish patch cable pathways from the camera to the camera's network data cabling port. Installer shall create penetrations using the appropriate tools necessary for the material that will contain the penetration.
- FF. EMT conduit shall be installed for all interior building penetrations that are established for patch cable pathways. The EMT conduit shall be 1/2-inch or 3/4-inch in diameter. The EMT conduit shall have appropriate bushings installed at both ends and be de-burred at both ends. The conduit shall be stable and secure within the penetration and have caulk applied between the conduit and the material containing the penetration.
- GG. All penetrations into interior and exterior wall partitions that are designated fire-rated wall partitions shall be sealed using a special fire-rated caulk.
- HH. Any patch cable penetrations that will pass through any type of metal material such as a metal stud top plate shall require the installation of rubber or plastic bushings or grommets. This application shall be required to protect all cabling from damage that could arise from coming in contact with any sharp or ragged metal materials.
- II. For camera installations in and around areas that are highly sensitive to dust, dirt, and debris, installer shall make every effort to keep those work areas clean and free of dust, dirt, and debris that may be generated by the installation work. Installer shall immediately clean and remove any dust, dirt, and debris that is generated when performing installations in and around areas that are highly sensitive to particulate matter. This shall also include the practice of removing ceiling tiles that need to be cut and transporting such ceiling tiles to a different location for cutting where the generation of dust, dirt, and debris does not present a hazard. Boxes or other containers that can effectively catch and contain dust, dirt, and debris shall also be utilized during the installation.
- JJ. Unless otherwise stated, installers shall mount the AXIS Vandal Guard Cover Plate for all AXIS P33XX-VE Cameras Installed.
- KK. Installer shall carefully apply silicone or a latex based caulk to the back of the camera mounting back plate to account for any locations where water could enter the camera's housing.
- LL. Installer shall make sure that all water-proof plugs are properly installed.
- MM. Installer shall place a strip of white electrical tape across the top seam of the camera covering approximately 240 degrees of the housing seam, thereby providing an extra layer of water- proofing to the camera housing, for any camera installed in an exterior environment.
- NN. Installer shall properly replace all ceiling tiles that have been displaced during the installation.

Installer shall leave the location in the state it was before the installation work

began, including but not limited to the following actions: the repositioning of any furniture or other objects moved during the install, the closure of access hatch doors opened, or any other action taken during the installation work.

- OO. All parts, tools, screws, and patch cables that are packaged with cameras and camera devices and components that are not used during the installation shall be saved and turned over to Grove Public Schools at the completion of the project. Manufacturer installation and operation instruction sheets and installation templates shall be saved and turned over to Grove Public Schools at the completion of the project.
- PP. All dust, debris, and fillings created or encountered during the installation process shall be removed from camera housings, holes, and wiring paths prior to the installation of camera devices and components.

3.2 TESTING

- A. The installer shall schedule and perform a security surveillance camera system acceptance test with the Grove Public Schools Department of Technology.
- B. Testing Specifications for each fiber optic cable:
 - 1. All of the following test shall be performed on each fiber in each cable installed and each test results shall be provided in written form
 - 2. End to end attenuation test with power meter. Maximum attenuation on installed fiber optic cables shall be within the manufacturer's specifications
- C. The testing of both windows of each fiber optic cable:
 - 1. If splicing of a fiber optic cable is required due to site conditions, each fiber in the associated cable shall be tested using an Optical Time Division Reflectometer (OTDR). All testing information and locations of each splice shall be in written form and provided with the as-build documents.
 - 2. The following items must be tested on each fiber associated with a splice.
 - a. Test each strand on one wavelength in one direction on each segment, no jumper allowed, and document
 - b. Test for overall continuity and document
 - c. Verify the length of each segment and document
 - d. Locate and indicate all splices on drawings

3.3 WIRING

- A. See Section 28 05 00

3.4 OWNER PERSONNEL TRAINING

- A. Provide training of owner personnel in proper operation and maintenance of video surveillance system.
- B. Training Outline- Operational staff.

1. Functions performed
2. Control Functions
3. Recording/Playback

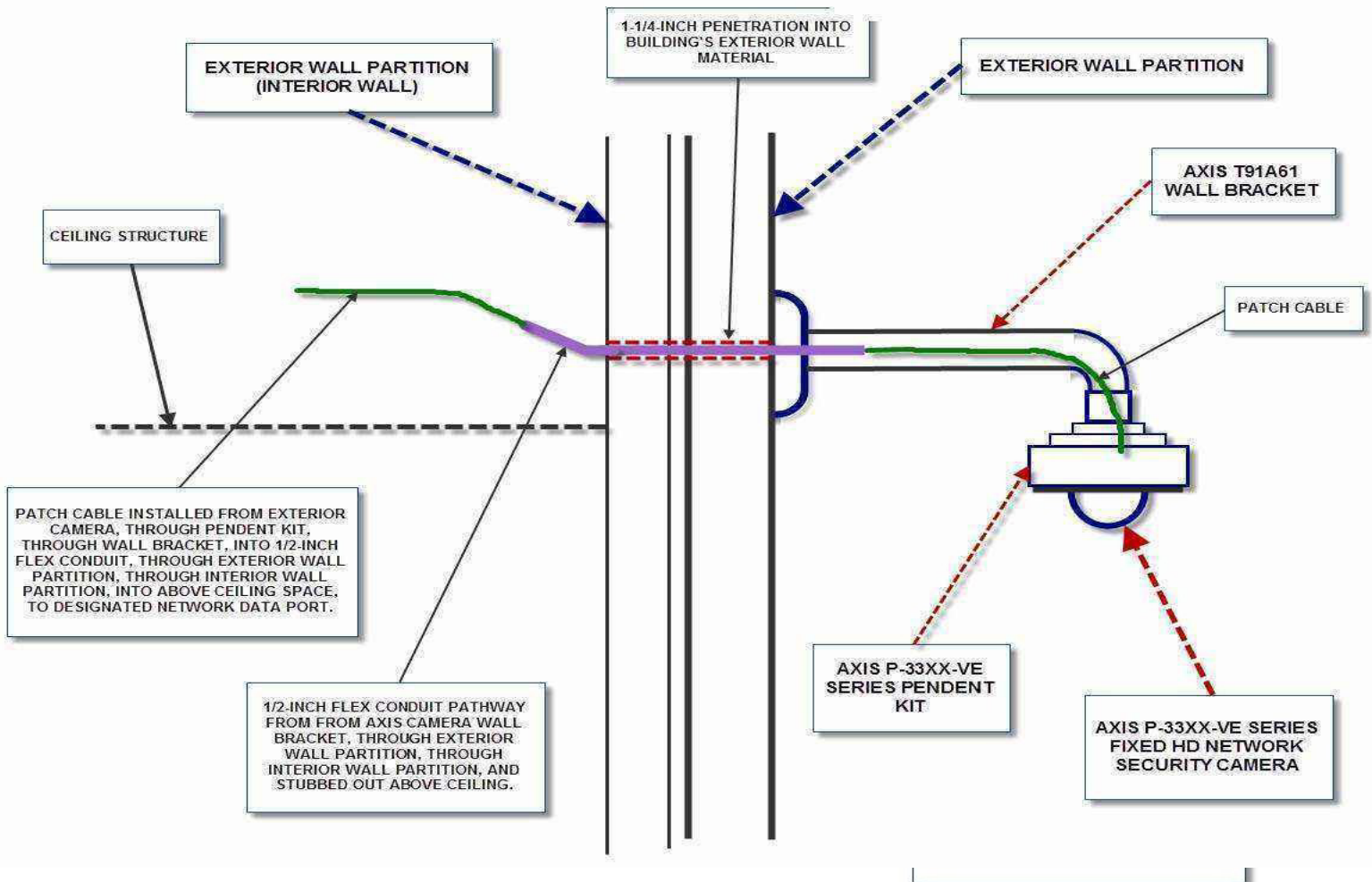
C. Training Outline- Maintenance Staff.

1. Systems Operation
2. Component Review
3. Routine Maintenance/Adjustments
4. Troubleshooting/Repair

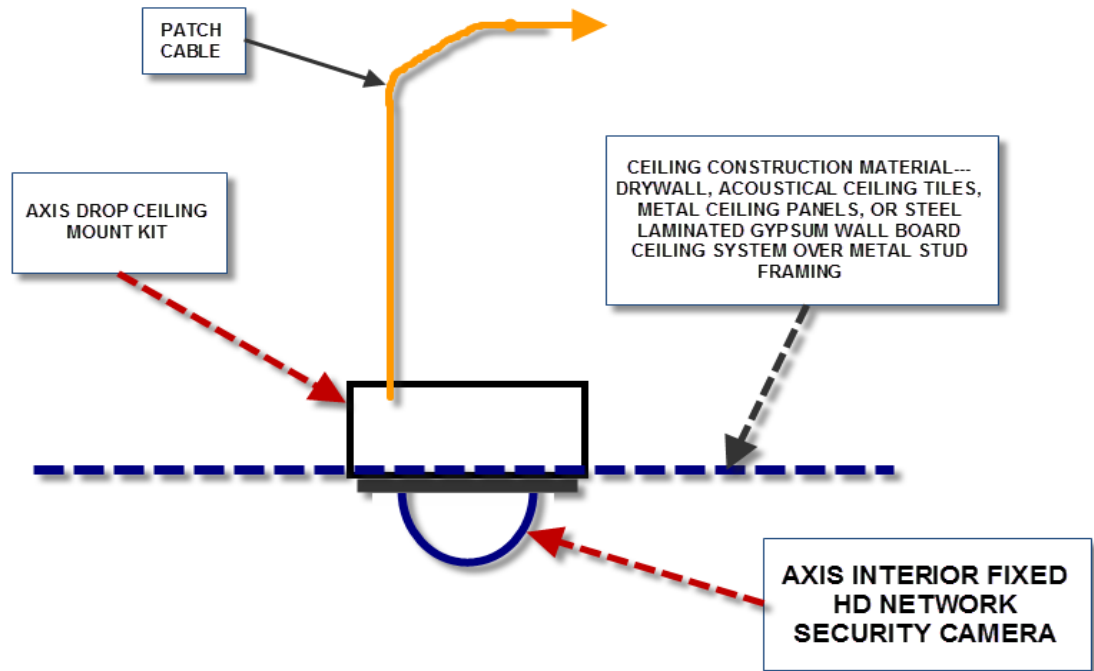
END OF SECTION

APPENDIX A

EXTERIOR FIXED CAMERA INSTALLATION DETAIL DIAGRAM MOUNTING BRACKET / PENDENT KIT



**INTERIOR FIXED SECURITY CAMERA
RECESSED-MOUNT (HORIZONTAL) INSTALLATION DIAGRAM**



**INTERIOR FIXED SECURITY CAMERA
RECESSED-MOUNT (VERTICAL) INSTALLATION DIAGRAM**

PATCH CABLE PATHWAY

1. PATCH CABLE MAY BE ROUTED OUT OF EITHER SIDE OF THE WALL PARTITION DEPENDING ON THE LOCATION OF THE NETWORK DATA CABLING CONNECTION. APPLY AN APPROPRIATE CAULK TO SEAL THE HOLE CREATED IN THE WALL PARTITION FOR THE PATCH CABLE.
2. PATCH CABLE MAY BE ROUTED OUT THE TOP OF THE WALL PARTITION THROUGH THE METAL TOP PLATE. IF THIS ROUTE IS USED, A GROMMET OR BUSHING MUST BE INSTALLED INTO THE METAL WALL PARTITION TO PROTECT THE PATCH CABLE FROM THE SHARP EDGES OF THE PENETRATION IN THE METAL TOP PLATE.

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**METAL TOP PLATE
OF WALL PARTITION
FRAMING STRUCTURE**

PATCH
CABLE

CEILING STRUCTURE
(FALSE CEILING OR
HARD-DECK CEILING)

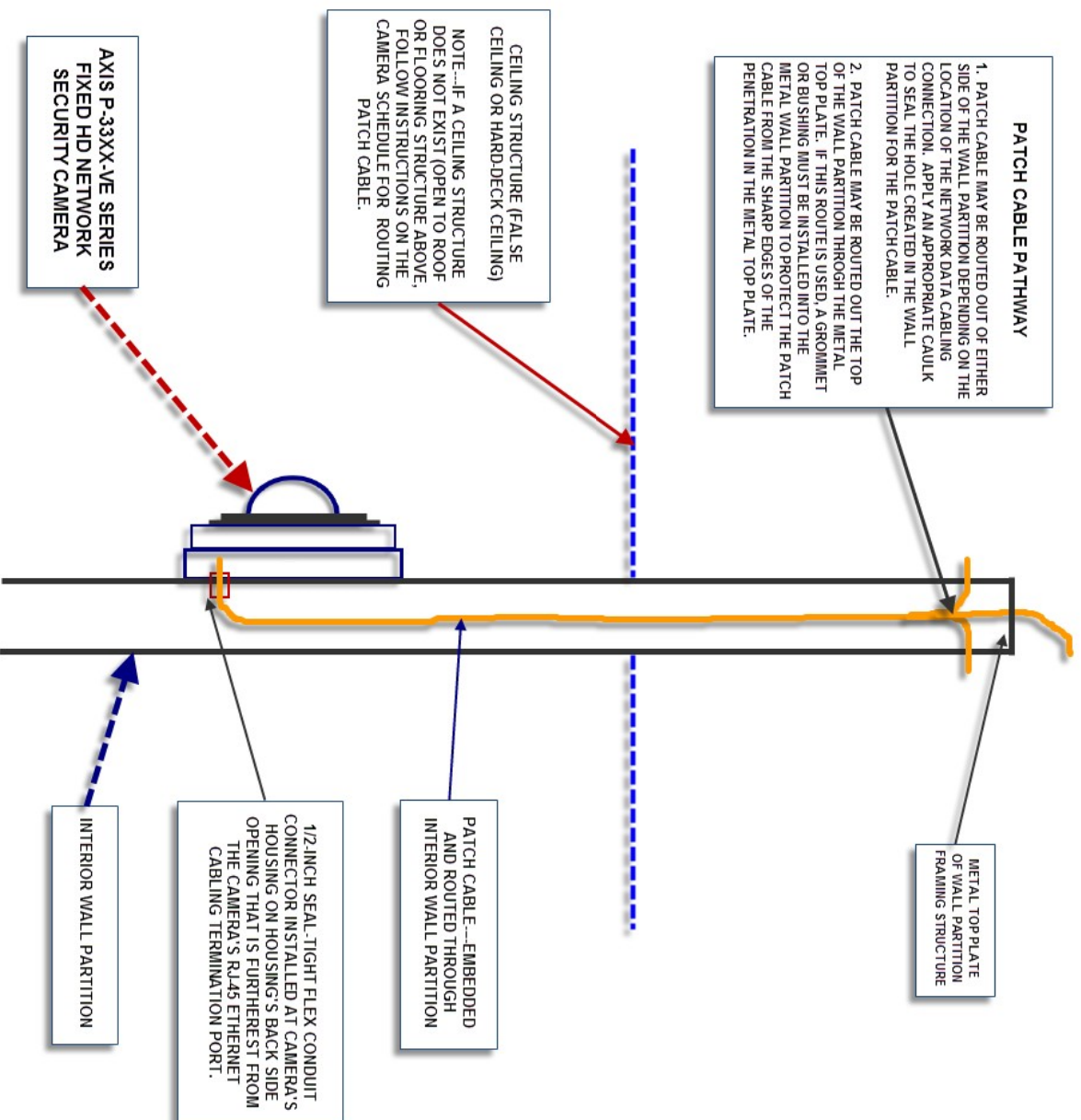
**AXIS INTERIOR FIXED
HD NETWORK
SECURITY CAMERA**

AXIS DROP CEILING MOUNT KIT

INTERIOR WALL
PARTITION

C
N

INTERIOR FIXED SECURITY CAMERA--- SURFACED-MOUNT (VERTICAL) INSTALLATION DIAGRAM



SECTION 28 31 12

DIGITAL ADDRESSABLE FIRE ALARM WITH VOICE ALARM FOR AUDITORIUM (Per AD#7)

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
 - 1. Division 01 General Requirements
 - 2. Division 07 Thermal and Moisture Protection, Section 078413 Penetration Firestopping
 - 3. Division 08 Openings, Section 087100 Door Hardware
 - 4. Division 21 Fire Suppression
 - 5. Division 26 Electrical, Section 260500 Common Work Results for Electrical
 - 6. Division 28 Electronic Safety and Security.
- C. The Contractor shall furnish and install a new Digital Addressable Fire Alarm with Voice Alarm in the Auditorium and associated rooms. The Auditorium System will be a sub system or Satellite System to the exiting building-wide Fire Alarm System.
- D. The Auditorium System Includes;
 - 1. Area 1
 - a. Shop
 - b. Stage
 - 2. Area 2
 - a. Ensemble
 - b. Practice (4)
 - c. Green Room
 - d. Control Room
 - e. Blade Box
 - 3. Area 3
 - a. Lobby
 - b. Ticket Office

1.02 SUMMARY

- A. Section Includes:
 - 1. This specification describes an addressable Fire Detection and alarm signaling system. The control panel shall be intelligent device addressable, analog detecting, low voltage and modular, with digital communication techniques, in full compliance with all applicable codes and standards. The features and capacities described in this specification are required as a minimum for this project and shall be furnished by the successful contractor.
 - 2. The system shall be in full compliance with National and Local Codes.

3. The system shall include all required hardware, raceways, interconnecting wiring and software to accomplish the requirements of this specification and the contract drawings, whether or not specifically itemized herein.
4. All equipment furnished shall be new and the latest state-of-the-art products of a single manufacturer, engaged in the manufacturing and sale of analog fire detection devices for over ten years.
5. The system as specified shall be supplied, installed, tested and approved by the local Authority Having Jurisdiction, and turned over to the owner in an operational condition.
6. In the interest of job coordination and responsibilities, the installing contractor shall contract with a single supplier for fire alarm equipment, engineering, programming, inspection and tests, and shall be capable of providing a "UL Listing Certificate" for the complete system.
7. The system specified shall be that of Cerberus™ PRO which meets the project requirements. Other systems shall be submitted 10 days prior to bid date for approval by the Engineer. All system approved shall meet all the requirements spelled out in this specification. System approval shall be in writing by the Engineer and a copy shall be submitted with the system submittals.

1.03 DEFINITIONS

- A. ASME: American Society of Mechanical Engineers.
- B. FACP: Fire alarm control panel.
- C. FM: FM Global (Factory Mutual).
- D. Furnish: To supply the stated equipment or materials.
- E. Install: To set in position and connect or adjust for use.
- F. LED: Light-emitting diode.
- G. NFPA: National Fire Protection Association. Definitions in NFPA 72 apply to fire alarm terms used in this Section.
- H. NICET: National Institute for Certification in Engineering Technologies.
- I. Provide: To furnish and install the stated equipment or materials.
- J. UL: Underwriters Laboratories.
- K. Cerberus DMS: Cerberus PRO Danger Management Station
- L. MNS: Mass Notification System.

1.04 SYSTEM DESCRIPTION

- A. Basic Cerberus Pro FC922-924 – The system shall be a complete, electrically supervised fire detection and notification system, with a microprocessor based operating system having the following capabilities, features, and capacities:
 1. Up to 16 nodes shall be networkable in a peer-to-peer configuration.

2. Communications between network nodes, each supporting an interactive, self-standing, intelligent local control panel, with system wide display. Any network node shall be capable of supporting a local system with the same capacities and features specified herein.
 3. The local system shall provide status indicators and control switches for all of the following functions:
 - a. Audible and visual notification alarm circuit zone control.
 - b. Status indicators for sprinkler system water-flow and valve supervisory devices.
 - c. Any additional status or control functions as indicated on the drawings, including but not limited to; emergency generator functions, fire pump functions, door unlocking and security with bypass capabilities.
 4. The system shall be listed by UL for configuration as an approved release system for deluge or pre-action sprinkler systems and clean agent fire extinguishing systems.
- B. Cerberus Pro FV922-924 Intelligent Voice Communication -- The system shall be complete, electrically supervised evacuation system using one-way communication with microprocessor-based operating system having the following capabilities, features and capacities:
1. Listed for emergency and non-emergency use.
 2. Listed for MNS from any control point to 'Request/Grant/Deny' and integrated with FC922-924 and FV922-924 (no separate MNS panel)
 3. Ability to support up to two microphones per FV922-924 control panel for one-way paging, and up to 32 microphones in a voice network.
 4. Ability to provide manual voice control.
 5. Two-channel message player supporting 64 messages (32 custom, 32 pre-recorded).
 6. Three simultaneous audio channels for each panel.
 7. Amplifiers shall be rated for 25V or 70.7V RMS, 50 watts. Voice amplification shall be supervised and backed up with like amplifiers. Back up shall be one or two per node.
 8. Ability to provide separate booster amplifier. Amplifiers shall be rated for 25V or 70.7V RMS, 100 watts.
 9. The system shall have the capability to support Peer-to-Peer or Master-Slave network and voice configurations.
 10. Multiple nodes shall provide peer-to-peer voice capability in order to eliminate a single point of failure.
 11. Audio shall be synchronized between nodes in order to take into account common areas.
 12. Speakers shall have the ability to play coded audio tones.
 13. The system shall provide status indicators and control switches for all of the following functions:

- a. Audible and visual notification alarm circuit zone control.
 - b. Speaker circuit zone control.
 - c. Status indicators for sprinkler system water flow and valve supervisory devices.
 - d. Any additional status or control functions as indicated on the drawings, including but not limited to: emergency generator functions, fire pump functions, door unlocking and security with bypass capabilities.
- C. Cerberus Pro 922-924 Networked to Cerberus DMS – The system shall have the ability to connect to the Cerberus DMS. Cerberus DMS shall be a PC based, display and software package UL listed for this application. The Cerberus DMS shall have as a minimum, the following:
 - 1. Intuitive graphical user interface.
 - 2. Global and local command abilities.
 - 3. Time-based control for entire system.
 - 4. SVGA graphics support.
 - 5. Built-in graphics editor.
 - 6. Event display by color and icon.
 - 7. Full touch screen support.
 - 8. Multi-level passwords.
 - 9. The system shall have the ability for up to four (4) command centers with full control of the fire detection.

1.05 PERFORMANCE REQUIREMENTS

- A. General Performance: Comply with NFPA 72 and all contract documents and specification requirements.
- B. All interconnections between this system and the monitoring system shall be arranged so that the entire system can be UL-Certificated.
- C. System shall be a complete, supervised, non-coded, addressable multiplex fire alarm system conforming to NFPA 72.
- D. The system shall have Style 6 circuits. The system shall operate in the alarm mode upon actuation of any alarm initiating device. The system shall remain in the alarm mode until all initiating device(s) are reset and the fire alarm control panel is manually reset and restored to normal.
- E. The system shall be capable of the following configurations. Both configurations are permitted on the same network.
 - 1. The system shall support up to 252 addressable devices, which may be divided in any ratio on one, two, three, or four separate, isolated Class B circuits.

2. The system shall support two loops of 252 addressable devices, each of which may be divided in any ratio on one, two, three, or four separate, isolated Class B circuits.
- F. The system shall support H-series devices and Cerberus™ PRO series devices.
 - G. The system shall have an optional digital alarm communication transmitter.
 - H. The system shall provide an off-normal warning prior to reset for all active devices.
 - I. The system shall be capable of remote monitoring via Cerberus™ PROView®, a proprietary software system that provides a graphical representation of the fire alarm control panel at a remote PC when connected via Ethernet to the system. The display will show the exact state of the panel, including blinking LEDs, and with menu buttons for control.
 - J. The system shall be capable of being configured via a PC Tool.
 - K. In networked systems, each of 4 control panels shall be configurable to be a global annunciator, capable of viewing all other control panels on the network.
 - L. The system shall provide the following functions and operating features:
 1. The FACP and auxiliary power panels shall provide power, annunciation, supervision and control for the system.
 2. Provide Class A initiating device circuits.
 3. Provide Class B initiating device circuits.
 4. Provide Style 7 signaling line circuits for the network.
 5. Provide Style 4 signaling line circuits for the network
 6. Provide two Class A notification appliance circuits. Arrange circuits to allow individual, selective, and visual notification by zone. Notification appliance circuits shall be zoned to correspond with the building fire barriers and other building features.
 7. Provide two Class B notification appliance circuits. Arrange circuits to allow individual, selective, and visual notification by zone. Notification appliance circuits shall be zoned to correspond with the building fire barriers and other building features.
 8. Strobes shall be synchronized throughout the entire building.
 9. Provide electrical supervision of the primary power (AC) supply, presence of the battery, battery voltage, and placement of system modules within the control panel.
 - M. The system shall provide a field test function where one person can test the complete system or a specific area while maintaining full operational function of other areas not being tested. Alarms, supervisory signals, trouble signals shall be logged in system history during the walk-test.
 - N. Alarm functions shall override trouble or supervisory functions. Supervisory functions shall override trouble functions.
 - O. Fire alarm signal initiation shall be by one or more of the following devices:
 1. Manual pull station

2. Heat detector
 3. Addressable area smoke detectors
 4. Addressable Multi-criteria, dual optical smoke detectors
 5. Addressable Multi-criteria smoke detectors with built-in Carbon Monoxide detector
 6. Standard Addressable Duct smoke detector
 7. Specialized Duct Smoke detector
 8. Projected beam detector
 9. VESDA Aspiration Smoke Detector Alarm
 10. Automatic sprinkler system water flow switch.
- P. Activation of any system fire, security, supervisory, trouble, or status initiating device shall cause the following actions and indications at all network Person Machine Interfaces using an LCD display with multiple detail screens.
1. Fire Alarm Condition:
 - a. Sound an audible alarm and display a custom message defining the building in alarm and the specific alarm point initiating the alarm on an LCD display.
 - b. Log into the system history archives all activity pertaining to the alarm condition.
 - c. Print alarm condition on system printer.
 - d. Sound the ANSI 117-1 signal with synchronized audible notification appliances and synchronized strobes throughout the facility.
 - e. Audible signals shall be silenced from the fire alarm control panel by an alarm silence switch. Visual signals shall be programmable to flash until system reset or alarm silencing, as required.
 - f. A signal dedicated to sprinkler system water flow alarm shall not be silenced while the sprinkler system is flowing at a rate of flow equal to a single head.
 - g. System operated duct detectors as per local requirements shall accomplish HVAC shut down.
 - h. Door closure devices shall operate by floor or by local requirements.
 2. Supervisory Condition:
 - a. Display the origin of the supervisory condition report at the local fire alarm control panel LCD display.
 - b. Activate supervisory audible and dedicated visual signal.
 - c. Audible signals shall be silenced from the control panel by the supervisory acknowledge switch.

- d. Record within system history the initiating device and time of occurrence of the event.
 - e. Print supervisory condition to system printer.
3. Trouble Condition
- a. Display at the local fire alarm control panel LCD display, the origin of the trouble condition report.
 - b. Activate trouble audible and visual signals at the control panel and as indicated on the drawings.
 - c. Audible signals shall be silenced from the fire alarm control panel by a trouble acknowledge switch.
 - d. Trouble conditions that have been restored to normal shall be automatically removed from the trouble display queue and not require operator intervention. This feature shall be software selectable and shall not preclude the logging of trouble events to the historical file.
 - e. Trouble reports for primary system power failure to the master control shall be automatically delayed for a period of time equal to 25% of the system standby battery capacity to eliminate spurious reports as a result of power fluctuations.
 - f. Record within system history, the occurrence of the event, the time of occurrence and the device initiating the event.
 - g. Print trouble condition to system printer.

1.06 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories. Complete manufacturer's catalog data including supervisory power usage, alarm power usage, physical dimensions, and finish and mounting requirements.
- B. Power calculations. Battery capacity calculations. Battery size shall be a minimum of 125% of the calculated requirement. Provide the following supporting information:
 - 1. Supervisory power requirements for all equipment.
 - 2. Alarm power requirements for all equipment.
 - 3. Power supply rating justification showing power requirements for each of the system power supplies. Power supplies shall be sized to furnish the total connected load in a worst-case condition plus 25% spare capacity.
 - 4. Voltage drop calculations for wiring runs demonstrating worst-case condition.
 - 5. NAC circuit design shall incorporate a 15% spare capacity for future expansion.
- C. Submit manufacturer's requirements for testing Signaling Line Circuits and device addresses prior to connecting to control panel. At a minimum the following tests shall be required; device address, the usage (Alarm, Supervisory etc), environmental compensation,

temperature ratings for thermal detectors and smoke detector sensitivities. This requirement shall need approval before any wiring is connected to the control panel.

- D. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Wiring Diagrams: For power, signal, and control wiring.
 - 3. Complete drawings covering the following shall be submitted by the contractor for the proposed system:
 - a. Floor plans in a CAD compatible format at a scale of 1/8"=1'-0" showing all equipment and raceways, marked for size, conductor count with type and size, showing the percentage of allowable National Electric Code fill used.
 - b. Provide a fire alarm system function matrix as referenced by NFPA 72, Figure A-7-5.2.2 (9). Matrix shall illustrate alarm input/out events in association with initiation devices. Matrix summary shall include system supervisory and trouble output functions. Include any and all departures, exceptions, variances or substitutions from these specifications and/or drawings at time of bid.
 - 4. Installation drawings shop drawings, and as-built drawings shall be prepared by an individual experienced with the work specified herein.
 - 5. Incomplete submittals shall be returned without review, unless with prior approval of the Engineer.
- E. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
 - 1. Light fixtures.
 - 2. HVAC registers
 - 3. Fire protection equipment interfaces
 - 4. Special suppression system interfaces
- F. Qualification Data: For qualified Installer, Applicator, manufacturer, fabricator, professional engineer, testing agency, and factory-authorized service representative.
- G. Source quality-control reports.
- H. Field quality-control reports.
- I. Operation and Maintenance Data: For all fire alarm equipment, to include in operation and maintenance manuals.
- J. Software and Firmware Operational Documentation:
 - 1. Software operating and upgrade manuals.

2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

K. Warranty: Sample of special warranty.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: The publications listed below form a part of this publication to the extent referenced. The publications are referenced in the text by the basic designation only. The latest version of each listed publication shall be used as a guide unless the authority having jurisdiction has adopted an earlier version.

1. FM Global (Factory Mutual (FM)):FM Approval Guide
2. National Fire Protection Association (NFPA)
 - a. NFPA 70 National Electrical Code
 - b. NFPA 72 National Fire Alarm Code
 - c. NFPA 90A Standard For The Installation of Air Conditioning and Ventilating Systems
 - d. NFPA 101 Life Safety Code
 - e. NFPA 720 Standard for the Installation of Carbon Monoxide (CO) Detection and Warning Equipment
3. Underwriters' Laboratories, Inc. (UL) equipment standards, Latest Edition
 - a. UL Fire Protection Equipment Directory
 - b. UL Electrical Construction Materials Directory
 - c. UL 38 – Manually Actuated Signaling Boxes for Use With Fire Protection Signaling Systems
 - d. UL 228 – Door Holding Devices
 - e. UL 268 - Smoke Detectors for Fire Protective Signaling Systems
 - f. UL 268A - Smoke Detectors for Duct Application
 - g. UL 464 - Audible Signal Appliances
 - h. UL 497A – Secondary Protectors for Communications Circuits
 - i. UL 521 - Heat Detectors for Fire Protective Signaling Systems
 - j. UL 864 - Control Units for Fire Protective Signaling Systems
 - k. UL 1283 – Electromagnetic Interference Filters

- l. UL 1449 - Transient Voltage Surge Suppressors
 - m. UL 1971 - Signaling Devices for the Hearing Impaired
 - n. UL 2075 – Gas and Vapor Detectors and Sensors
 - o. UL 2572 – Mass Notification Systems
 - 4. International Code Council
 - a. International Building Code
 - b. International Fire Code.
 - 5. State and Local Building Codes as adopted and/or amended by The Authority Having Jurisdiction, ADA, and/or State and local equivalency standards as adopted by The Authority Having Jurisdiction.
 - 6. NY-MEA
 - 7. The manufacturer shall have a minimum of 15 years production experience in the manufacture and design of high sensitivity aspiration-type smoke detection systems.
 - 8. ISO 9002
- B. Supplier Qualifications
- 1. The manufacturer of the supplied products must utilize multi-channel product distribution on a national basis to be considered for this bid. The manufacturer must have factory branches as well as independent distributors to allow the end user with the ability to utilize factory trained and authorized competitive service providers after system installation and commissioning.
 - 2. Provide the services of a factory trained and certified representative or technician, experienced in the installation and operation of the type of system provided. The representative shall be licensed in the State if required by law.
 - 3. The technician shall supervise installation, software documentation, adjustment, preliminary testing, final testing and certification of the system. The technician shall provide the required instruction to the owner's personnel in the system operation and maintenance.
 - 4. The suppliers shall furnish evidence they have an experienced service organization, which carries a stock of spare and repair parts for the system being furnished.
 - 5. The equipment supplier shall be authorized and trained by the manufacturer to calculate, design, install, test, and maintain the air sampling system and shall be able to produce a certificate stating such upon request.
- C. Installer Qualifications:
- 1. Before commencing work, submit data showing that the manufacturer has successfully installed fire alarm systems of the same scope, type and design as specified.
 - 2. The contractor shall submit copies of all required Licenses and Bonds as required in the State having jurisdiction.

3. The contractor shall employ on staff a minimum of one NICET level II technician or a professional engineer, registered in the State of the installation.
 4. The contractor shall be qualified by UL for certifying fire alarm systems.
 5. Contractors unable to comply with the provisions of Qualification of Installers shall present proof of engaging the services of a subcontractor qualified to furnish the required services.
- D. Testing Agency Qualifications: Qualified for testing indicated.
- E. Source Limitations for fire alarm equipment: Obtain fire alarm equipment from single source.
- F. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index: 25 or less.
 2. Smoke-Developed Index: 50 or less.
 3. Combustion Characteristics: ASTM E 136.
- G. 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.
- H. Pre-installation Conference: Conduct conference at Project site.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, and shelf life if applicable.
- B. Store materials inside, under cover, above ground, and kept dry and protected from physical damage until ready for use. Remove from site and discard wet or damaged materials.

1.09 PROJECT CONDITIONS

- A. Installed products or materials shall be free from any damage including, but not limited to, physical insult, dirt and debris, moisture, and mold damage.
- B. Environmental Limitations: Do not deliver or install products or materials until spaces are enclosed and weather-tight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire alarm equipment that fail(s) in materials or workmanship within specified warranty period.
1. Warranty Period: 1 year from date of Substantial Completion.

1.11 SERVICE AGREEMENT

Grove Public Schools
New Performing Arts Center

Project No. 15163
January 12, 2016
AD#7_02.10.16

- A. Technical Support: Beginning with Substantial Completion, provide software support for 1 year.
- B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.
 - 1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

1.12 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements all equipment shall be Cerberus™ PRO.

2.02 CONTROL PANEL

- A. The fire alarm control panel shall be microprocessor based using multiple microprocessors throughout the system providing rapid processing of smoke detector and other initiation device information to control system output functions.
- B. There shall be a watchdog circuit, which shall verify the system processors and the software **program. Problems with either the processors or the system program the panel shall activate** a trouble signal, and reset the panel.
- C. The system modules shall communicate with an RS 485 network communications protocol. All module wiring shall be to terminal blocks.
- D. The Cerberus Pro FC and FV 922 system shall be capable of the following configurations. Both configurations are permitted on the same network.
 - 1. The system shall support up to 252 addressable devices, which may be divided in any ratio on one, two, three, or four separate, isolated Class B circuits.
 - 2. The system shall support two DLC of 252 addressable devices, each of which may be divided in any ratio on one, two, three, or four separate, isolated Class B circuits.
- E. The Cerberus Pro FC and FV 924 system shall be capable of the following configurations. Both configurations are permitted on the same network.
 - 1. The system shall support up to 504 addressable devices, which may be divided in any ratio on one, two, three, or four separate, isolated Class B circuits.
 - 2. The system shall support two DLC of 504 addressable devices, each of which may be divided in any ratio on one, two, three, or four separate, isolated Class B circuits.
- F. The system shall be capable of supporting unshielded wiring applications.

- G. The system shall be compliant with the requirements of NFPA 720 as a Carbon Monoxide Detection Control Unit and shall meet the UL 2075 listing requirements. All inputs from CO sensors shall be indicated visually and audibly at the control panel. CO sensor inputs shall be distinct and descriptively annunciated from other signals.
- H. System Components:
1. The System Periphery board shall be capable of 252 intelligent devices distributed between one, two, three, or four Class B SLC circuits. Any trouble on one circuit shall not affect the other circuit. This module controls the signaling from the initiation devices reporting alarms and troubles to the control panel. This module shall also provide the signaling to the field devices for the controlling the output of specific initiation devices. The on board microprocessor provides the periphery board with the ability to function even if the main microprocessor fails. LED's on the board shall provide annunciation for the following; Power, Gnd. Fault, Alarm, Trouble. This board is integral to the system. The board shall be model number FCI2016-U1.
 2. The system periphery board shall be capable of supporting two system drivers of 252 intelligent devices distributed between one, two, three, or four Class B SLC circuits, for a total panel capacity of 504 addressable devices. Any trouble on one circuit shall not affect the other circuit. This module controls the signaling from the initiation devices reporting alarms and troubles to the control panel. This module shall also provide the signaling to the field devices for the controlling the output of specific initiation devices. The on board microprocessor provides the periphery board with the ability to function even if the main microprocessor fails. LED's on the board shall provide annunciation for the following: Power, Gnd. Fault, Alarm, Trouble. This board is integral to the system. The board shall be model number FCI2017-U1.
 3. The voice-system card cage (Model VCA2002-A1) supports the mounting and field wiring for cards used on a Model FV922 / FV924 FACP.
 4. The voice system CPU card (Model VCC2001-A1) is a central-processing unit (CPU) card that controls and monitors all modules and functions for Cerberus PRO intelligent voice-communication FACPs.
 5. The In/Out Voice System Card (Model VCC2002-A1) is the Input / Output card for the Cerberus PRO intelligent voice-communication system.
 6. The Voice Amplifier (25 / 70 V) Card used in 'real time', emergency communication, the 50W amplifier card (Model VCI2001-U1) provides AC power between a Model FV922 / FV924 panel and a site's speaker system. Up to four (4) Model VCI2001 amplifiers are supported in a 3-to1 backup, or 1-to-1 backup schematic on a single Cerberus PRO intelligent voice-communication system: configured as one (1), two (2) or three (3) main amplifiers, and one (1) or two (2) optional backup amplifiers.
 7. The MoNET connection module is used for communication between a Model FCM20-series operating unit and a Voice CPU card (Model VCC2001-A1) in a given Cerberus PRO intelligent voice communication panel. MoNET (Model FCA2031-A1) can additionally provide in system integration between an operating unit and a Modular Ethernet Switch (Model FN2012-A1 in each Cerberus PRO, non-voice FACP.
 8. The Microphone Option Module (Model VTO2004-U3) is used to provide live, non-pre-recorded voice communication on a Cerberus PRO intelligent voice communication panel. Model VTO2004-U3 can serve either as a main microphone installed in the main-system enclosure, or as a remote microphone in a remote enclosure. Up to two (2) Model VTO2004-U3 microphones are supported for each Model FV922 / FV924 FACP.

9. The Switch Option Module (Model VTO2001-U3) is a series of front-end, illuminated and programmable pushbuttons primarily mounted in the middle inner door of each Cerberus PRO intelligent voice-communication FACP. Each Model VTO2001-U3 module has 24 group-switches, thus totaling 48 LEDs, and consists of up to 96 multi-color LED-status indicators. Each LED switch-group is assigned specific functionality during the configuration process. Furthermore, a pushbutton [for each affected zone] will illuminate to acknowledge the command has been received at the Voice System CPU Card, Model VCC2001-A1. Additionally, if no microphone is used, up to eight (8) Model VTO2001-U3 switch-option modules can be used in a given three-eight-unit (3HU) enclosure (Model FHD2007-U3/R3).
 10. As an option, the Model EBA2004-A1 Booster Amplifier is a main board that allows for expansion of speaker zones for additional power to a Cerberus PRO intelligent voice communication system.
 11. The Signal Line Circuits (SLC) shall be tested for opens, shorts and communications with all addressable devices installed before connection to the control panel. Systems without this capability shall have a test panel installed for initial testing to eliminate any possible damage short term or long term to the control panel. After initial testing replace the test panel and proceed with complete testing.
 12. The standard Operator Interface shall have the ability to view events, acknowledge, silence, and reset the system and any networked Cerberus™ PRO control panels, when configured as a global PMI. The standard operator interface can acknowledge, silence, and reset voice panels via Global PMI.
 13. The LED Operator Interface shall have the ability to view events, acknowledge, silence, and reset the system and any networked Cerberus™ PRO control panels, when configured as a global PMI. Additionally, the operator interface provides twelve multicolored configurable LEDs for annunciating system status
 14. The System Periphery Board shall contain 2 Class B NAC circuits rated at 3 amps each with power-limited outputs. The zones shall be isolated and independently supervised. There shall be at least 6 unique codes/signals for each circuit based on system logic. These signals shall be Temporal Code 3 (Evacuation), Steady (Such as "Recall"), Temporal Code 3 (for CO alarms), March Time 120ppm, March Time 60ppm, and March Time 30ppm. The card shall have the following LED's to provide trouble shooting and annunciation; Power, Gnd. Fault, Zone Activation or Trouble. This functionality shall be integral to the system. The card shall be model number FCI2016-U1/FCI2017-U1.
 15. The control panel shall be equipped with four Form C relays for alarm, trouble, supervisory, and programmable output. The system shall provide the mounting of all system cards, field wiring, and panel's inter-card wiring. All power limited field wiring shall be separated from all non-power limited internal wiring. The card shall be model number FCI2016-U1/FCI2017-U1.
 16. The Remote Printer Module (FCA2018-U1) shall provide a means for connecting the Cerberus™ PRO system to a serial or parallel printer for creating a hard copy of system status and configuration reports. The module shall consist of two RS-232 (serial) ports and a single parallel port allowing connection to a parallel printer (such as the PAL-1).
- I. System response time from alarm to output shall be an average of three (3) seconds.
 - J. All system cards and modules shall have Flash memory for downloading the latest module firmware.

K. Passwords:
 Grove Public Schools
 New Performing Arts Center

Project No. 15163
 January 12, 2016
AD#7_02.10.16

1. Technician Level Password - There shall be a 4 character password that a user must enter into the control panel in order to perform such maintenance- and control-related functions at the panel as:
 - a. Arming and disarming devices.
 - b. Activating, deactivating or modifying detector ASD and sensitivity settings.
 - c. Activating and deactivating the History Log function, and deleting obsolete entries.
 - d. Changing the system time and date.
2. Maintenance Level Password - There shall be a 4 character password that a user must enter into the control panel in order to access the panel's reporting functions and walktest functions.
3. Acknowledge Silenceable Reset Access - There shall be a key required to open a locked cabinet that a system user must use in order to acknowledge events, turn silenceable audibles and visuals on and off, and perform panel resets.

L. Networking:

1. Digital communication capabilities supporting Style 4 (Class B) or Style 7 (Class A) communications using either DC digital or fiber optics technologies or combinations of both as required for the control panel to communicate with up to 416 FACPs.
2. Digital communication capabilities supporting Style 4 (Class B) or Style 7 (Class A) communications using either DC digital or fiber optics technologies or combinations of both as required for the control panel to communicate with up to 16 network nodes.
3. Communication protocol shall be of the RS485 type.

M. Degrade Mode Alarm Activation:

1. Each Cerberus™ PRO panel shall operate as a stand-alone fire alarm control panel with complete functionality in the event of loss of communications with other Cerberus™ PRO panels on a network.

N. Software Modifications: The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made. Systems that require the use of external programmers or change of EPROMs are not acceptable.

O. Logic: The fire alarm system shall support generic functions that deal with binary states (True/False, high/low), and produce desired outputs from one or more binary inputs (for example, alarm outputs from detector or manual station inputs). AND, OR, NOT, Any N, Latches, Start Timer, Delay Timer, Restart Timer are generic functions. Generic functions can be used as inputs to other function. The system shall support 500 logic functions.

P. History: The system shall store 2000 events in history. Trouble warnings will occur when the History buffer is full.

Q. Reports:

1. The system shall have the ability to provide configuration, status, queue and history reports.

2. Configuration reports shall provide the following information:
 - a. Custom Messages
 - b. Database Information
 - c. Entity Type
 - d. Zone usage
 - e. Device Category
 - f. Firmware revision
3. Status reports shall provide the following information:
 - a. Disarmed cards and devices
 - b. ASD settings
 - c. Sensitivity in %/foot
 - d. Alarm threshold in %/foot
 - e. Temperature in degrees F.
 - f. Walktest
4. Queue reports shall provide the following information:
 - a. Alarm events with custom message and event time
 - b. Gas alarm events with custom message and event time
 - c. Supervisory events with custom message and event time
 - d. Trouble events with custom message and event time
 - e. Status events with custom message and event time
 - f. Information events
5. History reports shall provide Address, History Type, Description, Time & Date and Custom Message. The following event types shall be reported:
 - a. Alarm events
 - b. Gas alarm events
 - c. Supervisory events
 - d. Status changes
 - e. Alarm verification
 - f. Output activation from logic

- g. System Reset
- h. Event Acknowledgements
- i. Block Acknowledgements
- j. Audible Silence System Flag Changes
- k. Sensitivity Changes
- l. Arm / Disarm Commands
- m. Arm / Disarm By Logic
- n. Manual Output Overrides
- o. Output Overrides By Logic
- p. Time Changes
- q. Menu Logins
- r. ASD Changes
- s. Walktest
- t. Device Input to Logic Activations/Deactivations

2.03 POWER SUPPLY

- A. The system Power Supply FP2011-U1 shall be a 170 Watt, 6-amp that provides 24VDC power for system operation. The power supply shall be filtered and regulated. The power supply provides power for all system operation, including signaling line circuits, notification appliance circuits, auxiliary power, battery charger, and all optional modules. The power supply shall be rated for 120/240 VAC 50/60 Hz. The module shall be model number FP2011-U1
- B. The power supply provides power for all system operation, including signaling line circuits, notification appliance circuits, auxiliary power, battery charger, and all optional modules. The power supply shall be rated for 120/240 VAC 50/60 Hz. The module shall be model number FP2012-U1.
- C. For applications requiring greater than 300W of power, the Model FP2013-U1 power supply can optionally power a Model FV922 or FV924 voice system. Model FP2013-U1 consists of two (2) power supply units and one (1) interconnection cable, in order to balance the power from Model FP2013-U1. Consequently, this power-supply configuration can provide up to 600W at 24VDC.
- D. The battery charger shall be able to charge the system batteries up to 100 AH batteries. Battery charging shall be microprocessor controlled and programmed to select battery sizes.
- E. Transfer from AC to battery power shall be instantaneous when AC voltage drops to a point where it is not sufficient for normal operation.

2.04 SYSTEM ENCLOSURE

- A. Provide the enclosure as specified. Provide the color as to the local AHJ requirements.
- B. Provide three-height-unit backbox as part of the Cerberus PRO intelligent voice-communication system hardware for use with 3HU system enclosures. Specifically, each backbox is used to fasten with a 3HU outer door.
- C. Provide Black cabinet enclosure.
- D. Provide Red cabinet enclosure.

2.05 INTELLIGENT INITIATING DEVICES

A. General

- 1. All initiation devices shall be insensitive to initiating loop polarity. Specifically, the devices shall be insensitive to plus/minus voltage connections.

B. Smoke Detectors – Standard Addressable H-Series

- 1. The detector shall be guaranteed in writing not to false alarm when configured by the factory trained certified technician. The detector must provide up to 11 different environmental algorithms that allow the detector to provide superior false alarm immunity without the need for additional alarm verification delays.
- 2. The detector shall have a multicolor LED to streamline system maintenance/inspection by plainly indicating detector status as follows: green for normal operation, amber for maintenance required, red for alarm.
- 3. The multi-criteria smoke detector shall be an intelligent digital photoelectric detector with a programmable heat detector. Detectors shall be listed for use as open area protective coverage, in duct installation and sampling assembly installation and shall be insensitive to air velocity changes. The detector communications shall allow the detector to provide alarm input to the system and alarm output from the system within four (4) seconds. So as to minimize the effort required by the installing and maintenance technician to appropriately configure the detector to ensure optimal system design, the detectors shall be programmable as application specific. Application settings shall be selected in software for a minimum of eleven environmental fire profiles unique to the devices installed location.
- 4. The detector shall be designed to eliminate the possibility of false indications caused by dust, moisture, RFI/EMI, chemical fumes and air movement while factoring in conditions of ambient temperature rise, obscuration rate changes and hot/cold smoke phenomenon into the alarm decision to give the earliest possible real alarm condition report.
- 5. The intelligent smoke detector shall be capable of providing three distinct outputs from the control panel. The outputs shall be from an input of smoke obscuration, a thermal condition or a combination of obscuration and thermal conditions. The detector shall be designed to eliminate calibration errors associated with field cleaning of the chamber.
- 6. The detector shall support the use of a relay, or LED remote indicator without requiring an additional software address. Low profile, white case shall not exceed 2.5 inches of extension below the finish ceiling.
- 7. For the detector where required, there shall be available a locking kit and detector guard to prevent unauthorized detector removal.

8. The smoke detector shall be model number HFP-11.
9. Where required, there shall be available a programmable remote lamp configurable to remotely duplicate the on-board LED status of another system device with the same software address. It shall be model ILED-H.

C. Smoke Detectors – Advanced Addressable FDO-Series

1. The detector shall be guaranteed in writing not to false alarm when configured by the factory trained certified technician. The detector must provide up to 19 different environmental algorithms that allow the detector to provide superior false alarm immunity without the need for additional alarm verification delays.
2. The detector shall have a tri-color LED to streamline system maintenance/inspection by plainly indicating detector status as follows: green for normal operation, amber for maintenance required, red for alarm.
3. Detector shall utilize state of the art forward backward light scattering technology, with improved detection for smoldering and flaming fire signatures. The detector shall replace the need for ionization detectors due to improved response characteristics to flaming fires.
4. Detector shall incorporate an addressable Carbon Monoxide (CO) detector. The CO detector shall be selectable as a multi-criteria fire detector or as a smoke detector and independent CO detector (in compliance with NFPA 720).
5. Detector shall provide pre-alarm signal at 0.2% obscuration/ft. to meet the performance requirements of National Fire Protection Association Standard 76, Fire Protection of Telecommunications Facilities as a Very Early Warning Fire Detector (VEWFD).
6. The forward backward light scattering technology shall provide improved immunity to spurious activation (deceptive phenomena). The detector shall have a “No False Alarm Guarantee”.
7. The detector shall be RoHS-compliant: it shall meet standards for Reduction of Hazardous Substances (RoHS) by reduction in lead content.
8. Detector shall be UL 2075 compliant as a gas and vapor detector.
9. The multi-criteria fire detector shall be an intelligent digital photoelectric detector with a programmable heat detector. Detectors shall be listed for use as open area protective coverage, in duct installation and sampling assembly installation and shall be insensitive to air velocity changes. The detector communications shall allow the detector to provide alarm input to the system and alarm output from the system within four (4) seconds. So as to minimize the effort required by the installing and maintenance technician to appropriately configure the detector to ensure optimal system design, the detectors shall be programmable as application specific. Application settings shall be selected in software for a minimum of 19 environmental fire profiles unique to the devices installed location.
10. The detector shall be designed to eliminate the possibility of false indications caused by dust, moisture, RFI/EMI, chemical fumes and air movement while factoring in conditions of ambient temperature rise, obscuration rate changes and hot/cold smoke phenomenon into the alarm decision to give the earliest possible real alarm condition report.
11. The detector shall be UL listed for operation in a 95% relative humidity (RH) environment.

12. The detector shall be designed to eliminate calibration errors associated with field cleaning of the chamber.
13. The detector shall support the use of a relay, or LED remote indicator without requiring an additional software address. Low profile, white case shall not exceed 2.5 inches of extension below the finish ceiling.
14. The detector shall support the use of an ambient temperature warning signal at the panel. This temperature shall be user-configurable for the set temperature of the warning and the event type generated by the warning. This event can be used to trigger system logic.
15. For the detector where required, there shall be available a locking kit and detector guard to prevent unauthorized detector removal.
16. Available models:
 - a. OP921. Photoelectric Smoke detector with an operating temperature range of 32°F to 120°F. Available in three parameter sets. Polar insensitivity with isolators. Three color LED.
 - b. OH921. Multi-Criteria incorporating 1 Optical sensor and 1 Thermal sensor with an operating temperature range of 32°F to 100°F. Available in three parameter sets. Polar insensitivity with isolators. Three color LED.
 - c. OOH941. Multi-Criteria incorporating 2 Optical sensors and 2 Thermal sensors with an operating temperature range of 32°F to 120°F. Nineteen selectable profiles. Polar insensitivity with isolators. Three color LED.
 - d. OOH941. Multi-Criteria incorporating 2 Optical sensors, 2 Thermal sensors, and Carbon Monoxide sensing technologies with an operating temperature range of 32°F to 100°F. Nineteen selectable profiles. Polar insensitivity with isolators. Three color LED. CO sensor may be programmed as part of the multi-criteria, or may be an independent CO detector.

D. Heat Detectors – Addressable

1. Thermal Detectors shall be rated at 135 degrees fixed temperature and 15 degrees per minute rate of rise. Detectors shall be constructed to compensate for the thermal lag inherent in conventional type detectors due to the thermal mass, and alarm at the set point of 135 degrees Fahrenheit. The choice of alarm reporting as a fixed temperature detector or a combination of fixed and rate of rise shall be made in system software and be changeable at any time without the necessity of hardware replacement.
2. The detectors furnished shall have a listed spacing for coverage up to 2,500 square feet and shall be installed according to the requirements of NFPA 72 for open area coverage. The thermal detector shall be model number HFPT-11.
3. Model HI921 heat detector shall have the following temperature settings:
 - a. Fixed temperature at 135°F, 145°F, 155°F, 165°F, 174°F
 - b. Rate of Rise at 15°F/ min (8.3°C) at 135°F (57°C)
 - c. Rate of Rise at 15°F/ min (8.3°C) at 174°F (79°C)
 - d. Low temperature warning at 40°F (4.4°C)

E. Duct Smoke Detectors – Addressable

1. For duct detector applications, the smoke detector shall be an intelligent digital photoelectric detector. Detectors shall be listed for use as open area protective coverage, in duct installation and sampling assembly installation and shall be insensitive to air velocity changes.
2. The detector communications shall allow the detector to provide alarm input to the system and alarm output from the system within four (4) seconds. The detector shall be mounted in a duct detector housing listed for that purpose. The duct detector shall support the use of a remote test switch, relay or LED remote indicator. The duct detector shall be supplied with the appropriate sampling tubes to fit the installation.
3. Where duct detectors are exposed to the weather a weatherproof enclosure shall be available. The duct housing cover shall include a test port for functional testing of the detector without cover removal. The duct housing shall include a cover removal switch capable of indicating cover removal status to the fire alarm control panel.
4. The intelligent duct detector shall be model number AD2-P Series. Where required there shall be available a duct housing with an on-board relay. Also where required, there shall be a standalone housing available with its own power supply and test/reset switch that does not require connection to a fire alarm control panel. It shall be model AD2-4W.
5. Duct smoke detector housing shall allow use in duct systems with air velocity ranging from 100 to 4,000 feet per minute, within temperature ranges of 32°F to 120°F per minute, and with relative humidity ranging from 0 to 95%.
6. Duct Housings and Accessories:
 - a. FDBZ492 Global Air Duct Housing for Conventional and Addressable Detectors
 - b. FDBZ492-R Global Air Duct Housing for Addressable P2 Detectors with Relay Application
 - c. FDBZ492-R Global Air Duct Housing for Conventional Detectors with Relay Application
 - d. FDBZ492-PR Global Air Duct Housing for Conventional Detectors with Relay Application and Built-in Power Source
 - e. FDBZ-WP Weather-Proof housing to accommodate all versions of Global Air Duct Housings
 - f. FDBZ-RTL Remote Test Lamp for Conventional Detectors

F. Detector Bases – Addressable

1. Detector bases shall be low profile twist lock type with screw clamp terminals and self-wiping contacts. Bases shall be installed on an industry standard, 4" square or octagonal electrical outlet box.
2. Detectors shall be listed per UL 268A as "direct in duct" without need for a duct housing.
3. Multi-Criteria Fire Detector Model OOHC shall be listed as providing CO detection in duct application.

4. The model number for the standard base shall be DB-11 - 6" Version.
5. The model number for the standard base shall be DB-11E - 4" Version.
6. Where selective localized control of electrical devices is required for system operation, furnish and install detector base with software programmed addressable relay integral to the base. The relay shall switch electrical loads within relay ratings, as indicated on the drawings. Operation of the addressable control circuit shall be independent of the number of detectors and relays on the circuit or the number in an alarm state. Relay bases shall be rated for resistive or inductive load (120VAC or 30VDC) 3 amps. The relay base shall be model number DB2-HR.
7. Where indicated on the drawings, furnish detector base with integral approved audible evacuation alarm signal having an output of 85db @ 10'. The audible signal shall be individually addressable and software programmed for operation. The audible base shall be model number ADBH-11.

Add new audible base information here. We have 2 new audible bases ABHW-4B which can be loop powered and uses temporal 4 as per NFPA720. ABHW-4S is can also use temporal 4 and not loop powered but complies with 520Hz requirement

G. Manual Pull Stations – Addressable

1. Provide addressable manual stations where shown on the drawings, to be flush or surface mounted as required. Manual stations shall contain the intelligence for reporting address, identity, alarm and trouble to the fire alarm control panel. The manual station communications shall allow the station to provide alarm input to the system and alarm output from the system within less than four (4) seconds.
2. The manual station shall be equipped with terminal strip and pressure style screw terminals for the connection of field wiring. Surface mounted stations where indicated on the drawings shall be mounted using a manufacturer's prescribed matching red enamel outlet box.
3. The single action pull station shall be model number HMS-S.
4. The double action pull station shall be model number HMS-D.
5. Where required, there shall also be available pull stations with break glass, capable of explosion proof installation, capable of weatherproof installation, reset key operation, and metal housings.

H. Addressable Interface Devices

1. Addressable Interface Devices shall be provided to monitor contacts for such items as water-flow, tamper, and PIV switches connected to the fire alarm system. These interface devices shall be able to monitor a single or dual contacts. An address will be provided for each contact. Where remote supervised relay is required the interface shall be equipped with a SPDT relay rated for 4 amps resistive and 3.5 amps inductive. The addressable interface modules shall be model number HTRI Series.
2. Where needed, a Conventional Zone Module shall connect to the Signal Line Circuit, which will allow the use of conventional initiation devices. This module shall have the ability to support up to 15 conventional smoke detectors and an unlimited number of contact devices. This module shall also be capable of monitoring Linear Beam detectors and conventional Flame detectors. Where required, there shall be an intrinsically safe

detection solution for NEMA defined intrinsically safe installations (model DI-3IS with ISI-1) compatible with the conventional zone module. The module shall be model HZM.

3. Single Device Damper Monitoring and Control: A single HTRI switch input shall be able to monitor all 3 states of a damper – open, closed, and in transit. A single HTRI-R shall be able to fully control a damper (through the relay connected to the motor control) while also using its switch input for monitoring all 3 states of the damper.
4. Model FCIO422 addressable input/output module shall be insensitive to polarity and shall have capability for up to 4 separate inputs (Class B) or 2 separate Class A inputs and 4 separate outputs (Class B).

2.06 CONVENTIONAL INITIATION DEVICES

A. General:

1. The conventional detector, via the tri-color LED shall provide an automatic UL-listed sensitivity monitoring arrangement in compliance with NFPA 72 sensitivity testing requirements.
2. The detector shall be UL listed for operation in a 95% relative humidity (RH) environment.

B. Photoelectric Smoke Detector shall be microprocessor operated providing indication of detector trouble. The detector shall have a tri colored LED, green for normal, red for alarm and amber for trouble. The detector shall have supervised optics and shall provide an indication when detector requires service or is outside the normal sensitivity range. The detector shall be low profile and plug into a twist lock base. This detector shall be connected to a HZM module to provide a unique address. The photoelectric smoke detector shall be model number PE-11.

C. Model OP121 Photoelectric Smoke Detector shall have listed operating temperature of 32°F to 120°F, 95% RH, 0 to 4000 ft/min air velocity. The detector shall have a tri colored LED, green for normal, red for alarm and amber for trouble. The detector shall have supervised optics and shall provide an indication when detector requires service or is outside the normal sensitivity range. The detector shall be low profile and plug into a twist lock base.

D. Model OH121 Photoelectric and Thermal Detector shall have listed operating temperature of 32°F to 100°F, 95% RH, 0 to 4000 ft/min air velocity. The detector shall have a tri colored LED, green for normal, red for alarm and amber for trouble. The detector shall have supervised optics and shall provide an indication when detector requires service or is outside the normal sensitivity range. The detector shall be low profile and plug into a twist lock base.

E. Model HI121 Electronic Thermal Detector 135° F shall have listed operating temperature of 32°F to 100°F, 95% RH. The detector shall be listed for 2500 sq. ft. coverage. The detector shall be low profile and plug into a twist lock base. The detector shall have a tri colored LED, green for normal, red for alarm and amber for trouble.

F. Electronic Thermal Detector 135° F is a fixed temperature self-restoring detector. The detector is rated for 2500 sq. ft. coverage. The detector shall be low profile and plug into a twist lock base. This detector shall be connected to a HZM module. The thermal detector shall be model number DT-11.

G. Heat Detector explosion proof shall be rate compensation type detector rated for 140° up to 450°. Provide detector with temperature ratings for the appropriate application or as indicated on drawings. The detector shall mount in an explosion proof 4" electrical box. This detector

shall be connected to a HZM module. The explosion proof thermal detectors shall be model number DT-EX Series.

- H. Heat Detector 200° F Rate of Rise detector shall be a dual heat detector using the rate of rise and fixed temperature principles. Rate of rise portion shall operate when a change of temperature exceeds 15° within 60 seconds. The fixed temperature portion shall operate at rated temperature. The detector shall mount to a standard electrical 4" box. This detector shall be connected to a HZM module. The thermal detector shall be model number DT-200R.
- I. Heat Detector 200° F Fixed temperature portion shall operate at the rated temperature. The detector shall mount to a standard electrical 4" box. This detector shall be connected to a HZM module. The thermal detector shall be model number DT-200F.
- J. Heat Detector 200° F Rate Compensated shall use the rate compensation principle of detection. This type of detector compensates for the thermal lag inherent in heat detectors. The detector shall mount in a standard 4" electrical box. This detector shall be connected to a HZM module. The thermal detector shall be model number DT-200CS.
- K. Heat Detector 200° F Rate Compensated Weatherproof shall use the rate compensation principle of detection. This type of detector compensates for the thermal lag inherent in heat detectors. The detector shall mount in a weatherproof 4" electrical box. This detector shall be connected to a HZM module. The thermal detector shall be model number DT-200WP.

2.07 DEVICE PROGRAMMING UNIT

- A. Device Programming Unit: The programming tool shall program the intelligent devices with addresses. The unit shall test the device to respond to its address. Dipswitches and rotary switches shall not be acceptable. The programmer shall be model DPU with carrying case.

2.08 NOTIFICATION APPLIANCES

- A. Series SE – Speaker and Speaker Strobes
 - 1. Speaker appliances shall be Siemens Series SE Speakers, and the speaker-strobe appliances shall be Siemens Series SE Speaker Strobes or approved equals
 - 2. Speakers shall be UL Listed under Standard 1480 for Fire Protective Service, and speakers equipped with strobes shall be listed under UL Standard 1971 for Emergency Devices for the Hearing-Impaired
 - 3. Speaker with strobes shall be certified to meet the requirements of FCC Part 15, Class B
 - 4. All speakers shall be designed for a field-selectable input of either 25 or 70 VRMS; with selectable power taps from 1/8 watt to 2 watts
 - 5. All wall-mount models shall have listed sound output of up to 89 dBA at 10 feet and a listed frequency response of 400 to 4000 Hz
 - 6. All ceiling-mount models shall have listed sound output of up to 87 dB at 10 feet and a listed frequency response of 400 to 4000 Hz
 - 7. Speaker shall incorporate a sealed-back construction
 - 8. All inputs shall employ terminals that accept #12 to #18 AWG wire sizes

9. Strobe intensity, where Multi-Candela appliances are specified, shall have field-selectable settings, and shall be rated per UL Standard 1971 for:
 - a. 15/30/75/110cd (wall mounting)
 - b. 135/185cd (wall mounting)
10. Strobe intensity, where Multi-Candela appliances are specified, shall have field-selectable settings, and shall be rated per UL Standard 1971 for:
 - a. 15/30/75/110cd (ceiling mounting)
 - b. 135/185cd (ceiling mounting)
11. Selector switch for selecting the candela shall be tamper resistant
12. The strobe portion, when synchronization is required, shall be compatible with DSC sync modules, FireFinder XLS panel, FC 922-924, or PAD-3/4 power supply with built-in sync protocol
13. The strobes shall not drift out of synchronization at any time during operation
14. The strobes shall revert to a non-synchronized flash-rate, if the sync module or Power Supply should fail to operate (i.e. – contacts remain closed)
15. Wall-mount speaker and speaker-strobe appliances shall be designed for indoor-flush mounting to 4" x 2-1/8" electrical boxes without need for an extension ring or surface mounting
16. Ceiling-mount, speaker-strobe appliances shall be designed for indoor-flush mounting
17. Speaker and speaker strobe shall incorporate a speaker-mounting plate with a snap-on grille cover
18. The finish of the Series SE speakers and speakers strobes shall be white or red
19. All speaker and speaker-strobe appliances shall listed for Special Applications: Strobes are designed to flash at 1-flash-per-second minimum over their "Regulated Input Voltage Range"

B. SET – Speakers and Speaker Strobes

1. Speaker appliances shall be Siemens Series SET Speakers and speaker-strobe appliances shall be Siemens Series SET Speaker Strobes or approved equals
2. Speakers shall be UL Listed under Standard 1480 for Fire Protective Service, and speakers equipped with strobes shall be listed under UL Standard 1971 for Emergency Devices for the Hearing-Impaired
3. Speaker with strobes shall be certified to meet the requirements of FCC Part 15, Class B
4. All models shall have listed sound output of up to 93 dB at 10 feet and a listed frequency response of 400 to 4000 Hz
5. Speaker shall also incorporate a sealed-back construction

6. All inputs shall employ terminals that accept #12 to #18 AWG wire sizes
7. Strobe portion of the appliance shall produce a flash rate of one (1) flash per second, and shall incorporate a Xenon flashtube enclosed in a rugged Lexan® lens
8. Strobe shall be of low-current design
9. Strobe intensity, where Multi-Candela appliances are specified, shall have field-selectable settings, and shall be rated per UL Standard 1971 for:
 - a. 15/30/75/110cd
 - b. 135/185cd
 - c. 15/75 single Candela (wall mount)
 - d. 15/30/75/95cd or 115/177cd (ceiling mount)
10. Selector switch for selecting the candela shall be tamper resistant
11. The strobe portion, when synchronization is required, shall be compatible with DSC sync modules, FireFinder XLS panel, FC 922-924, or PAD-3/4 power supply with built-in sync protocol
12. The strobes shall not drift out of synchronization at any time during operation
13. Speaker and speaker-strobe appliances shall be designed for indoor surface or flush mounting
14. Speaker and speaker-strobe shall incorporate a speaker-mounting plate with a grille cover, which is secured with two screws for a level finish
15. Grille cover shall mount to standard electrical hardware requiring no additional trim plate or adapter
16. The finish of the Series SET speakers and speakers strobes shall be white or red
17. All speaker and speaker-strobe appliances shall be listed for Special Applications: Strobes are designed to flash at 1-flash-per-second minimum over their "Regulated Input Voltage Range"

C. Series SEF – Speakers and Speaker Strobes

1. Speaker appliances shall be Siemens Series SEF Speakers and speaker-strobe appliances shall be Siemens Series SEF Speaker Strobes or approved equals
2. Speakers shall be UL Listed under Standard 1480 for Fire Protective Service, and speakers equipped with strobes shall be listed under UL Standard 1971 for Emergency Devices for the Hearing-Impaired
3. Speaker with strobes shall be certified to meet the requirements of FCC Part 15, Class B
4. All models shall have listed sound output of up to 87 dB at 10 feet and a listed frequency response of 400 to 4000 Hz

5. Speakers shall be designed for a field-selectable input of either 25 or 70 VRMS, with selectable power taps from 1/8 watt to 2 watts
6. Speaker shall incorporate a sealed-back construction
7. All inputs shall employ terminals that accept #12 to #18 AWG wire sizes
8. Strobe portion of the appliance shall produce a flash rate of one (1) flash per second, and shall incorporate a Xenon flashtube enclosed in a rugged Lexan® lens
9. Strobe shall be of low-current design
10. Strobe intensity, where Multi-Candela appliances are specified, shall have field-selectable settings, and shall be rated per UL Standard 1971 for:
 - a. 15/30/75/110cd (wall mount) -or-
 - b. 135/185cd (wall mount)
 - c. 15/30/75/95cd (ceiling mount) -or-
 - d. 115/177cd (ceiling mount)
11. Selector switch for selecting the candela shall be tamper resistant
12. The strobe portion, when synchronization is required, shall be compatible with DSC sync modules, FireFinder XLS panel, FC 922-924, or PAD-3/4 power supply with built-in sync protocol
13. The strobes shall not drift out of synchronization at any time during operation
14. Strokes shall revert to a non-synchronized flash-rate, if the sync module or Power Supply should fail to operate (i.e. – contacts remain closed)
15. Speaker and speaker-strobe appliances shall be designed for indoor surface or flush mounting
16. Speaker and speaker-strobe shall incorporate a speaker-mounting plate with a grille cover, which is secured with two screws for a level finish
17. Grille cover shall mount to standard electrical hardware requiring no additional trim plate or adapter
18. The finish of the Series SEF speakers and speakers strobes shall be white or red
19. All speaker and speaker-strobe appliances shall be listed for Special Applications: Strokes are designed to flash at 1-flash-per-second minimum over their “Regulated Input Voltage Range”

D. Series ST Strokes

1. Visual-notification appliances shall be Cerberus™ PRO Series ST Strobe Appliances or approved equals
2. The Series ST shall meet and be listed for UL Standard 1971 (Emergency Devices for the Hearing-Impaired) for Indoor Fire Protection Service

3. Strobe shall be listed for indoor use, and shall meet the requirements of FCC Part 15 Class B
4. Strobe appliances shall produce a flash rate of one (1) flash per second over the Regulated Voltage Range, and shall incorporate a Xenon flashtube enclosed in a rugged Lexan® lens
5. All inputs shall be compatible with standard, reverse polarity supervision of circuit wiring by a Fire-Alarm Control Panel (FACP)
6. Strobe Plates, when installed, shall be the Cerberus™ PRO-Series (ST-MC-RETRO) Strobe Plate, and shall have the same electronic circuitry as the Cerberus™ PRO Series ST
7. The Series ST Strobe shall be of low-current design
8. The strobe intensity shall have field-selectable settings, and shall be rated per UL Standard 1971 for 15/30/75/95cd or 115/177cd for ceiling mount where Multi-Candela appliances are specified
9. The selector switch for selecting the candela shall be tamper resistant
10. The appliance shall be compatible with the Cerberus™ PRO DSC sync modules, FireFinder XLS panel, FC 922-924, or PAD-3 power supply with built-in sync protocol when synchronization is required
11. The strobes shall not drift out of synchronization at any time during operation
12. If the sync module or Power Supply fails to operate, (i.e. - contacts remain closed), the strobe shall revert to a non-synchronized flash rate
13. The strobes shall be designed for indoor surface of flush mounting
14. The Series ST Strobe Appliances shall incorporate a Patented, Integral Strobe Mounting Plate that shall allow mounting to single-gang, double-gang, 4-inch square, 100mm European type back boxes, or the SHBBS Surface Back box
15. The Series ST Multi-Candela or Single-Candela Strobe Plate shall mount to either a standard, 4-inch square back box for flush mounting, or shall mount to the Cerberus™ PRO SBL2S back box for surface mounting
16. All notification appliances shall be backward compatible

2.09 DIGITAL COMMUNICATOR

- A. The Multi-Point Digital Alarm Communicator FCA2015-U1 shall be UL864 listed to provide point identification of alarm, supervisory, security and trouble events to a Central or Remote Receiving Station. The DACT shall support the following:
 1. Ademco Contact ID or SIA protocol
 2. Ademco Contact ID selection shall provide the ability to transmit events for up to 999 individual zones
 3. SIA selection shall provide the ability to transmit events for up to 10000 individual points

4. Programming of accounts and phone numbers
5. Dual phone line interface
6. Line fault monitoring.
7. Automatic 24-hour test
8. The DACT supports configurable alarm, alarm restoral, trouble, trouble restoral, supervisory, supervisory restoral, and reset events.
9. The DACT supports Ademco Contact ID alarm event codes for general alarm, smoke detector alarm, waterflow alarm, duct alarm, and manual alarm events.
10. Optionally, the DACT can be programmed to report events by event queue only.

B. VOIP Communicator

1. VOIP communication specification
2. New network modules which allow for VOIP communication. Fire and

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Perform work in accordance with the requirements of NFPA 70, NFPA 72 and NECA 1-2006, Standard of Good Workmanship in Electrical Contracting.
- B. Fasten equipment to structural members of building or metal supports attached to structure, or to concrete surfaces.
- C. In the event that limited energy cable installation is allowed, all cable runs shall be run at right angles to building walls, supported from structure at intervals not exceeding 3 feet and where installed in environmental air plenums, be rated for such use and tied/supported by components listed for environmental air plenums installation.
- D. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.
- E. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- F. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

- G. Provide primary power for each panel from normal/ emergency panels as indicated on the Electrical Power Plans. Power shall be 120 VAC service, transformed through a two-winding, isolation type transformer and rectified to low voltage DC for operation of all circuits and devices.

3.03 BOXES, ENCLOSURES AND WIRING DEVICES

- A. Boxes shall be installed plumb and firmly in position.
- B. Extension rings with blank covers shall be installed on junction boxes where required.
- C. Junction boxes served by concealed conduit shall be flush mounted.
- D. Upon initial installation, all wiring outlets, junction, pull and outlet boxes shall have dust covers installed. Dust covers shall not be removed until wiring installation when permanent dust covers or devices are installed.
- E. "Fire alarm system" decal or silk-screened label shall be applied to all junction box covers.

3.04 CONDUCTORS

- A. Each conductor shall be identified as shown on the drawings at each with wire markers at terminal points. Attach permanent wire markers within 2 inches of the wire termination. Marker legends shall be visible.
- B. All wiring shall be supplied and installed in compliance with the requirements of the National Electric Code, NFPA 70, Article 760, and that of the manufacturer.
- C. Wiring for strobe and audible circuits shall be a minimum 14 AWG, signal line circuits minimum 18 AWG twisted.
- D. All splices shall be made using solder-less connectors. All connectors shall be installed in conformance with the manufacturer recommendations.
- E. Crimp-on type spade lugs shall be used for terminations of stranded conductors to binder screw or stud type terminals. Spade lugs shall have upset legs and insulation sleeves sized for the conductors.
- F. The installation contractor shall submit for approval prior to installation of wire, a proposed color code for system conductors to allow rapid identification of circuit types.
- G. Wiring within sub panels shall be arranged and routed to allow accessibility to equipment for adjustment and maintenance.

3.05 DEVICES

- A. Relays and other devices to be mounted in auxiliary panels are to be securely fastened to avoid false indications and failures due to shock or vibration.
- B. Wiring within panels shall be arranged and routed to allow accessibility to equipment for adjustment and maintenance.
- C. All devices and appliances shall be mounted to or in an approved electrical box.

3.06 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- B. Permanently label or mark each conductor at both ends with permanent alphanumeric wire markers.
- C. A consistent color code for fire alarm system conductors throughout the installation.

3.07 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Testing General:
 - 1. All Alarm Initiating Devices shall be observed and logged for correct zone and sensitivity. These devices and their bases shall be tagged with adhesive tags located in an area not visible when installed, showing the initials of the installing technician and date.
 - 2. Wiring runs shall be tested for continuity, short circuits and grounds before system is energized. Resistance, current and voltage readings shall be made as work progresses.
 - 3. The acceptance inspector shall be notified before the start of the required tests. All items found at variance with the drawings or this specification during testing or inspection by the acceptance inspector shall be corrected.
 - 4. Test reports shall be delivered to the acceptance inspector as completed.
 - 5. All test equipment, instruments, tools and labor required to conduct the system tests shall be made available by the installing contractor. The following equipment shall be a minimum for conducting the tests:
 - a. Ladders and scaffolds as required to access all installed equipment.
 - b. Multi-meter for reading voltage, current and resistance.
 - c. Two-way radios and flashlights.
 - d. A manufacturer recommended device for measuring air flow through air duct smoke detector sampling assemblies.
 - e. Decibel meter.
 - f. In addition to the testing specified to be performed by the installing contractor, the installation shall be subject to test by the acceptance inspector.

3.08 ACCEPTANCE TESTING

- A. A written acceptance test procedure (ATP) for testing the fire alarm system components and installation will be prepared by the engineer in accordance with NFPA 72 and this specification. The contractor shall be responsible for the performance of the ATP, demonstrating the function of the system and verifying the correct operation of all system components, circuits, and programming.

- B. A program matrix shall be prepared by the installing contractor referencing each alarm input to every output function affected as a result of an alarm condition on that input.
- C. The installing contractor prior to the ATP shall prepare a complete listing of all device labels for alphanumeric annunciator displays.
- D. Loop Resistance Tests: Measure and record the resistance of each circuit with each pair of conductors in the circuit short-circuited at the farthest point from the circuit origin. The tests shall be witnessed by the owner and test results recorded for use at the final acceptance test.
- E. Preliminary Testing: Conduct preliminary tests to ensure that all devices and circuits are functioning properly. After preliminary testing is complete, provide a letter certifying that the installation is complete and fully operable. The letter shall state that each initiating and indicating device was tested in place and functioned properly. The letter shall also state that all panel functions were tested and operated properly. The Contractor and an authorized representative from each supplier of equipment shall be in attendance at the preliminary testing to make necessary adjustments.
- F. Final Acceptance Test: Notify the owner in writing when the system is ready for final acceptance testing. Submit request for test at least 14 calendar days prior to the test date. A final acceptance test will not be scheduled until meggar test results, the loop resistance test results, and the submittals required in Part 1 are provided to the owner. Test the system in accordance with the procedures outlined in NFPA 72.
 - 1. Verify that the control unit is in the normal condition as detailed in the manufacturer's operating and maintenance manual.
 - 2. Test each initiating and indicating device and circuit for proper operation and response. Disconnect the confirmation feature for smoke detectors during tests to minimize the amount of smoke or test gas needed to activate the detector.
 - 3. Test the system for all specified functions in accordance with the contract drawings and specifications and the manufacturer's operating and maintenance manual.
 - 4. Visually inspect all wiring.
 - 5. Verify that all software control and data files have been entered or programmed into the FACP.
 - 6. Verify that Shop Drawings reflecting as-built conditions are accurate.
 - 7. Measure the current in circuits to assure that there is the calculated spare capacity for the circuits.
 - 8. Measure voltage readings for circuits to assure that voltage drop is not excessive.
 - 9. Measure the voltage drop at the most remote appliance on each notification appliance circuit.
- G. The acceptance inspector shall use the system record drawings in combination with the documents specified in this specification during the testing procedure to verify operation as programmed. In conducting the ATP, the acceptance inspector shall request demonstration of any or all input and output functions. The items tested shall include but not be limited to the following:

1. System wiring shall be tested to demonstrate correct system response and correct subsequent system operation in the event of:
 - a. Open, shorted and grounded signal line circuits.
 - b. Open, shorted and grounded notification, releasing circuits.
 - c. Primary power or battery disconnected.
2. System notification appliances shall be demonstrated as follows:
 - a. All alarm notification appliances actuate as programmed
 - b. Audibility and visibility at required levels.
3. System indications shall be demonstrated as follows:
 - a. Correct message display for each alarm input at the control display.
 - b. Correct annunciator light for each alarm input at each annunciator and graphic display as shown on the drawings.
 - c. Correct history logging for all system activity.
4. System off-site reporting functions shall be demonstrated as follows:
 - a. Correct zone transmitted for each alarm input
 - b. Trouble signals received for disconnect
5. Secondary power capabilities shall be demonstrated as follows:
 - a. System primary power shall be disconnected for a period of time as specified herein. At the end of that period, an alarm condition shall be created and the system shall perform as specified for a period as specified.
 - b. System primary power shall be restored for forty-eight hours and system-charging current shall be normal trickle charge for a fully charged battery bank.
 - c. System battery voltages and charging currents shall be checked at the fire alarm control panel.

H. Vesda System Tests

1. The contractor shall allow for the manufacturer's representative to attend commissioning of the entire installation in the presence of the owner and/or its representative.
2. All necessary instrumentation, equipment, materials and labor shall be provided by the Contractor.
3. The Contractor shall record all tests and system calibrations and a copy of these results shall be retained on site in the System Log Book.
4. System Checks

- a. Visually check all pipes to ensure that all joints, fittings, bends, sampling points, etc., comply with the Specification.
 - b. Check the system to ensure the following features are operational and programmed in accordance with the specification.
 - 1) Alarm threshold levels
 - 2) Detector address
 - 3) Time and date
 - 4) Time delays
 - 5) Air flow fault thresholds
 - 6) External button operable (Reset/ Isolate)
 - 7) Referencing
 - c. Units set to U.S. /S.I.
 - d. Check to ensure that all ancillary warning devices operate as specified.
 - e. Check interconnection with Fire Alarm Control Panel to ensure correct operation.
5. Tests
- a. Introduce Smoke into the Detector Assembly to provide a basic functional test.
 - b. Introduce smoke to the least favorable Sampling Point in each Sampling Pipe. Transport time is not to exceed two minutes.
 - c. Activate the appropriate Fire Alarm zones and advise all concerned that the system is fully operational. Fill out the log book and commissioning report accordingly.
 - d. If more than two bargraph divisions illuminate under normal conditions (no smoke), review event log for two (2) weeks from date of commissioning and make appropriate adjustments to the alarm and delay thresholds.

3.09 DOCUMENTATION

- A. System documentation shall be furnished to the owner and shall include but not be limited to the following:
 - 1. System record drawings and wiring details including one set of reproducible drawings, and a CD ROM with copies of the record drawings in DXF format for use in a CAD drafting program.
 - 2. System operation, installation and maintenance manuals.
 - 3. System matrix showing interaction of all input signals with output commands.
 - 4. Documentation of system voltage, current and resistance readings taken during the installation, testing and ATP phases of the system installation.

5. System program showing system functions, controls and labeling of equipment and devices.

3.10 PROTECTION

- A. Remove and replace devices and panel components that are wet, moisture damaged, or mold damaged.

3.11 DEMONSTRATION

- A. Instructor: Include in the project the services of an instructor, who shall have received specific training from the manufacturer for the training of other persons regarding the inspection, testing and maintenance of the system provided. The instructor shall train the employees designated by the owner, in the care, adjustment, maintenance, and operation of the fire alarm system.
- B. Training sessions shall cover all aspects of system performance, including system architecture, signaling line circuit configurations, sensor and other initiating device types, locations, and addresses, fire alarm control panel function key operation, and other functions as designated by the owner.
- C. Required Instruction Time: Provide 16 hours of instruction after final acceptance of the system. The instruction shall be given during regular working hours on such dates and times as are selected by the owner. The instruction may be divided into two or more periods at the discretion of the owner. One training session shall be videotaped by the contractor. Videotapes shall be delivered to the owner.
- D. Provide a typeset printed or typewritten instruction card mounted behind a Lexan plastic or glass cover in a stainless steel or aluminum frame. Install the frame in a conspicuous location observable from the FACP. The card shall show those steps to be taken by an operator when a signal is received as well as the functional operation of the system under all conditions, normal, alarm, supervisory and trouble. The instructions shall be approved by the owner.
- E. Comprehensive system troubleshooting training shall be provided for a single individual designated by the owner. This session shall be separate and distinct from the above described sessions.
- F. All training sessions shall be conducted following final system certification and acceptance. Three additional training sessions shall be provided for all security personnel on all shifts six months after final system certification.
- G. All training sessions shall be conducted by an authorized fire alarm system distributor representative, who has received specific training from the manufacturer for the training of other persons regarding the inspection, testing, and maintenance of the system provided.

END OF SECTION

SYMBOLS		SYMBOLS		ABBREVIATIONS	
	DESCRIPTION		DESCRIPTION		DESCRIPTION
	DOWNLIGHT LIGHTING FIXTURE OF TYPE INDICATED		DISCONNECT SWITCH	A	AMPERE
	WALL WASHER DOWNLIGHT LIGHTING FIXTURE OF TYPE INDICATED		COMBINATION MOTOR STARTER & DISCONNECT SWITCH	AFF	ABOVE FINISHED FLOOR
	WALL MOUNTED LIGHTING FIXTURE OF TYPE INDICATED		MAGNETIC MOTOR STARTER	BAS	BUILDING AUTOMATION SYSTEM
	FLUORESCENT LTG. FIXTURE OF TYPE INDICATED		MOTOR	BHD	BARE HARD DRAWN
	FIXTURE ON LIFE-SAFETY BRANCH EMERGENCY CIRCUIT		EMERGENCY POWER OFF (EPO) PUSHBUTTON	C.	CONDUIT
	FLUORESCENT STRIP LIGHT		PHOTOCELL	C/B	CIRCUIT BREAKER
	FLUORESCENT STRIP LIGHT WITH BACK-UP EMERGENCY BATTERY PACK		CONTACTOR	CKT	CIRCUIT
	EXIT LIGHT MOUNTED FROM ABOVE		TIME CLOCK	C.O.	CONDUIT ONLY
	WALL MOUNTED EXIT LIGHT		PROXIMITY CARD READER	C.R.	COIL RELAY
	EMERGENCY BATTERY PACK LIGHT		REQUEST TO EXIT	DPDT	DOUBLE POLE DOUBLE THROW
	JUNCTION BOX		AUTOMATIC DOOR PUSHPLATE	EP	EXPLOSION PROOF
	DUPLEX RECEPTACLE ON NORMAL POWER CIRCUIT		AUDIO VISUAL WALL PLATE AND BACKBOX	FACP	FIRE ALARM CONTROL PANEL
	DUPLEX RECEPTACLE ON NORMAL POWER CIRCUIT ABOVE COUNTER & BACKSPASH		BELL	FAAP	FIRE ALARM ANNUNCIATOR PANEL
	QUADPLEX RECEPTACLE ON NORMAL POWER CIRCUIT		HORN	GD	GENERAL DUTY
	ISOLATED GROUND RECEPTACLE ON NORMAL POWER CIRCUIT		BUZZER	GFCI	GROUND FAULT CIRCUIT INTERRUPTER
	DUPLEX RECEPTACLE INTENDED FOR TV USE - VERIFY ELEVATION		PUSHBUTTON	GFP	GROUND FAULT PROTECTION
	DUPLEX RECEPTACLE IN FLOOR ON NORMAL POWER CIRCUIT		WALL MOUNTED VACANCY SENSOR	HD	HEAVY DUTY
	SIMPLE RECEPTACLE ON NORMAL POWER CIRCUIT		CEILING MOUNTED VACANCY SENSOR, 1000 SQUARE FEET RANGE, 360°	KVA	KILOVOLT-AMPERES
	SPECIAL PURPOSE OUTLET ON NORMAL POWER CIRCUIT		CIRCUIT BREAKER AMPERE RATING AND # POLES SHOWN	KVAR	KILOVOLT-AMPERES REACTIVE
	T.V. OUTLET		POWER TRANSFORMER-RATING INDICATED	KW	KILOWATT
	DATA OUTLET		CONNECTION	KWH	KILOWATT-HOURS
	CONDUIT HOMERUN TO PANEL INDICATED		SURGE PROTECTION DEVICE	LIG	LONG, INSTANTANEOUS AND GROUND FAULT ADJUSTABLE TRIP SETTINGS
	UNDERGROUND CONDUIT HOMERUN TO PANEL INDICATED		WATT HOUR METER	LSIG	LONG, SHORT, INSTANTANEOUS AND GROUND FAULT ADJUSTABLE TRIP SETTINGS
	OUTDOOR UNDERGROUND CONDUITS		POTENTIAL TRANSFORMER	MCB	MAIN CIRCUIT BREAKER
	UNDERGROUND TELEPHONE CONDUIT		CURRENT TRANSFORMER	MLO	MAIN LUGS ONLY
	ELECTRICAL CONNECTION TO EQUIPMENT INDICATED		GROUND FAULT RELAY	NF	NON-FUSED
	TELEPHONE BACKBOARD OR CABINET		GROUNDDED WYE WINDING CONNECTION	NIC	NOT IN CONTRACT
	PANEL OR SWITCHBOARD - 250V OR BELOW		DELTA WINDING CONNECTION	NL	NIGHT LIGHT
	SPECIAL PANEL AS INDICATED		NORMALLY OPEN CONTACT	OHE	OVERHEAD ELECTRICAL
	DRY TYPE TRANSFORMER		NORMALLY CLOSED CONTACT	SPD	SURGE PRETECTION DEVICE
	SINGLE POLE SWITCH		RESISTIVE LOAD	SPST	SINGLE POLE, SINGLE THROW
	TWO POLE SWITCH		UTILITY POWER POLE	TVSS	TRANSISTOR VOLTAGE SURGE SUPPRESSOR
	THREE-WAY SWITCH & PILOT		FIRE ALARM PULL BOX	U.G.	UNDERGROUND
	THREE-WAY SWITCH		INTERCOMM - SEE NOTE 1.	UNO	UNLESS NOTED OTHERWISE
	FOUR-WAY SWITCH		CEILING MOUNTED SPEAKER	V	VOLT
	SINGLE POLE SWITCH & PILOT				

LIGHT FIXTURE SCHEDULE			
TYPE	DESCRIPTION	LAMPS	MANUFACTURER
A2	2X4 RECESSED-LED	LED-6000 LUMENS	LITHONIA #2GTL460LEZ1LP840
A2E	SAME AS TYPE "A2" EXCEPT WITH EMERGENCY BATTERY PACK	LED-6000 LUMENS	LITHONIA #2GTL460LEZ1LP840-EL14L
A2F	SAME AS TYPE "A2" EXCEPT WITH FLANGE KIT FOR GYPSUM BOARD CEILING	LED-6000 LUMENS	LITHONIA #2GTL-F-460LEZ1LP840
A2FE	SAME AS TYPE "A2B" EXCEPT WITH EMERGENCY BATTERY PACK	LED-6000 LUMENS	LITHONIA #2GTLF-F-460LEZ1LP840-EL14L
A3	2X4 RECESSED-LED	LED-7200 LUMENS	LITHONIA #2GTL472LEZ1LP840-EL14L
A3E	SAME AS TYPE "A3" EXCEPT WITH EMERGENCY BATTERY PACK	LED-7200 LUMENS	LITHONIA #2GTL472LEZ1LP840-EL14L
A4	4FT-WALL MOUNTED CORRIDOR	2-F32T8	LITHONIA #W-2-32-MVOLT-2/1-GE810IS
A4E	SAME AS TYPE "A4" EXCEPT WITH EMERGENCY BATTERY PACK	2-F32T8	LITHONIA #W-2-32-MVOLT-2/1-GE810IS-EL
B2E	6" APERTURE-LED-DOWNLIGHT FIXTURE WITH EMERGENCY BATTERY PACK	LED-2500 LUMENS	GOTHAM #EVO35-25-GAR-MD-LSS-MVOLT-E21-EL
BF	SAME AS TYPE "B2E" EXCEPT WITH FLANGE KIT	LED-2500 LUMENS	GOTHAM #EVO35-25-GAR-MD-LSS-MVOLT-E21
BFE	SAME AS TYPE "BF" EXCEPT WITH EMERGENCY PACK	LED-2500 LUMENS	GOTHAM #EVO35-25-GAR-MD-LSS-MVOLT-E21-ELR
C	LED WALL MOUNTED - CYLINDER	LED	BETA CALCO #62-6021-FINISH
D	LED WALL MOUNTED WITH BATTERY BACKUP	LED	LIGHTWAY #WPWN-8-LED-U-30W-3-Z99-CSP-B810
F	INDUSTRIAL 1X4 SUSPENDED WITH WIRE-GUARD	LED	LITHONIA #ZLIF-L48-4500-MDD-MVOLT-35K-80CRI-WH-ZACVH
FE	SAME AS TYPE "F" EXCEPT WITH EMERGENCY BATTERY PACK	LED	LITHONIA #ZLIF-L48-4500-MDD-MVOLT-35K-80CRI-WH-E7W-ZACVH
G	SHOWER LED-FIXTURE	1500 LUMENS	LITHONIA # REALSC 06 MW ESL 1500L 0.955C-277-LP6LN
H	2X2 RECESSED-LED	3300 LUMENS	LITHONIA #2BLT2-33L-ADSM-EZ1-LP835
HE	SAME AS TYPE "H" EXCEPT WITH EMERGENCY BATTERY PACK	3300 LUMENS	LITHONIA #2BLT2-33L-ADSM-EZ1-LP835-EL14 LENGTH AS INDICATED ON PLANS
J	OUTSIDE WALL MOUNTED FIXTURE	3249 LUMENS	EELP #WP15-Q-23L-QT-BLK
K1	LED 4 FT STRIP LIGHT	3000 LUMENS 33WATTS	ZLD1-L48-3000LM-FST-MVOLT-35K-80CRI-WH
K2	LED 2 FT STRIP LIGHT	2500 LUMENS 22WATTS	ZLD1-L24-2500LM-FST-MVOLT-35K-80CRI-WH
M	MAKE UP LIGHT -ABOVE MIRRORS AND ALSO AT BOTH SIDES OF MIRRORS	LED	EUREKA #3540-35-LED-17.30-VOLT-SC-WH
N	LINEAR LED LIGHTS FOR ROOF SIGNAGE-"GROVE PERFORMING ARTS CENTER" PROVIDE TWO TQD TRANSFORMERS AT 120V PRIMARY	565 LUMENS PER FOOT, 12.2 W/FT	WINONA #WVSL-LCB-XS-MSL4-200ADJ-15-LLP6A-30K-24V-200SEA-NAA.
S	OUTSIDE STRIP LIGHT	LED	PHILLIPS #EW ACCENT MX POWERCORE PROVIDE LENGTH AS INDICATED ON PLANS. PHILLIPS ITEM #523-00008-04
X1	LED-SINGLE FACE EXIT LIGHT WITH EMERGENCY BATTERY PACK	WITH UNIT	EELP #XE2RWEM-SD
S1	LED POLE MOUNTED PARKING LOT FIXTURE	LED-18390 LUMENS	LITHONIA #K4D-LED-60C-1000-40K-R3-208-PUMPBAK-DOBXD, 25FT SQUARE POLE-SPD-DAD12P
S2	SAME AS TYPE "S1" EXCEPT DOUBLE FIXTURES	LED-18390 LUMENS	LITHONIA #K4D-LED-60C-1000-40K-R3-208-PUMPBAK-DOBXD, 25FT SQUARE POLE-SPD-DAD12P-2BRACKETS

NOTES: ALL OUTSIDE LIGHT FIXTURES SHALL BE FINISHED BLACK ON COLOR. TO BE APPROVED BY ARCHITECT



Jan 26, 2016

RE: Grove Public School Performing Arts Center
Grove OK

Type	MFG	Part
A2	LSI	GA24 LED VHO NW UE P12
A2E	LSI	GA24 LED VHO NW UE P12 EM
A2F	LSI	GA24 LED VHO NW UE P12 FK24
A2FE	LSI	GA24 LED VHO NW UE P12 EM FK24
A3	LSI	GA24 LED VHO NW UE P12
A3E	LSI	GA24 LED VHO NW UE P12 EM
A4	LSI	BRB 2 32 SSO10 UE
A4E	LSI	BRB 2 32 SSO10 EM UE
B2E	VANTAGE LUMINAIRES	A6VOPLD 1 30 35K L6060 SCL EM
BF	VANTAGE LUMINAIRES	A6VOPLD 1 30 35K L6060 SCL
BFE	VANTAGE LUMINAIRES	A6VOPLD 1 30 35K L6060 SCL EM
C	LSI	XALV WCC LED20 NW SP 120V SCUD X J4R WM
D	LSI	XCHWM3 X LED 28 450 NW UE BRZ BB
F	LSI	SDL 4 LED HO WW UE TCH10
FE	LSI	SDL 4 LED HO WW UE EM TCH10
G	VANTAGE LUMINAIRES	A6VOPLD 1 15 35K L6015 SCL AT
H	LSI	LPASC22 LED HO WW UE
HE	LSI	LPASC22 LED HO WW UE EM
J	CGF DESIGN INC	TA-G LED 30 CT4 UNV EBX BK
K1	LSI	SDL 4 LED SS WW UE
K2	LSI	SDL 2 LED SS WW UE
M	HINKLEY	53844PN
N	BOCA FLASHER	HPNLS HO 3000K 10 120V A W S C
S	INDUSTRIAL LIGHTING PRODUCT	WT 60WLED UNIV 40 DPCL
X1	LSI	EX R U WB WH SD2
S1	LSI	XGBM 3 LED HO NW UE BRZ
S1-POLE	LSI	5SQB5 S07G 25' S BRZ/5BC/ABOLT
S2	LSI	XGBM 3 LED HO NW UE BRZ
S2-POLE	LSI	5SQB5 S07G 25' D180 BRZ/5BC/ABOLT

RE: GROVE SCHOOLS - PERFORMING ARTS CENTER
GROVE OK

Type	MFG	Part
BASE LIGHTING		
A2	METALUX	24GR-LD4-64-F1-UNV-L840-HCD1-U
A2E	METALUX	24GR-LD4-64-F1-UNV-EL14W-L840-HCD1-U
A2F	METALUX	24GR-LD4-64-F1-UNV-L840-HCD1-U DF-24W-U
A2FE	METALUX	24GR-LD4-64-F1-UNV-EL14W-L840-HCD1-U DF-24W-U
A3	METALUX	24GR-LD4-72-F1-UNV-L840-HCD1-U
A3E	METALUX	24GR-LD4-72-F1-UNV-EL14W-L840-HCD1-U
A4	METALUX	BAU-232-UNV-EB82-U
A4E	METALUX	BAU-232-XXXV-EL-I320-EB82-U
B2	PORTFOLIO	LD6A30DE010 ERM6A30835 6LM1LI HB26
B2E	PORTFOLIO	LD6A30DE010EMBOD ERM6A30835 6LM1ELI HB26
BF	PORTFOLIO	LD6A30DE010 ERM6A30835 6LM1LI HB26
BFE	PORTFOLIO	LD6A30DE010EMBOD ERM6A30835 6LM1ELI HB26
C	REBELLE	7010-2X12L-40-VOLT-WFL/WFL-DIM-FINISH
D	LIGHTWAY	WPNW-8-LED-U-30W-3-Z99-CSP-BB10
F	METALUX	4SNLED-LD4-46SL-LN-UNV-L835-CD1-U AYC-CHAIN/SET-U
FE	METALUX	4SNLED-LD4-46SL-LN-UNV-EL7W-L835-CD1-U AYC-CHAIN/SET-U
G	HALO COMM	PD615ED010 PDM6A835 64VW
H	METALUX	22CZ-LD4-34-UNV-L835-HCD1-U

Type	MFG	Part
HE	METALUX	22CZ-LD4-34-UNV-EL14W-L835-HCD1-U
J	FAIL-SAFE	TRR15-LD4-30W-50-CL-BK-UNV-EDD1 VRSD
K1	METALUX	4SNLED-LD4-30SL-LN-UNV-L835-CD1-U
K2	METALUX	2SNLED-LD4-26SL-LN-UNV-L835-CD1-U
M	EUREKA	3540-35-LED.17.30-VOLT-SC-WH
N	SSL LIGHTING	BLXG2AC-4-UNV-3K-15-D SC10W TCAPWD
S	METALUX	4VT2-LD4-4-DR-UNV-L835-CD1-WL-U
SE	METALUX	4VT2-LD4-4-DR-UNV-VT-REM-EL-L835-CD1-WL-U
X1	SURE-LITES	LPX7SD
S1	VISIONAIRE LIGHTING	PST2L-96LC-7-4K-UNV-KM-BZ
S1	VISIONAIRE LIGHTING	SNTS-4S-7-25-12BC-136-T238R-BZ
S1	VISIONAIRE LIGHTING	BOAA-PST2L-S1-BZ
S2	VISIONAIRE LIGHTING	PST2L-96LC-7-4K-UNV-KM-BZ
S2	VISIONAIRE LIGHTING	SNTS-4S-7-25-12BC-136-T238R-BZ
S2	VISIONAIRE LIGHTING	BOAA-PST2L-D2-BZ
THEATER LIGHTING		
A	PORTFOLIO	LSR8A60D010TEMB ER8A60830 8LN1LI
B	PORTFOLIO	LSR8A60D010TEMB ER8A60830 8LM1LI
C	ATLANTIC LIGHTING	LED6X6-VR55-35K-VOLT-LUT HI LUME DIMMING-VSQ6610HZ-PF
D	FAIL-SAFE	MSN-UNV-B
E	FAIL-SAFE	MSN-UNV-B
F	PORTFOLIO	LSR8A30D010TEMB ER8A30830 8LN1LI
G	TRAXON	QUATTRO LINER
H	NEO-RAY	S23DW-2-L30-SR-4-U-DD-SI-S93S
H1	NEO-RAY	S23DP-2-L30-XX-4-U-DD-SI-S93S

Jan 25, 2016

RE: 7245T GROVE PS PAC

Type	MFG	Part
A2	ELITE LIGHTING USA	24-OT-LED-6000L-DIM10-MVOLT-40K (2X4/GRID/SPEC LED TROFFER/6K LUMENS/4K/0-10V DIM/WHT)
A2E	ELITE LIGHTING USA	24-OT-LED-6000L-DIM10-MVOLT-40K- EMG-LED (2X4/GRID/SPEC LED TROFFER/6K LUMENS/4K/0-10V DIM/ WHT)(EM)
A2F	ELITE LIGHTING USA	24-OT-LED-6000L-DIM10-MVOLT-40K- 24FK (2X4/FLANGE/SPEC LED TROFFER/6K LUMENS/4K/0-10V DIM/ WHT)
A2FE	ELITE LIGHTING USA	24-OT-LED-6000L-DIM10-MVOLT-40K- EMG-LED-24FK (2X4/FLANGE/SPEC LED TROFFER/6K LUMENS/4K/0-10V DIM/WHT)(EM)
A3	ELITE LIGHTING USA	24-OT-LED-8000L-DIM10-MVOLT-40K (2X4/GRID/SPEC LED TROFFER/8K LUMENS/4K/0-10V DIM/WHT)
A3E	ELITE LIGHTING USA	24-OT-LED-8000L-DIM10-MVOLT-40K- EMG-LED (2X4/GRID/SPEC LED TROFFER/8K LUMENS/4K/0-10V DIM/ WHT)(EM)
A4	Columbia Lighting	SA4-232-EU-FO841(2)(4' LINEAR WALLBRACKET/WHT/1 BALLAST)
A4E	Columbia Lighting	SA4-232-EU-FO841-I320(2)(4' LINEAR WALLBRACKET/WHT/1 BALLAST)(1400 LUM EM)

Type	MFG	Part
B2	ELITE LIGHTING USA	HH6-LED-3000L-DIM10-MVOLT-MD-40K-85/HH6-6501CL-WH (6" LED CAN/3000 LUMENS/4K/MED DIST/0-10V DIM/ALZAK)
B2E	ELITE LIGHTING USA	HH6-LED-3000L-DIM10-MVOLT-MD-40K-85-EMG-LED/HH6-6501CL-WH (6" LED CAN/3000 LUMENS/4K/MED DIST/0-10V DIM/ALZAK)(EM)
BF	ELITE LIGHTING USA	HH6-LED-3000L-DIM10-MVOLT-MD-40K-85/HH6-6501CL-WH (6" LED CAN/3000 LUMENS/4K/MED DIST/0-10V DIM/ALZAK)
BFE	ELITE LIGHTING USA	HH6-LED-3000L-DIM10-MVOLT-MD-40K-85-EMG-LED/HH6-6501CL-WH (6" LED CAN/3000 LUMENS/4K/MED DIST/0-10V DIM/ALZAK)(EM)
C	Original Cast Lighting	VA2-010A-08-WF-PTD-2LD10/40K-120 (DECO UP-DOWN WALL CYLINDER/SMALL/LED/4K/WIDE OPTICS)
D	Williams	VWPH-LED32/735-T3-DBZ-EM/BSL722LT-EDD*PH-UNV (DECO CUTOFF WALLPACK/BRZ/35K/WET LISTED/EM)
F	Williams	LX4D-4-L12/835-A-ACF/48-DIM-UNV (4' LINEAR STRIP/FROST LENS/WHT/35K/4800 LUMENS/AC MNT/0-10V DIM)
FE	Williams	LX4D-4-L12/835-A-EM/10W-ACF/48-DIM-UNV (4' LINEAR STRIP/FROST LENS/WHT/35K/4800 LUMENS/AC MNT/0-10V DIM)(EM)
G	ELITE LIGHTING USA	HH6-LED-1500L-DIM10-120-WD-35K-85/HH6-6501WT-WH (6" LED CAN/1500 LUMENS/35K/0-10V DIM/WIDE DIST)
H	Williams	LT-22-L34/835-AF-EQCLIPS-DIM-UNV (2X2/GRID/LED CTR ACRYLIC BASKET/WHT/3400 LUMENS/35K/0-10V DIM)
HE	Williams	LT-22-L34/835-AF-EM/BSL310LP-EQCLIPS-DIM-UNV (2X2/GRID/LED CTR ACRYLIC BASKET/WHT/3400 LUMENS/35K/0-10V DIM)(EM)
J	NEPTUN LIGHT	LED-202-040-UNV-850-BLK (DECO SURFACE ROUND WALLPACK/40W/BLACK/5K/UNV/3200 LUMENS)
K1	Williams	LLMS-4-L34/835-RD-DIM-UNV (4' ROUNDED LENS STRIP/WHT/35K/3400 LUMENS/WHT)
K2	Williams	LLMS-2-L20/835-RD-DIM-UNV (2' ROUNDED LENS STRIP/WHT/35K/2000 LUMENS/WHT)

Type	MFG	Part
M	Visa Lighting	CB5201-L30K-L-BCA-DCC (3' LED SCONCE/3K/BRUSHED CHROME/ OPAL LENS/0-10V DIM)
N	Insight Lighting	MXI-12-30K-15-U-CES-48"-REM-NO-TN (4' LED LINEAR WALL WASH/3K/12W PER FT/ADJ MNT/REMOTE DRIVER/ ALUM FINISH)
N/PWR	Insight Lighting	RPS/100/PWR/WET (100W REMOTE POWER SUPPLY/UNV)(WILL RUN 2X4' FIXTURES)
S	Columbia Lighting	LXEM4-35LW-RFA-EDU (4' LINEAR VAPORTIGHT/WET LISTED/WHT/35K/ 4K LUMENS)
SE	Columbia Lighting	LXEM4-35LW-RFA-EDU-ELL14 (4' LINEAR VAPORTIGHT/WET LISTED/ WHT/35K/4K LUMENS)(EM)
X1	Williams	EXIT-R-EM-WHT-SDT (EXIT/WHT/ PLASTIC/RED LETTERS/LED/EM/SELF-DIAGNOSTICS)
S1	Spaulding Lighting	CL1-A-60LU-4K-3-DB (LED SITE HEAD/ BRZ/TYPE 3 DIST/15K LUMENS/4K/ ARM INC)
S1/P	Spaulding Lighting	SSS-25-40-7-A2-DB (25' SSS POLE/ 1@90 DRILL/BRZ)
S2	Spaulding Lighting	CL1-A-60LU-4K-3-DB (LED SITE HEAD/ BRZ/TYPE 3 DIST/15K LUMENS/4K/ ARM INC)
S2/P	Spaulding Lighting	SSS-25-40-7-XX-DB (25' SSS POLE/ 2@TBD DRILL/BRZ)