MARCH 26, 2025
IMPROVEMENT TO THE STAMFORD MAINTENANCE OF EQUIPMENT (MOE) FACILITY
FEDERAL AID PROJECT NO. CT-2023-025-01
STATE PROJECT NO. 0301-0509
CITY OF STAMFORD

ADDENDUM NO. 3

This Addendum addresses the following questions and answers contained on the "CT DOT QUESTIONS AND ANSWERS WEBSITE FOR ADVERTISED CONSTRUCTION PROJECTS":

Question and Answer Nos. 1, 6, 27, 28, 29, 44, 46, 47, 48, 49, 50, 51, 54, 55, 61, 62, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 81, 83, 91, 92, 93, 94, 95, 96, 97, 98, 100, 101, 102, 103, 104, 105, 107, 112, 113, 114, 115, 116, 117, 118, 119, 121, 122, 123, 124, 126, 128, 136, 140, 141, 142, 143, 144, 145, 146, 147.

SPECIAL PROVISIONS

NEW SPECIAL PROVISIONS

The following Special Provision are hereby added to the Contract:

- ITEM NO. 1209405A – PAINTED PAVEMENT MARKINGS (GENERAL)
- ITEM NO. 1212017A – TEMPORARY PLASTIC LEGEND ARROWS AND MARKINGS

The following CSI Sections are hereby added to the Contract:

- 096280 – STATIC CONTROL FLOORING
- 096536 – STATIC-CONTROL RESILIENT FLOORING

REVISED SPECIAL PROVISIONS

The following Special Provisions are hereby deleted in their entirety and replaced with the attached like-named Special Provisions:

- SECTION 1.02 – PROPOSAL REQUIREMENTS AND CONDITIONS
- ITEM NO. 0100072A – REMOVAL AND DISPOSAL OF UNDERGROUND TANKS
- ITEM NO. 0210040A – OIL-WATER SEPARATOR
  ITEM NO. 0210041A – OIL-WATER SEPARATOR WITH COALESCING PLATES

- ITEM NO. 1108672A – CISCO PROFESSIONAL SERVICE
- ITEM NO. 1108675A – ETHERNET SWITCH – CISCO IE3200
- ITEM NO. 1108681A – ETHERNET SWITCH – CISCO IE9320
- ITEM NO. 1108808A – TRAINING
- ITEM NO. 1112263A – CCTV POLE TYPE B – STRAIGHT POLE

The following CSI Section are hereby deleted in their entirety and replaced with the attached like-named CSI Sections:

- 093100 – CERAMIC TILE
- 095123 – ACOUSTICAL TILE CEILINGS
- 096519 – RESILIENT TILE FLOORING
- 098433 – SOUND-ABSORBING WALL UNITS
- 105113 – METAL LOCKERS
- 283100 – FIRE DETECTION AND ALARM

DELETED SPECIAL PROVISIONS

The following Special Provisions are hereby deleted in their entirety:

- ITEM NO. 1112253A – CCTV POLE TYPE E – DUAL CAMERA MAST ARM
- ITEM NO. 1112254A – CCTV POLE TYPE F – MAST ARM
- ITEM NO. 1112263A – CCTV POLE TYPE G – STRAIGHT POLE

CONTRACT ITEMS

NEW CONTRACT ITEMS

ITEM NO.	DESCRIPTION	UNIT	QUANTITY
0210041A	OIL-WATER SEPARATOR WITH COALESCING PLATES	EA.	1
0653001	CLEAN EXISTING CATCH BASIN	EA.	5
0653010	CLEAN EXISTING MANHOLE	EA.	8
0653100	CLEAN EXISTING CULVERT – 12" TO 42" DIAMETER	L.F.	900
0822100.01	TEMPORARY TRAFFIC BARRIER	L.F.	1,700
0822101.01	RELOCATED TEMPORARY TRAFFIC BARRIER	L.F.	600
0977001	TRAFFIC CONE	EA.	100
0978002	TRAFFIC DRUM	EA.	100
0979003	CONSTRUCTION BARRICADE TYPE III	EA.	20
1008908A	CLEAN EXISTING CONDUIT	L.F.	2,000
1112263A	CCTV POLE TYPE B – STRAIGHT POLE	EA.	12
1209405A	PAINTED PAVEMENT MARKINGS (GENERAL)	S.F.	400

1212017A	TEMPORARY PLASTIC LEGEND ARROWS AND MARKINGS	S.F.	1,000
1220027	CONSTRUCTION SIGNS	S.F.	500
1807210	TEMPORARY IMPACT ATTENUATION SYSTEM	EA.	3

REVISED CONTRACT ITEMS

ITEM NO.	DESCRIPTION	ORIGINAL QUANTITY	REVISED QUANTITY
0202502A	REMOVAL OF CONCRETE PAVEMENT	5,500 S.Y.	700 S.Y.
0210040A	OIL-WATER SEPARATOR	2 EA.	1 EA.
0502182A	RUBBER GRADE CROSSING	200 L.F.	190 L.F.
0502236A	PAVED GRADE CROSSING	40 L.F.	60 L.F.
1401021	DROP MANHOLE (4' DIA.) 10' – 20' DEEP (SANITARY SEWER)	2 EA.	4 EA.

DELETED CONTRACT ITEMS

ITEM NO.	DESCRIPTION	ORIGINAL QUANTITY	REVISED QUANTITY
0586510.10A	SPECIAL MANHOLE – 0' – 10' DEEP	1 EA.	0 EA.
1112253A	CCTV POLE TYPE C – DUAL CAMERA MAST ARM	3 EA.	0 EA.
1112254A	CCTV POLE TYPE D – MAST ARM	9 EA.	0 EA.

PLANS

NEW PLANS

The following Plan Sheets are hereby added to the Contract:

04.04-1.A3	
04.05-1.A3	15.11-1.A3
04.06-1.A3	15-11-2.A3
04-07-1.A3	15.11-3.A3
	15-11-4.A3
05-40-1.A3	15-11-5.A3
09.09-1.A3	15.11-6.A3

REVISED PLANS

The following Plan Sheets are hereby deleted and replaced with the like-numbered Plan Sheets:

02.01.A3	04.13.A3	04.31.A3	05.07.A3
	04.14.A3		05.08.A3
03.03.A3	04.15.A3	05.03.A3	05.09.A3
03.04.A3	04.16.A3	05.04.A3	05.10.A3
03.05.A3	04.19.A3	05.05.A3	05.12.A3
03.06.A3	04.20.A3	05.06.A3	05.13.A3

05.14.A3	06.23.A3	07.08.A3	14.026.A3
05.15.A3	06.24.A3	07.09.A3	14.062.A3
05.16.A3	06.26.A3	07.10.A3	
05.19.A3	06.27.A3	07.11.A3	15.02.A3
05.20.A3	06.29.A3	07.12.A3	15.03.A3
05.21.A3	06.30.A3	07.13.A3	15.04.A3
05.22.A3	06.34.A3	07.14.A3	15.05.A3
05.25.A3	06.35.A3	07.41.A3	15.06.A3
05.27.A3	06.37.A3		15.07.A3
05.35.A3	06.42.A3	09.03.A3	15.09.A3
05.36.A3			15.10.A3
	07.02.A3	10.07.A3	
06.04.A3	07.03.A3	10.08.A3	
06.06.A3	07.04.A3	10.18.A3	
06.07.A3	07.05.A3		
06.08.A3	07.06.A3		
06.13.A3	07.07.A3		

DELETED PLAN

The following Plan Sheet is hereby deleted in its entirety:

04.04
04.05
04.06
04.07

The Bid Proposal Form has been revised to reflect these changes.

The Detailed Estimate Sheet does not reflect this change.

There will be no change in the number of calendar days due to this Addendum.

The foregoing is hereby made a part of the contract.

ITEM #1209405A – PAINTED PAVEMENT MARKINGS (GENERAL)

Add the following:

Section 12.09.01 – Description:
Work under this item shall consist of applying temporary painted pavement markings of any shape or color as may be required to implement the maintenance and protection of traffic pattern.

Temporary painted pavement markings shall be permitted wherever pavement will be replaced in the course of the project. With the permission of the Engineer, temporary pavement markings may be used on existing pavement to remain when such markings can be removed without damage to the pavement. Removal or masking or temporary painted markings will not be measured separately for payment. Damage to existing pavement shall be repaired at the Contractor's expense.

Section 12.09.03 – Construction Methods:
PAINTED PAVEMENT MARKINGS (GENERAL) will be applied based on the color, shape, or linear length shown on the plans, details, or specifications. Individual colors, shapes, or lengths, including Yellow, White, and Black Mask, will not be measured separately for payment.

Section 12.10.04 – Method of Measurement:
PAINTED PAVEMENT MARKINGS (GENERAL) will be measured based on the actual square feet of temporary painted pavement markings installed inclusive of all colors, shapes, or linear lengths, including Yellow, White, and Black Mask. Individual colors or shapes will not be measured separately for payment. Removal of temporary markings will not be measured separately for payment.

Section 12.10.05 – Basis of Payment:
PAINTED PAVEMENT MARKINGS (GENERAL) will be paid at the contract unit price based on the actual square feet of temporary painted pavement markings installed inclusive of all colors, shapes, or linear lengths, including Yellow, White, and Black Mask. Individual colors or shapes will not be paid separately. Removal of temporary markings will not be paid separately but included in the general cost of work.

Pay Item	Pay Unit
PAINTED PAVEMENT MARKINGS (GENERAL)	SF

ITEM #1212017A – TEMPORARY PLASTIC LEGEND ARROWS AND MARKINGS

Add the following:

Section 12.12.01 – Description:
Work under this item shall consist of applying temporary plastic markings of any shape or color as may be required to implement the maintenance and protection of traffic pattern.

Section 12.12.03 – Construction Methods:
TEMPORARY PLASTIC LEGEND ARROWS AND MARKINGS will be applied based on the color, shape, or linear length shown on the plans, details, or specifications. Individual colors, shapes, or lengths, including Yellow, White, and Black Mask, will not be measured separately for payment.

Section 12.10.04 – Method of Measurement:
TEMPORARY PLASTIC LEGEND ARROWS AND MARKINGS will be measured based on the actual square feet installed inclusive of all colors shapes, or linear lengths, including Yellow, White, and Black Mask. Individual colors or shapes will not be measured separately for payment.

Section 12.10.05 – Basis of Payment:
TEMPORARY PLASTIC LEGEND ARROWS AND MARKINGS will be paid at the contract unit price based on the actual square feet installed inclusive of all colors, shapes, or linear lengths, including Yellow, White, and Black Mask. Individual colors or shapes will not be paid separately.

Pay Item	Pay Unit
TEMPORARY PLASTIC LEGEND ARROWS AND MARKINGS	SF

SECTION 096280 – STATIC CONTROL FLOORING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions of Division 1, State of Connecticut, Department of Transportation, Standard Specifications for Roads, Bridges, Facilities and Incidental Construction, Form 819 - 2024 and supplemental specifications thereto, shall be a part of this specification.

1.2 SUMMARY

A. This section includes the following:

1. Static control flooring system as shown on the drawings and in schedules.

B. Related sections include the following:

1. Cast-in-Place Concrete, section 033000

1.3 SYSTEM DESCRIPTION

A. The work shall consist of preparation of the substrate, the furnishing and application of a pigmented 100 % solids epoxy/urethane-based static dissipative floor coating system. The system shall have the color and texture as specified by the Owner with a nominal thickness of 28 mils. It shall be applied to the prepared area(s) as defined in the plans strictly in accordance with the Manufacturer's recommendations.

1.4 SUBMITTALS

A. Submit the following in accordance with Form 819 Article 1.20-1.05.02 and NOTICE TO CONTRACTOR – SUBMITTALS
B. Product Data: Latest edition of Manufacturer's literature including performance data and installation procedures.
C. Manufacturer’s Safety Data Sheet (SDS) for each product being used.
D. Samples: A 3 x 3 inch square sample of the proposed system. Color, texture, and thickness shall be representative of overall appearance of finished system subject to normal tolerances.

1.5 QUALITY ASSURANCE

A. The Manufacturer shall have a minimum of 10 years experience in the production, sales, and technical support of epoxy and urethane industrial flooring and related materials.
B. The Applicator shall have experience in installation of the flooring system as confirmed by the manufacturer in all phases of surface preparation and application of the product specified.

C. No requests for substitutions shall be considered that would change the generic type of the specified System.
D. System shall be in compliance with requirements of United States Department of Agriculture (USDA), Food, Drug Administration (FDA), and local Health Department.
E. System shall be in compliance with the Indoor Air Quality requirements of California section 01350 as verified by a qualified independent testing laboratory.

F. A pre-installation conference shall be held between Applicator, General Contractor and the Owner to review and clarification of this specification, application procedure, quality control, inspection and acceptance criteria and production schedule.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping

1. All components of the system shall be delivered to the site in the Manufacturer's packaging, clearly identified with the product type and batch number.

B. Storage and Protection

1. The Applicator shall be provided with a storage area for all components. The area shall be between 60 F and 90 F, dry, out of direct sunlight and in accordance with the Manufacturer's recommendations and relevant health and safety regulations.
2. Copies of Safety Data Sheets (SDS) for all components shall be kept on site for review by the Engineer or other personnel.

C. Waste Disposal

1. The Applicator shall be provided with adequate disposal facilities for non-hazardous waste generated during installation of the system.

1.7 PROJECT CONDITIONS

A. Site Requirements

1. Application may proceed while air, material and substrate temperatures are between 60 F and 85 F providing the substrate temperature is above the dew point. Outside of this range, the Manufacturer shall be consulted.
2. The relative humidity in the specific location of the application shall be less than 80 % and the surface temperature shall be at least 5 F above the dew point.
3. The Applicator shall ensure that adequate ventilation is available for the work area.
4. The Applicator shall be supplied with adequate lighting equal to the final lighting level during the preparation and installation of the system.

B. Conditions of new concrete to be coated with epoxy material.

1. Concrete shall be moisture cured for a minimum of 7 days and have fully cured a minimum of twenty eight days in accordance with ACI-308 prior to the application of the coating system pending moisture tests.
2. Concrete shall have a flat rubbed finish, float or light steel trowel finish (a hard steel trowel finish is neither necessary or desirable).
3. Sealers and curing agents should not be used.
4. Concrete surfaces on grade shall have been constructed with a vapor barrier to protect against the effects of vapor transmission and possible delamination of the system.

C. Safety Requirements

1. All open flames and spark-producing equipment shall be removed from the work area prior to commencement of application.

2. "No Smoking" signs shall be posted at the entrances to the work area.
3. The Owner shall be responsible for the removal of foodstuffs from the work area.
4. Non-related personnel in the work area shall be kept to a minimum.

1.8 WARRANTY

A. Manufacturer warrants that material shipped to buyers at the time of shipment substantially free from material defects and will perform substantially to manufacturer's published literature if used in accordance with the latest prescribed procedures and prior to the expiration date.

PART 2 – PRODUCTS

2.1 FLOORING

A. Basis of Design Product (**SDT-1**): Dur-A-Flex, Inc, Dur-A-Gard ESD, Epoxy-Based static dissipative seamless flooring system with Armor Stat ES, Urethane-Based static dissipative topcoat, or approved equal.
   1. System Materials:
      a. Primer: Dur-A-Flex, Inc, Dur-A-Glaze #4 ESD Primer resin and hardener.
      b. Base Coat: Dur-A-Flex, Inc, Dur-A-Gard ESD resin and hardener.
      b. Topcoat: Dur-A-Flex, Inc, Armor-Stat ESD Topcoat resin, hardener and grit.

   2. Patch Materials
      a. Shallow Fill and Patching: Use Dur-A-Flex, Inc. Dur-A-Glaze Cove Rez with NoSag #2 or Elast-O-Coat with NoSag #1.
      b. Deep Fill and Sloping Material (over ¼ inch): Use Dur-A-Flex, Inc. Dur-A-Crete.

2.2 MANUFACTURER

A. Dur-A-Flex, Inc., 95 Goodwin Street, East Hartford, CT 06108, Phone: (860) 528-9838, Fax: (860) 528-2802

B. Manufacturer of Approved System shall be single source and made in the USA.

2.3 PRODUCT REQUIREMENTS

A. Primer		Dur-A-Glaze #4 ESD Primer
1.	Percent Solids	100 %
2.	VOC	7.45 g/L
3.	Surface Resistivity, ASTM D 257	10^6-10^9 ohm/Square
4.	Static Decay, Mil-Std-3010, Method 4046	0.01 seconds
5.	Voltage generation, ESD STM 97.2	14v
6.	Compressive Strength, ASTM D 695	16,000 psi
	ASTM C 579	10,500 psi
7.	Tensile Strength, ASTM D 638	3,000 psi
	ASTM C 307	1,950 psi
8.	Tensile Elongation, ASTM D 638	7.5%
9.	Flexural Strength, ASTM D 790	4,000 psi
	ASTM C 580	2,900 psi
10.	Hardness (Shore D), ASTM D 2240	70-80
11.	Linear Shrinkage, ASTM D 2566	0.02%
12.	Linear Expansion, ASTM D 696	$2x10^{-5}$
13.	Bond Strength to Concrete, ASTM D 4541	400 psi, substrate fails
14.	Indentation, MIL D-3134	0.025 Max
15.	Impact Resistance, MIL D-3134	Pass

16.	Water Absorption, ASTM D 570	0.04%
17.	Heat Resistance Limitation	140 F to 200 F
18.	Flammability, ASTM D 570	Self Extinguishing
19.	Flame Spread/NFPA 101, ASTM E 84	Class A

B. Base Coat — Dur-A-Gard ESD

1.	Percent Solids	100 %
2.	VOC	7.45 g/L
3.	Surface Resistivity, ASTM D 257	10^6-10^9 ohm/Square
4.	Static Decay, Mil-Std-3010, Method 4046	0.01 Seconds
5.	Compressive Strength, ASTM D 695	16,000 psi
	ASTM C 579	10,500 psi
6.	Tensile Strength, ASTM D 638	3,000 psi
	ASTM C 307	1,950 psi
7.	Tensile Elongation, ASTM D 638	7.5%
8.	Flexural Strength, ASTM D 790	4,000 psi
	ASTM C 580	2,900 psi
9.	Abrasion Resistance, ASTM D 4060	40 mg loss
	C-10 Wheel, 1,000 gm load, 1,000 cycles	
10.	Flame Spread/NFPA-101, ASTM E 84	Class A
11.	Flammability, ASTM D 635	Self Extinguishing
12.	Impact Resistance MIL D-3134	Pass
13.	Water Absorption. MIL D-3134	0.04 %
14.	Heat Resistance Limitation	140 F to 200 F

C. Topcoat — Armor-Stat ESD Topcoat

1.	Percent Solids	69 %
2.	VOC	57 g/L
3.	Tensile Strength, ASTM D 2370	7,000 psi
4.	Adhesion, ASTM 4541	Substrate Failure
5.	Hardness, ASTM D 3363	>4H
6.	60^0 Gloss ASTM D 523	30 +/-10
7.	Abrasion Resistance, ASTM D4060	5 mg loss
	CS 17 wheel (1,000 g load) 1,000 cycles	
8.	Pot Life, 70 F, 50% RH	45 mins
9.	Full Chemical Resistance	7 days

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas and conditions, with Applicator present, for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting flooring performance.

1. Verify that substrates and conditions are satisfactory for flooring installation and comply with requirements specified.

3.2 PREPARATION

A. General

1. New and existing concrete surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, and bituminous products.

2. Moisture Testing: Perform tests recommended by manufacturer and as follows.
. a. Perform relative humidity test using is situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75% relative humidity level measurement.
   b. If the relative humidity exceeds 75 % relative humidity then Dur-A-Glaze MVP Primer moisture mitigation system must be installed prior to resinous flooring installation. Slab-on grade substrates without a vapor barrier may also require the moisture mitigation system.
3. There shall be no visible moisture present on the surface at the time of application of the system. Compressed oil-free air and/or a light passing of a propane torch may be used to dry the substrate.
4. Mechanical surface preparation:
   a. Shot blast all surfaces to receive flooring system with a mobile steel shot, dust recycling machine (Blastrac or equal). All surface and embedded accumulations of paint, toppings hardened concrete layers, laitance, power trowel finishes and other similar surface characteristics shall be completely removed leaving a bare concrete surface having a minimum profile of CSP 3-4 as described by the International Concrete Repair Institute.
   b. Floor areas inaccessible to the mobile blast machines shall be mechanically abraded to the same degree of cleanliness, soundness and profile using diamond grinders, or other suitable equipment.
   c. Where the perimeter of the substrate to be coated is not adjacent to a wall or curb, a minimum 1/4 inch key cut shall be made to properly seat the system, providing a smooth transition between areas. The detail cut shall also apply to drain perimeters and expansion joint edges.
   d. Cracks and joints (non-moving) greater than 1/8 inch wide are to be chiseled or chipped-out and repaired per manufacturer's recommendations.
5. At spalled or worn areas, mechanically remove loose or delaminated concrete to a sound concrete and patch per manufacturer's recommendations.

3.3 APPLICATION

A. General

1. The system shall be applied in five distinct steps as listed below:
   a. Substrate preparation
   b. Priming
   c. Install Copper foil tape
   d. Base coat application
   e. Topcoat application
2. Immediately prior to the application of any component of the system, the surface shall be dry and any remaining dust or loose particles shall be removed using a vacuum or clean, dry, oil-free compressed air.
3. The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer's recommendations.
4. The system shall follow the contour of the substrate unless pitching or other leveling work has been specified by the Architect.
5. A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.

B. Primer

1. The primer shall be Dur-A-Glaze #4 ESD Primer that is mixed at the ratio of 2 parts resin to 1 part hardener per the manufacturer's instructions.
2. The primer shall be applied by notched squeegee and back rolled at the rate of 200 sf/gal, to yield a dry film thickness of 8 mils.

C. Copper Foil Tape

1. Install copper foil tape conductive adhesive to ground.

2. Use a minimum of ½ inch wide copper foil tape.
3. Copper foil tape is to be installed at one point per 1,000 SF.

D. Base coat

1. The base coat shall be comprised of a liquid resin and hardener that is mixed at the ratio of 3 parts resin to 1 part hardener per the manufacturer's instructions.
2. The base coat of Dur-A-Gard ESD shall be applied by notched squeegee and back rolled applied at the rate of 100 sf/gal to yield a dry film thickness of 16 mils.

E. Topcoat

1. The topcoat shall be a kit comprised of a liquid resin, hardener and grit mixed per the manufacturer's instructions.
2. The topcoat of Armor-Stat ESD shall be applied by notched squeegee and immediately back-rolled at the rate of 350 sf/kit to yield a dry film thickness of 3 to 4 mils.
3. The finished floor will have a nominal thickness of 28 mils.

3.4 FIELD QUALITY CONTROL

A. Tests, Inspection

1. The following tests shall be conducted by the Applicator:
   a. Temperature
      1. Air, substrate temperatures and, if applicable, dew point.
   b. Coverage Rates
      1. Rates for all layers shall be monitored by checking quantity of material used against the area covered.
   c. Surface resistance readings after 24 hour cure @ 70F
      1. Floor readings should be tested using OHM-STAT RT-1000 Megohmeter @ 100V and read between 10^6-10^9 OHM/square

3.5 CLEANING AND PROTECTION

A. Cure flooring material in compliance with manufacturer's directions, taking care to prevent their contamination during stages of application and prior to completion of the curing process.

B. Remove masking. Perform detail cleaning at floor termination, to leave cleanable surface for subsequent work of other sections.

SECTION 096536 – STATIC-CONTROL RESILIENT FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions of Division 1, State of Connecticut, Department of Transportation, Standard Specifications for Roads, Bridges, and Incidental Construction, Form 819 - 2024 and supplemental specifications thereto, shall be a part of this specification

1.2 SUMMARY

A. Section Includes:

1. Static-control, solid vinyl floor tile.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to static-control resilient flooring including, but not limited to, the following:

a. Examination and preparation of substrates to receive static-control resilient flooring.
b. Installation techniques required for specified products.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each type of static-control resilient flooring and in each color, pattern, and texture required, in manufacturer's standard size, but not less than 6 by 9 inches.

1.5 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in installation techniques required by manufacturer for specified static-control resilient flooring.

1.8 PROJECT CONDITIONS

A. Maintain ambient temperatures in spaces to receive static-control resilient flooring within range recommended by manufacturer for period recommended in writing before installation, during installation, and after installation.

B. Close spaces to traffic during static-control resilient flooring installation.

C. Close spaces to traffic for period recommended in writing by manufacturer after static-control resilient flooring installation.

D. Install static-control resilient flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

2.2 STATIC-CONTROL, SOLID VINYL FLOOR TILE (**SDT-2**)

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

1. Tarkett North America.
2. Roppe Corp.
3. Flexco Corp.

B. Basis of Design Product:

C. Static-Control Properties: As determined by testing identical products in accordance with test method indicated by an independent testing and inspecting agency.

1. Electrical Resistance:
   a. ESD-approval SP method 2472: $R \leq 10^9$ Ohms

2. Static Decay: 5000 to 0 V in less than 0.25 seconds when tested in accordance with FED-STD-101C, Method 4046.1.

D. Critical Radiant Flux: 0.45 W/sq. cm or greater when tested in accordance with ASTM E648 or NFPA 253.

E. Construction: Manufacturer's standard, high-density vinyl resin with smooth surface.

F. Thickness: Manufacturer's standard, but not less than 0.08 inch.

G. Size: 24 by 24 inches.

H. Colors: iQ Toro SC - Toro GREY 0101.

I. Maintenance Floor Tiles: Special floor tiles inscribed "Conductive floor. Do not wax."

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified portland cement or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Static-Control Adhesive: Provided or approved by manufacturer; type that maintains electrical continuity of floor-covering system to ground connection.

C. Grounding Strips: Provided or approved by manufacturer; type and size that maintains electrical continuity of floor-covering system to ground connection.

D. Integral-Flash-Cove Base Accessories:

1. Cove Strip: 1-inch radius support strip provided or approved by manufacturer.
2. Cap Strip: Square metal, vinyl, or rubber cap provided or approved by manufacturer.
3. Corners: Metal inside and outside corners and end stops provided or approved by floor-covering manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates in accordance with manufacturer's written instructions to ensure successful installation of static-control resilient flooring and electrical continuity of floor-covering systems.

B. Concrete Substrates: Prepare in accordance with ASTM F710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with floor-covering adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended in writing by manufacturer. Proceed with installation only after substrate alkalinity is not less than 6 or more than 8 pH unless otherwise recommended in writing by flooring manufacturer.
4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install static-control resilient flooring until it is same temperature as space where it is to be installed.

1. Move static-control resilient flooring and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum substrates to be covered by static-control resilient flooring immediately before installation.

3.2 INSTALLATION, GENERAL

A. Install static-control resilient flooring in accordance with manufacturer's written instructions.

B. Extend grounding strips beyond perimeter of static-control resilient floor-covering surfaces to ground connections.

C. Scribe, cut, and fit static-control resilient flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

1. Extend static-control resilient flooring below built-in items and permanent, but movable, items that allow for a flexible layout where indicated on Drawings.

D. Extend static-control resilient flooring into toe spaces, door reveals, closets, and similar openings.

E. Extend static-control resilient flooring to center of door openings where flooring or color transitions occur.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on static-control resilient flooring as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

G. Free-Lay Installation: Install static-control resilient flooring in accordance with manufacturer's written instructions for a completed installation without open cracks, raising and puckering at joints, and surface imperfections.

H. Adhesive Installation: Adhere static-control resilient flooring to substrates using a full spread of static-control adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

I. Integral-Flash-Cove Base: Cove static-control flooring 6 inches up vertical surfaces. Support static-control resilient flooring at horizontal and vertical junction with cove strip. Butt at top against cap strip.

1. Install metal corners at inside and outside corners according to manufacturer's written instructions.

3.3 INSTALLATION OF FLOOR TILE

A. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so floor tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half floor tile at perimeter.

1. Lay floor tiles square with room axis.

B. Match floor tiles for color and pattern by selecting floor tiles from cartons in same sequence as manufactured and packaged if so numbered. Discard broken, cracked, chipped, or deformed floor tiles.

3.4 INSTALLATION OF SHEET FLOOR COVERINGS

A. Unroll sheet floor coverings and allow them to stabilize before cutting and fitting.

B. Lay out sheet floor coverings as follows:

1. Maintain uniformity of sheet floor-covering direction.
2. Minimize number of seams and place them in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in floor-covering substrates.
3. Match edges of floor coverings for color shading at seams.
4. Avoid cross seams.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to test electrical resistance of static-control resilient flooring in accordance with ASTM F150 for compliance with requirements.

1. Arrange for testing after the following:

a. Static-control adhesives have fully cured.
b. Static-control resilient flooring has stabilized to ambient conditions.
c. Ground connections are completed.

B. Static-control resilient flooring will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of static-control resilient flooring.

B. Protect static-control resilient flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

C. Cover static-control resilient flooring and protect from rolling loads until Substantial Completion.

END OF SECTION 096536

SECTION 1.02 – PROPOSAL REQUIREMENTS AND CONDITIONS

1.02.01 – Contract Bidding and Award:

After the first sentence of the third paragraph, add the Following:

In accordance with the provisions of the Construction Contract Bidding and Award Manual, bidders must be prequalified for **25B – Vertical Construction - Intermediate**, to be eligible to bid on this project. Bidders that are not prequalified for this work classification will not be approved to bid on this project.

ITEM #0100072A – REMOVAL AND DISPOSAL OF UNDERGROUND TANKS

Description:
This work shall include all labor and equipment to remove and dispose of two existing 1000-gallon Oil/Water Separators, including the tank, manhole risers, and all valves, fittings, vents, or other appurtenances. One oil water separator is believed to be primarily concrete construction; the second is believed to be a steel double walled tank with coalescing plates.

Materials:
The tank shall be removed and backfilled. Backfill shall be of a suitable nature and appropriately compacted to support new railroad track installation above the former tank location.

Demolition debris from the tank shall be brought to the waste stockpile area for testing to determine appropriate disposal.

Construction Methods:
The underground tank shall be pumped dry, and the effluent tested and disposed of as contaminated water. All pipes leading into the oil/water separator shall be disconnected and be either removed, or plugged at both ends prior to tank demolition. Concrete tanks shall be broken up, excavated and backfilled. Steel, fiberglass, or other tanks shall be removed intact as much as feasible.

The contractor shall submit a working drawing, sealed by a licensed CT professional engineer, documenting all methods and materials used to satisfactorily remove the oil/water separator tank and manhole risers.

Method of Measurement:
This work will not be measured for payment but paid on a lump sum basis for the removal of two 1000-gallon oil-water separators of the types noted to the satisfaction of the Engineer, including the tank, manhole risers, and all valves, fittings, vents, or other appurtenances. This work shall include all labor, tools, and equipment to drain, demolish, and excavate the oil/water separator. Backfill will be measured separately.

Basis of Payment:
This work will be paid for at the contract lump sum cost for REMOVAL AND DISPOSAL OF UNDERGROUND TANKS, including the tank, manhole risers, and all valves, fittings, vents, or other appurtenances. This work shall include all labor, tools, and equipment to drain, demolish, and excavate the oil/water separator.

Backfill will be paid for at the respective unit cost.

Pay Item	Pay Unit
REMOVAL AND DISPOSAL OF UNDERGROUND TANKS	L.S.

ITEM #0210040A – OIL-WATER SEPARATOR
ITEM #0210041A – OIL-WATER SEPARATOR WITH COALESCING PLATES

Description:

OIL-WATER SEPARATOR: Work under this section shall include designing, furnishing, excavating, installing, and testing an Oil-Water Separator at the specified location and invert and sump depth as shown in the plans. Oil-water separator shall consist of a buried tank with weir walls separating inlet and outlet chambers, as well as manhole risers and manhole frames with vented cast iron covers to provide access to the respective chambers.

OIL-WATER SEPARATOR WITH COALESCING PLATES: Work under this section shall include designing, furnishing, excavating, installing, and testing an Oil-Water Separator with Coalescing Plates at the specified location and invert and sump depth as shown in the plans. Coalescing plates increase the effective surface area of the tank interior to allow smaller suspended oil droplets to merge to increase separation efficiency. OWS shall be an underground double-wall tank with manway risers sized to accommodate maintenance access or replacement of coalescing plate assembly and other interior appurtenances.

When discharging to sanitary, coordination with the City of Stamford WPCA shall be required per Special Provision Section 14.00 - Sanitary.

Materials

OIL-WATER SEPARATOR: Manhole frame and cover shall be cast iron and rated for HS-20 loading. Each cover shall have a one-inch diameter vent in the center. Legend shall read “Sanitary Sewer” when discharging to the city sanitary.

The Oil-Water Separator shall be installed in accordance with all applicable codes and with strict adherence to the manufacturer instructions, specifications, and recommendations. Prior to backfilling, all necessary inspections and approvals shall be obtained (i.e., building department, design engineer, WPCA, etc.).

Oil-Water Separator shall be in accordance with the “State of Connecticut Deep General Permit for Discharges from Miscellaneous Industrial Users” (MIU GP), effective October 31, 2020, or later. Special attention shall be made to Appendix H: Vehicle Maintenance Wastewaters.

- The interior of a precast concrete oil-water separator shall be coated with an epoxy sealant resistant to gasoline, oil, and solvents.
- All structural seams shall be located above the static liquid level and grouted with non-shrinking cement or similar material and coated with a waterproof sealant.
- Voids between separator walls and inlet and outlet piping shall be grouted with non-shrinking cement and coated with waterproof sealant.
- Concrete covers shall be permanently removed from the separator.
- No pipe carrying any other water, material, or substance, shall be connected to the separator.

OIL-WATER SEPARATOR WITH COALESCING PLATES: The Oil-Water Separator with Coalescing Plates shall be installed in accordance with all applicable codes and with strict adherence to the manufacturer instructions, specifications, and recommendations. Prior to backfilling, all necessary inspections and approvals shall be obtained (i.e., building department, design engineer, etc.).

Oil-Water Separator with Coalescing Plates shall be in accordance with the "State of Connecticut Deep General Permit for Discharges from Miscellaneous Industrial Users" (MIU GP), effective October 31, 2020, or later. Special attention shall be made to Appendix H: Vehicle Maintenance Wastewaters.

Oil-Water Separator with Coalescing Plates shall comply with the following requirements:

- Tank shall be a double wall atmospheric-type tank. The inner tank shall be completely contained within the outer tank, enclosing 100% of the tank volume. The space between the inner and outer walls shall be monitored by an electronic leak detection system through a pipe that extends vertically to the top of the tank from the bottom of the shell.
- Tank shall have the structural strength to withstand static and dynamic hydraulic loading while empty and during operating conditions. Provide calculations, signed and stamped by a Registered Professional Engineer to determine the structural strength under specified overbearing or external pressure.
- Tank shall be furnished with removable inclined parallel flat/corrugated plate coalescers to separate free oil droplets and settleable or suspended solids particles from water without clogging the coalescers.
- The effluent free oil concentration shall be 10 mg/l or less.
- Tank shall consist of inlet and outlet connections, non-clogging diffuser pipe to distribute the flow, energy dissipater and sludge baffle.
- Tank shall be provided with two manways complete with removable vapor tight cover, gasket and corrosion-resistant bolts. Manway shall be rated for HS-20 loading.
- Exterior and interior surfaces of the tank shall be coated with polyurethane or FRP coating for corrosion protection as applicable.
- Tank shall be vented. Tank shall be provided with sampling port, gauging and lifting lugs.
- Tank shall be constructed in accordance with applicable UL standards for underground tanks containing petroleum products (UL-58, UL 1316, etc.). Where applicable, tank shall also conform to UL-1746 "Standard for External Corrosion Protection Systems for Steel Underground Storage Tanks".
- Tank shall be provided with steel hold-down straps, anchors and concrete hold down pad.

Included in the unit cost for Oil-Water Separator with Coalescing Plates shall be vents as required extending 8' above the finished grade at the locations shown on the plans, as well as up to 200 linear feet of stainless steel vent pipe between the tank appurtenances and vents. Vents shall be connected to the inlet pipe, outlet pipe, and manways, or to other appurtenances as specified by the manufacturer.

Construction Methods:

The Contractor shall submit shop drawings sealed by a CT licensed professional Engineer to the Engineer for approval prior to construction in accordance with Article 1.05.02. The Oil Water Separator shall be designed for Cooper E-80 loadings. When discharging to sanitary, coordination with the City of Stamford WPCA shall be required per Special Provision Section 14.00 - Sanitary.

OIL-WATER SEPARATOR: shall be installed at the location specified according to the manufacturer's specifications and accepted shop drawings, and generally conform to the construction details on DWG. UMD-106 in Subset 05. Tank shall be sealed fully watertight and not subject to degradation due to exposure to oil. Tank shall be fully connected, tested, and accepted prior to receiving oil-water influent.

OIL-WATER SEPARATOR WITH COALESCING PLATES: shall be installed at the location specified according to the manufacturer's specifications and accepted shop drawings, and generally conform to the construction details on DWG. UMD-112 in Subset 05. Tank shall be sealed fully watertight and not subject to degradation due to exposure to oil. Tank shall be fully connected, tested, and accepted prior to receiving oil-water influent.

Method of Measurement:

OIL-WATER SEPARATORS will be measured per each unit satisfactorily installed and accepted. All excavation work, cutting, pre-cast and cast-in-place concrete work, piping, fittings, manhole risers and frame assemblies shall be included within in the unit price.

OIL-WATER SEPARATOR WITH COALESCING PLATES will be measured per each unit satisfactorily installed and accepted. All excavation work, cutting, pre-cast and cast-in-place concrete work, tank placement, piping, fittings, manhole risers and frame assemblies shall be included within in the unit price.

Basis of Payment:

OIL-WATER SEPARATORS will be paid for at the contract unit price for OIL-WATER SEPARATOR per unit satisfactorily installed and accepted. All excavation work, cutting, pre-cast and cast-in-place concrete work, piping, fittings, manhole risers and frame assemblies shall be included within in the unit price.

OIL-WATER SEPARATORS WITH COALESCING PLATES will be paid for at the contract unit price for OIL-WATER SEPARATOR WITH COALESCING PLATES per unit satisfactorily installed and accepted. All excavation work, cutting, pre-cast and cast-in-place concrete work, piping, fittings, manway risers and frame assemblies shall be included within in the unit price.

Pay Item	Pay Unit
0210040A - OIL-WATER SEPARATOR	EA.
0210041A – OIL WATER SEPARATOR WITH COALESCING PLATES	EA.

ITEM #1108672A – CISCO PROFESSIONAL SERVICES

Description:

Cisco equipment furnished for Item #1108681A – "Ethernet Switch – Cisco IE9320" and Item #1108675A– "Ethernet Switch – Cisco IE3200" shall be configured by a Cisco Authorized Partner that is familiar with the existing system. The Cisco Authorized Partner shall be Presidio Inc. located at One Penn Plaza, New York, NY; telephone number 212-652-5700. In addition, existing network equipment that the new equipment interfaces or integrates with shall also be configured by the same vendor to create and maintain a fully functioning and seamlessly integrated communication network for the security network specified in the contract. The exception is for Cisco M6 DWDM equipment. MNR will perform configuration of the Cisco M6.

Professional services required shall include detailed network design, network implementation planning, hot staging of equipment, migration/cut-in of the live network, testing, and configuration and execution of the network design plan. Provide documentation for the design, implementation plan, testing plans and procedures, and as-built configurations. Work shall include configuration of any existing switches that the new equipment interconnects/interfaces; except for Cisco M6 switches.

All work related to Stamford MOE Facility or New Haven Main Line shall be coordinated with Metro-North.

Material and Services:

Cisco Professional Services shall include but not be limited to:

A. Provide an assessment of the network requirements for the security system and review of the existing network configuration
B. Develop the high level design, detailed low level design, network implementation plan, and detailed testing plans and procedures.
C. Hot staging of the equipment specified under Item #1108681A and Item #1108675A for up to 45 days at a location provided by the Contractor (with approval from Metro-North and the Engineer). Staging service shall include fully configuring and testing the new equipment as close as possible to the actual live/production environment that the equipment to be installed. Staging service shall include receiving the equipment, detailed inventory of the equipment, and shipping of all equipment to the field locations.
D. Develop method of procedures to integrate (e.g. cut-in) the new equipment into the existing network and expand the network. Scope of work shall include configuration of existing equipment.
E. Provide field support to the Contractor for installation of network switches (IE3200) at field locations.
F. Execute the approved design and implementation plan in the field. Service shall include final configuration of the system.

G. Fully test the network according to the approved test plan.
H. Develop as-built documents for the network implemented, including hardware installation and software configuration.
I. All documents, procedures, and plans shall be delivered and accepted by Metro-North for Stamford MOE Facility and any work along the New Haven Main Line.

Contractor shall provide 90 days of warranty on the service provided after acceptance of the completed work.

Basis of Payment:

The sum of money shown on the Estimate and in the itemized proposal as "Estimated Cost" for this work will be considered the bid price even though payment will be made as described below. The estimated cost figure is not to be altered in any manner by the bidder. Should the bidder alter the amount shown, the altered figures will be disregarded and the original price will be used to determine the total amount for the contract.

The Department will pay the Contractor its actual costs for “Cisco Professional Services” plus an additional 5% as reimbursement for the Contractor’s administrative expense in connection with the services provided. The 5% markup will be paid when the Engineer receives cancelled check(s) or receipted invoice(s) as proof of payment from the Contractor. Prior to procuring the services, the Contractor shall submit a detailed quote indicating all work to be done by Cisco for approval by the Engineer. All work and amounts shall be pre-approved by the Engineer. Payment will not be made without pre-approval.

Pay Item	**Pay Unit**
Cisco Professional Services	Estimated

ITEM #1108675A – ETHERNET SWITCH – CISCO IE3200

Description:

The Contractor shall furnish and install Cisco® Industrial Ethernet (IE) 3200 Series DIN-mount L2 switches at the locations as shown in the Plans and in this specification.

Materials:

The Cisco IE 3200 switches shall be configured with the minimum requirements as outlined in this Specification.

It shall be the responsibility of the Contractor to coordinate the purchase and delivery of this equipment with the Engineer, MNR Communications, and Cisco to guarantee the most recent version/models are being purchased. It shall also be the responsibility of the Contractor to purchase all necessary components, pieces, parts, modules, cabling, software, licenses, and configuration in addition to the parts specifically mentioned above to provide a complete and fully-functioning system as described in these Special Provisions, Plans, and elsewhere in the Contract Documents. Configuration and testing shall be performed by Cisco Professional Services. Payment of work performed by Cisco authorized partner will be paid under Item #1108672A – Cisco Professional Services.

The following minimum requirements shall be met for the configurations of each switch provided under this contract.

For each switch shown in the plans, contractor shall provide specified switch model and additional components in the quantities shown below for each switch:

Cisco Part Number	Description	Quantity
IE-3200-8P2S-E	Rugged Industrial Ethernet switch w/ (2) 1 Gigabit Ethernet (GigE) SFP Ports, (8) 10/100 PoE/PoE+ ports	Each
PWR-IE170W-PC-AC=	High-Voltage AC/DC Power Source, 170W	1
GLC-LX-SM-RGD	1000 Mbps Single-Mode Rugged SFP, 1300nm	2
CON-SNT-IE32008S	SMARTNET Warranty Service, 8x5x Next Business Day	2*

*SMARTNET support shall be provided for 2 years for each switch

Construction:

Prior to purchase, the Contractor shall submit a complete parts list and "Bill of Materials" (BOM) for approval by the Engineer.

Prior to installation, the Contractor shall submit shop drawings for installation to the Engineer

and shall be approved by the Engineer. A complete list of all components, pieces, parts and modules being supplied shall be submitted to the Engineer for approval.

Testing:

Refer to "Section 10.00 – General Clauses For Highway Illumination and Traffic Signal Projects (Acceptance Testing)" for overall testing requirements and additional information.

Training:

Refer to "Item #1108808A – Training" for overall testing requirements and additional information.

Method of Measurement:

Each Ethernet Switch – Cisco IE3200 will be measured for payment as "Each" for the actual number of switches listed in this specification and furnished, installed, tested, and accepted.

Basis of Payment:

The work under this item will be paid for at the contract unit price per each "Ethernet Switch – Cisco IE3200" including components all furnished, installed, tested, and accepted, which price shall include all material including delivery, tools, equipment, labor, and work incidental thereto.

Pay Item	**Pay Unit**
Ethernet Switch – Cisco IE3200	Each

ITEM #1108681A – ETHERNET SWITCH – CISCO IE9320

Description:

The Contractor shall furnish and install Cisco® 9300 Series rack-mount L2/L3 switches at the locations as shown in the Plans and listed in this specification.

Materials:

The Cisco 9300 series switches shall be configured with the minimum requirements as outlined in this Specification.

It shall be the responsibility of the Contractor to coordinate the purchase and delivery of this equipment with the Engineer, MNR Communications) and Cisco to guarantee the most recent version/models are being purchased. It shall also be the responsibility of the Contractor to purchase all necessary components, pieces, parts, modules, cabling, software, licenses, and configuration in addition to the parts specifically mentioned above to provide a complete and fully-functioning system as described in these Special Provisions, Plans, and elsewhere in the Contract Documents. Configuration and testing shall be performed by Cisco Professional Services. Payment of work performed by Cisco will be paid under Item #1108672A – Cisco Professional Services.

The following minimum requirements shall be met for the configurations of each switch provided under this contract.

For each switch shown in the plans, contractor shall provide specified switch model and additional components in the quantities shown below for each switch:

Cisco Part Number	Description	Quantity
C9300L-24T-4G	Ethernet Switch w/ (24) 1 Gigabit copper ports, and (4) fixed 1G SFP uplinks	Each
PWR-C1-350WAC-P	High-Voltage AC/DC Power Source, 350W	2
SFP-10G-LR-X	10GBASE-LR SMF Extended Temperature	4
IE9300-DNA-E	Cisco Catalyst Center Essentials license	1
CAB-CONSOLE-USB	Cisco Console Cable 6 ft. USB Type A to Mini-B	1
CON-SNT-IES12P50	SMARTNET Warranty Service, 8x5x Next Business Day	2*

*SMARTNET support shall be provided for 2 years for each switch

Cisco Part Number	Description	Quantity
C9300-24S	Ethernet switch w/ (24) 1 Gigabit SFP ports, and modular uplinks	Each
PWR-C1-715WAC-P	High-Voltage AC/DC Power Source, 715W	2
C9300-NM-4M	Network Module w/ (4) Multigigabit ports	1
SFP-10G-LR-X	10GBASE-LR SMF Extended Temperature	A/N
IE9300-DNA-E	Cisco Catalyst Center Essentials license	1
CAB-CONSOLE-USB	Cisco Console Cable 6 ft. USB Type A to Mini-B	1
CON-SNT-IES12P50	SMARTNET Warranty Service, 8x5x Next Business Day	2*

*SMARTNET support shall be provided for 2 years for each switch

Cisco Part Number	Description	Quantity
C9300-24P	Ethernet switch w/ (24) 1 Gigabit copper POE/POE+ ports, and modular uplinks	Each
PWR-C1-715WAC-P	High-Voltage AC/DC Power Source, 715W	2
C9300-NM-4M	Network Module w/ (4) Multigigabit ports	1
SFP-10G-LR-X	10GBASE-LR SMF Extended Temperature	A/N
IE9300-DNA-E	Cisco Catalyst Center Essentials license	1
CAB-CONSOLE-USB	Cisco Console Cable 6 ft. USB Type A to Mini-B	1
CON-SNT-IES12P50	SMARTNET Warranty Service, 8x5x Next Business Day	2*

*SMARTNET support shall be provided for 2 years for each switch

Cisco Part Number	Description	Quantity
C9300X-24HX	Ethernet switch w/ (24) 10G/mGig copper UPOE+ ports, and modular uplinks	Each
PWR-C1-1100WAC-P	High-Voltage AC/DC Power Source, 1100W	2
C9300X-NM-8M	Network Module w/ (8) Multigigabit ports	
SFP-10G-LR-X	10GBASE-LR SMF Extended Temperature	A/N
IE9300-DNA-E	Cisco Catalyst Center Essentials license	1
CAB-CONSOLE-USB	Cisco Console Cable 6 ft. USB Type A to Mini-B	1
CON-SNT-IES12P50	SMARTNET Warranty Service, 8x5x Next Business Day	2*

*SMARTNET support shall be provided for 2 years for each switch

Cisco Part Number	Description	Quantity
C9300-48U	Ethernet switch w/ (48) 1 Gigabit copper UPOE ports, and modular uplinks	Each
PWR-C1-1100WAC-P	High-Voltage AC/DC Power Source, 1100W	2
C9300-NM-4M	Network Module w/ (4) Multigigabit ports	1
SFP-10G-LR-X	10GBASE-LR SMF Extended Temperature	A/N
IE9300-DNA-E	Cisco Catalyst Center Essentials license	1
CAB-CONSOLE-USB	Cisco Console Cable 6 ft. USB Type A to Mini-B	1
CON-SNT-IES12P50	SMARTNET Warranty Service, 8x5x Next Business Day	2*

*SMARTNET support shall be provided for 2 years for each switch

Construction:
Prior to purchase, the Contractor shall submit a complete parts list and "Bill of Materials" (BOM) for approval by the Engineer.

Prior to installation, the Contractor shall submit shop drawings for installation to the Engineer and shall be approved by the Engineer. A complete list of all components, pieces, parts and modules being supplied shall be submitted to the Engineer for approval.

Refer to "Section 10.00 – General Clauses For Highway Illumination and Traffic Signal Projects (Basic Electrical Materials and Methods)" for additional requirements.

Testing:
Refer to "Section 10.00 – General Clauses For Highway Illumination and Traffic Signal Projects (Acceptance Testing)" for overall testing requirements and additional information.

Training:

Refer to "Item #1108808A – Training" for overall testing requirements and additional information.

Method of Measurement:

Each Ethernet Switch – Cisco IE9320 will be measured for payment as "Each" for the actual number of switches listed in this specification and furnished, installed, tested, and accepted. All necessary interconnecting cables, inner ducts, mounting hardware, accessories to provide a complete installation of the switch at the locations shown on the plan shall be part of this pay item.

Basis of Payment:
The work under this item will be paid for at the contract unit price per each "Ethernet Switch – Cisco IE9320" including components all furnished, installed, tested, and accepted, which price shall include all material, delivery, tools, equipment, labor, and work incidental thereto.

Pay Item	**Pay Unit**
Ethernet Switch – Cisco IE9320	Each

ITEM #1108808A – TRAINING

Description:

The Contractor shall provide training on products specified in the following Contract provisions:

1. Ethernet Switch – Cisco IE3200
2. Ethernet Switch – Cisco IE4010
3. Ethernet Switch – Cisco IE9320

4. Network Video Recorder
5. Video Management System
6. PTZ Dome Camera
7. Fixed Mount Dome Camera
8. Multi Sensor (4-Lens) Camera
9. New Security Rack
10. Remote CCTV Cabinet

11. 60W PoE Injector
12. PTZ Power Supply
13. PoE Surge Protection Chassis – Rack Mount
14. PoE Surge Protection Chassis – Wall Mount
15. PoE Surge Protection Module
16. Firewall
17. Wi-Fi Access Points
18. Wi-Fi Controller
19. Access Control System

The above list may not be all inclusive and does not relieve the Contractor from responsibility to provide training for all system elements or training that is required under other Contract provisions.

In addition to overall system training, the Contractor shall provide Genetec Certification courses for Metro-North personnel as described in Item #1108882A – Video Management System Support Services. Such training shall be paid under the respective Bid Item.

Training Program General Requirements:

A Training Program shall be provided by the Contractor in order to provide initial and ongoing training for all users of the CCTV System. The Contractor shall provide videos on DVD of all Contractor-provided training sessions to facilitate the ongoing training. Training shall include ALL components of the CCTV system including (but not limited to) head-end, cameras, field panels and equipment, communications network, and shall include site-specific information. Training shall include ALL respective components of the Wi-Fi System and Access Control

System.

The training shall be tailored to the functions and configuration of the final system as furnished by the Contractor.

Construction Method:

Submit Training Plan for approval by the Engineer. After approval of the Training Plan, the Contractor shall conduct the specified training. The training program shall be implemented through the use of formal classroom training and/or other forms of presentation as recommended by the Contractor. The curriculum shall be designed so that each group of trainees shall be trained in the full repertoire of system commands which they may have to use in the course of performing their designated functions. Students shall be provided with complete sets of training materials and operating manuals during the training sessions, which they shall retain for use on the job at the completion of training. Formal training shall also include a comprehensive student testing program for determining that the intended training has been successfully imparted.

Contractor shall develop and implement a training database configuration to train staff on the use of the system. This training configuration should address the functions and operation of the CCTV, Wi-Fi and Access Control systems in real-time simulation of typical alarm events. To support this project, a test database shall be created which shall remain available for centralized training after the system is in operation. The test database configuration shall not degrade the performance any system.

Contractor shall conduct the required training at the facility, at the scheduled times and location designated by the Engineer consistent with the approved Training Plan. The full complement of training courses shall be conducted over time to accommodate shift personnel, vacations, and make-up sessions. A detailed schedule for the delivery of all training shall be included in the Project Plan and Schedule and reported on during the regularly scheduled status meetings. All training shall be completed no later than 14 calendar days prior to commencement of the 31-day operational test unless otherwise coordinated with the Engineer. The training shall include, but not be limited to the following groupings of staff:

1. Operator training shall include a simulation of actual site conditions at each facility and shall be provided for three groups of 15 students per course/per facility. Each group shall be trained for the equivalent of two eight hour instructional classes (training must be flexible to accommodate shift workers). Training shall include, but not be limited to: sequence of operation review; sign-on/sign-off; selection of all displays and reports: commanding of points, English and graphic mode; modifying English text; selection of all alarm functions; temporarily modifying resolution and frame rate for viewing; reviews of all topics presented in the Operator's Manual. Training shall also provide site-specific information about the newly installed components and demonstration of the new system with particular emphasis of components or settings that are different from previous phases.

2. System Administrator Training shall include, in addition to subjects addressed in the operator training classes, training for two groups of six DOT or MNR supervisors per facility. Each group shall be trained for two, eight hour instructional classes to be held on two separate days. Training shall include, but not be limited to: communications system instruction; use of operator terminal; program upload, download modification; password assignment and modification; operator assignment and modification; point disable/enable; terminal and data segregation/modification; sequence of operation and flowcharts; modification of control programs and databases; add/delete/modify data points; review of all topics presented in the System Administrator's Manual. Training shall also provide site-specific information about the newly installed components and demonstration of the new system with particular emphasis of components or settings that are different from previous phases.

3. Maintenance Training shall include training for two groups of six students per course, per facility. Each group shall be trained for four, eight hour instructional classes to be held on four separate days. System maintenance training shall include all functions required to maintain the System and to prepare maintenance personnel to make minor adjustments to the System, troubleshoot the System at the board level, replace defective components and field devices, and perform other maintenance functions normally associated with board-level maintenance activities. This shall include, at a minimum, component overview, safety, troubleshooting, programming, adjustments, and maintenance requirements of the following:
    a. Overall system and architecture
    b. System components
    c. System racks, cabinets, and panels
    d. CCTV cameras
    e. Head-end systems
    f. Power supplies and power injectors
    g. Network architecture and network equipment
    h. Wi-Fi system
    i. Access Control System

    Training shall include symptom recognition, shut down and start-up procedures, replacement of all devices and subcomponents including cameras, lenses, housings, power supplies, switches, illuminators, etc.

    Training shall also provide site-specific information about the newly installed components and demonstration of the new system with particular emphasis of components or settings that are different from previous phases.

Method of Measurement:

Upon completion of each training program, the Contractor shall prepare and deliver a training report which shall summarize the results of the training program, including a list of attendees, course evaluation form, and recommendations for follow-up training or modification to the

curriculum.

The Contractor shall furnish electronic copies (both native and PDF formats) of all materials used during the training. The PDF versions shall be created electronically and not scanned from a printed copy. Furnish to the Engineer five (5) file sets each of the User Manual slides, coursework, and training aids in addition to providing an appropriate manual for each person attending the classes.

Basis of Payment:

This work will be paid for at the Contract lump sum price for "Training" which price shall include all labor, equipment, materials and services incidental thereto.

System Training, other than Genetec Certification training specified elsewhere, shall be included as part of Item #1108872A – Video Management System. The Contractor shall bid the Project accordingly.

Pay Item	**Pay Unit**
Training	L.S.

ITEM #1112263A – CCTV POLE TYPE B – STRAIGHT POLE

Description:

This item consists of furnishing and installing a CCTV pole at each location as shown in the plans. The poles shall be straight poles designed as shown in the Plans and as described in these Specifications.

Materials:

The CCTV Poles shall be constructed of aluminum and shall conform to the following requirements:

Pole Material

Seamless, extruded structural aluminum square tube complying with ASTM B 429/B 429M, Alloy 6063-T6 with two access handholes in pole wall.

Shape

The pole shall be square without taper

Mounting Provisions

When applicable, mast arms shall be welded directly to face of CCTV pole. Aluminum welding shall conform to AWS D1.2. Flange for bolted mounting as shown on the Plans. All fastening hardware shall be stainless steel.

Pole Base

The pole shall be fully welded to a cast aluminum, alloy 356-T6 base plate, sized to the dimensions shown in the Plans. All anchors and associated hardware shall be stainless steel. Anchor rods shall conform to ASTM A193 Grade B8M, and nuts shall conform to ASTM A194 Grade 8M. All pole bases shall be provided with base covers, which shall completely enclose the base plate and anchoring hardware so as to prevent any exposure to the outside environment. Grout shall be of non-shrink type and in accordance with Standard specification, Article M.03.05.

Handholes

The pole shall have two access handholes in pole wall, not blocking or interfering with equipment to be installed on the pole.

Finish

The poles shall be powder coated to match the color of the existing poles where they will be installed. All colors shall be approved by the Engineer prior to having the finish applied to the poles.

Construction Methods:

The Contractor shall submit shop drawings for CCTV poles prior to supplying this item. The material, construction, color and all details of the poles construction must be approved by the Engineer.

Contractor shall coordinate devices to be mounted on the poles with surrounding area and requirements of other sections of the Contract Documents. Coordinate with the pre-installation camera surveys and shop drawing requirements of the CCTV cameras.

Each pole shall be mounted on grade and shall include a pole foundation as shown in the Plans. Pole foundation shall be minimum of 96" inground with a variable of 24" to 36" above ground to achieve specified camera pole height.

All poles shall be grounded in accordance with other sections of these Specifications. Work of this item shall include all materials required to properly ground the poles to the ground grid.

Testing:

Refer to "Section 10.00 – General Clauses For Highway Illumination and Traffic Signal Projects (Acceptance Testing)"for overall testing requirements and additional information. As part of the Field Installation Testing, Contractor shall verify poles and devices mounted to poles are installed in accordance with approved shop drawings and manufacturer instructions.

Method of Measurement:

The work will be measured for payment by the number of "Each" furnished, approved, installed, grounded, inspected, and accepted.

Basis of Payment:

The work under this item will be paid for at the contract unit price per each for unit furnished and installed which price shall include full compensation for all materials and other incidentals needed to complete the work.

Pay Item	**Pay Unit**
CCTV Pole Type B – Straight Pole	Each

SECTION 093100 – CERAMIC TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions of Division 1, State of Connecticut, Department of Transportation, Standard Specifications for Roads, Bridges, Facilities and Incidental Construction, Form 819 - 2024 and supplemental specifications thereto, shall be a part of this specification.

1.2 SUMMARY

A. Section Includes:
   1. Porcelain tile.
   2. Thresholds.
   3. Tile backing panels.

B. Related Sections:
   1. Section 079200 “Joint Sealants” for sealing of expansion, contraction, control, and isolation joints in tile surfaces if not specified within this Section.

1.3 DEFINITIONS

A. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.

B. Facial Dimension: Actual tile size (minor facial dimension as measured per ASTM C 499).

C. Facial Dimension: Nominal tile size as defined in ANSI A137.1.

1.4 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:

   1. Level Surfaces: Minimum 0.6.

1.5 ACTION SUBMITTALS

A. Submit the following in accordance with Form 819 Article 1.20-1.05.02 and NOTICE TO CONTRACTOR – SUBMITTALS.

B. Product Data: For each type of tile, mortar, grout, and other products specified.

C. Tile Samples for Initial Selection: Manufacturer's color charts consisting of actual tiles or sections of tiles showing the full range of colors, textures, and patterns available for each type and composition of tile indicated. Include Samples of accessories involving color selection.

D. Grout Samples for Initial Selection: Manufacturer's color charts consisting of actual sections of grout showing the full range of colors available for each type of grout indicated.

E. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

F. Product Certificates: Signed by manufacturers certifying that the products furnished comply with requirements.

G. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names of Designers and owners, and other information specified.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain products from a single manufacturer in accordance with Form 819 Article 1.20-1.06.01.

B. Installer Qualifications: Engage an experienced installer who has completed tile installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

C. Source Limitations for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties without delaying the Work.

D. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

E. Source Limitations for Other Products: Obtain each of the following products specified in this Section from one source and by a single manufacturer for each product:

1. Stone thresholds.
2. Cementitious backer units.
3. Joint sealants.
4. Waterproofing.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Refer to Form 819 Article 1.06.03 and Form 819 Article 1.20-1.06.03 for additional information.

B. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.

C. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

D. Handle tile with temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is completed and ambient temperature and humidity conditions are being maintained to comply with referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Tile Products:

a. American Marrazzi Tile, Inc.
b. American Olean Tile Company.
c. Buchtal Corporation USA.
d. Cerim-Floor Gres Ceramiche.
e. Crossville Ceramics.
f. Dal-Tile Corporation.
g. Florida Tile Industries, Inc.
h. GranitiFiandre.

i. Interceramics, USA.
j. KPT, Inc.
k. Laufen International, Inc.
l. Lonestar Ceramics Company.
m. Mannington Ceramic Tile.
n. Metropolitan Ceramics.
o. Monarch Tile, Inc.
p. Quarry Tile Company.
q. Seneca Tiles, Inc.
r. Summitville Tiles, Inc.
s. United States Ceramic Tile Company.

2. Tile-Setting and -Grouting Materials:

a. American Olean Tile Company.
b. Atlas Minerals & Chemicals, Inc.
c. Boiardi Products Corporation.
d. Bonsal: W.R. Bonsal Company.
e. Bostik.
f. C-Cure Corporation.
g. Custom Building Products.
h. Dal-Tile Corporation.
i. DAP, Inc.
j. Laticrete International, Inc.
k. Mapei Corporation.
l. Southern Grouts & Mortars, Inc.
m. Summitville Tiles, Inc.
n. TEC Incorporated.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard Grade requirements, unless otherwise indicated.
2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting Materials" and "Grouting Materials" articles.

C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:

1. Provide Designer's selections from manufacturer's full range of colors, textures, and patterns for products of type indicated.

D. Factory Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, blend tile in the factory and package so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples.

E. Mounting: Where factory-mounted tile is required, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless another mounting method is indicated.

1. Where tile is indicated for installation in swimming pools, on exteriors, or in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for these kinds of installations and has a record of successful in-service performance.

F. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating them with a continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.3 TILE PRODUCTS

A. ColorBody Porcelain Tile (CT-1): Provide basis of design product Dal-Tile – Keystones complying with the following requirements:

1. Wearing Surface: Nonabrasive.
2. Size: 2x2.
3. Thickness: 1/4 inch.
4. Finish: Matte.
5. Shade Variation: V2 medium.
6. Location: As indicated on drawings.
7. Dynamic Coefficient of Friction: Not less than 0.42.
8. Tile Color: Castlerock, D618 mosaic.
9. Grout Color: As selected by Architect from manufacturer’s full range.

B. ColorBody Porcelain Tile (CT-2): Provide basis of design product Dal-Tile – Keystones complying with the following requirements:

1. Wearing Surface: Nonabrasive.
2. Size: 2x2
3. Thickness: 1/4 inch.
4. Finish: Matte.
5. Shade Variation: V2 medium.
6. Location: As indicated on drawings.
7. Dynamic Coefficient of Friction: Not less than 0.42.
8. Tile Color: Artic White, D617 criss cross mosaic.

9. Grout Color: As selected by Architect from manufacturer's full range.

C. ColorBody Porcelain Tile (CT-3): Provide basis of design product Dal-Tile – Keystones complying with the following requirements:

1. Wearing Surface: Nonabrasive.
2. Size: 1 inch.
3. Thickness: 1/4 inch.
4. Finish: Matte.
5. Shade Variation: V4 random.
6. Location: As indicated on drawings.
7. Dynamic Coefficient of Friction: Not less than 0.42.
8. Tile Color: White Rock Blend, DK35 Organic Penny Mosaic.
9. Grout Color: As selected by Architect from manufacturer's full range.

D. ColorBody Porcelain Tile (CT-4): Provide basis of design product Dal-Tile – Keystones complying with the following requirements:

1. Wearing Surface: Nonabrasive.
2. Size: 2 inch Organic Penny Mosaic.
3. Thickness: 1/4 inch.
4. Finish: Matte.
5. Shade Variation: V1 low.
6. Location: As indicated on drawings.
7. Dynamic Coefficient of Friction: Not less than 0.42.
8. Tile Color: Desert Grey, D014.
9. Grout Color: As selected by Architect from manufacturer's full range.

E. Edge Protection and Transition Profiles for Floors and Walls (Toilet and Locker Rooms):
1. Shapes: As follows, selected from Schluter Systems, L.P., 194 Pleasant Ridge Road, Plattsburgh, NY 12901-5841. Tel.: (800) 472-4588. Fax: (800) 477-9783. E-mail: specessist@schluter.com. Internet: www.schuleter.com.
   a. Wainscot Cap: Basis of design product: Schluter FINEC/FNEC-SQ.
   b. Tapered Transition Tile: Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide a reduction in thickness from 1/2 to 1/4 inch across nominal 4-inch dimension.
   c. Internal and external corners, and floor to wall transitions: Basis of design product: Schluter DILEX-AHK.
      1) Description: anodized aluminum profile with integrated trapezoid perforated anchoring leg, connected at a 90-degree angle by a cove-shaped section with 3/8: radius that forms the visible surface.
      2) Corners:
         a) Provide with matching inside corners.
         b) Provide with matching outside corners.
         c) Provide with matching end caps.
         d) Provide with matching connectors.

3) Material and Finish:
   a) AE- Satin Anodized Aluminum.
4) Height as required.

2.4 THRESHOLDS

A. General: Provide stone thresholds that are uniform in color and finish, fabricated to sizes and profiles indicated to provide transition between tile surfaces and adjoining finished floor surfaces.

1. Fabricate thresholds to heights indicated, but not more than 1/2 inch above adjoining finished floor surfaces, with transition edges beveled on a slope of no greater than 1:2.

B. Marble Thresholds: Provide marble thresholds complying with ASTM C 503 requirements for exterior use and with a minimum abrasive-hardness value of 10 per ASTM C 241.
1. Provide white, honed marble complying with the Marble Institute of America's Group A requirements for soundness.

2.5 SETTING MATERIALS

A. Portland Cement Mortar Installation Materials: Not Used.

B. Standard Dry-Set Mortar (Thinset): ANSI A118.1.

1. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.1.

C. Medium-Bed, Modified Dry-Set Mortar: Comply with requirements in ANSI A118.4. Provide product that is approved by manufacturer for application thickness of 5/8 inch.
1. Provide prepackaged, dry-mortar mix containing dry, re-dispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
2. Provide prepackaged, dry-mortar mix combined with acrylic resin liquid-latex additive at Project site

2.6 GROUTING MATERIALS

A. Standard Cement Grout: ANSI A118.6.

2.7 ELASTOMERIC SEALANTS

A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements of Division 7 Section "Joint Sealants."

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.

C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and temperature extremes.

D. Available Products: Subject to compliance with requirements, products which may be incorporated into the Work include, but are not limited to, the following:

1. One-Part, Mildew-Resistant Silicone Sealants:

    a. Dow Corning 786; Dow Corning Corporation.
    b. Sanitary 1700; GE Silicones.
    c. Pecora 898 Sanitary Silicone Sealant; Pecora Corp.
    d. Rhodorsil 6B White; Rhone-Poulenc, Inc.
    e. Tremsil 600 White; Tremco, Inc.

2.8 TILE BACKING PANELS

A. Provide cementitious backer units complying with ANSI A118.9, of thickness and width indicated below, and in maximum lengths available to minimize end-to-end butt joints.
1. Thickness: 5/8 inch, where indicated.
2. Width: Manufacturer's standard width, but not less than 32 inches.

B. Available Products: Subject to compliance with requirements, cementitious backer units that may be incorporated into the Work include, but are not limited to, the following:

1. The Original Wonderboard; Custom Building Products.
2. Wonderboard Multi+Board; Custom Building Products.
3. DomCrete Cementitious Tile-Backer Board; Domtar Gypsum.
4. Util-A-Crete Concrete Backer Board; FinPan, Inc.
5. DUROCK Cement Board; United States Gypsum Co.

2.9 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Edge Strips: White-zinc-alloy terrazzo strips, 1/8 inch wide at top edge with integral provision for anchorage to mortar bed or substrate, unless otherwise indicated.

C. Temporary Protective Coating: Provide product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; is compatible with tile, mortar, and grout products; and is easily removable after grouting is completed without damaging grout or tile.

1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F per ASTM D 87.
2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as a temporary protective coating for tile.

D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.10 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm; dry; clean; free from oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 series of tile installation standards for installations indicated.
2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.

3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust latter in consultation with Designer.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Remove coatings, including curing compounds, and other substances that contain soap, wax, oil, or silicone and are incompatible with tile-setting materials by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.

C. Provide concrete substrates for tile floors installed with dry-set or latex-portland cement mortars that comply with flatness tolerances specified in referenced ANSI A108 series of tile installation standards for installations indicated.

1. Use trowelable leveling and patching compounds per tile-setting material manufacturer's written instructions to fill cracks, holes, and depressions.
2. Remove protrusions, bumps, and ridges by sanding or grinding.

D. Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, verify that tile has been blended in the factory and packaged so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

E. Substrate Flatness:

1. For tile shorter than 15 inches, confirm that structure or substrate is limited to variation of 1/4 inch in 10 ft. from the required plane, and no more than 1/16 inch in 12 inches when measured from tile surface high points.

F. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent adhesion or staining of exposed tile surfaces by grout, protect exposed surfaces of tile against adherence of mortar and grout by precoating them with a continuous film of temporary protective coating indicated below, taking care not to coat unexposed tile surfaces:

1. Petroleum paraffin wax, applied hot.
2. Grout release.
3. Petroleum paraffin wax or grout release.

3.3 INSTALLATION OF CERAMIC TILE

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
   a. Tile floors in wet areas.
   b. Tile floors consisting of rib-backed tiles.

B. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are the same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets the same width as joints within tile sheets so joints between sheets are not apparent in finished work.

E. Lay out tile wainscots to next full tile beyond dimensions indicated.

F. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Locate joints in tile surfaces directly above joints in concrete substrates.
2. Prepare joints and apply sealants to comply with requirements of Division 7 Section "Joint Sealants."

G. Grout tile to comply with the requirements of the following tile installation standards:

1. For ceramic tile grouts (sand-portland cement, dry-set, commercial portland cement, and latex-portland cement grouts), comply with ANSI A108.10.
2. For chemical-resistant epoxy grouts, comply with ANSI A108.6.
3. For chemical-resistant furan grouts, comply with ANSI A108.8.

H. At showers, tubs, and where indicated, install cementitious backer units and treat joints to comply with ANSI A108.11 and manufacturer's written instructions for type of application indicated.

I. Joint Widths: Install tile on floors with the following joint widths:

1. Porcelain Tile: 1/4 inch.

J. Back Buttering: For installations indicated, obtain 100 percent mortar coverage by complying with applicable special requirements for back buttering of tile in referenced ANSI A108 series of tile installation standards:
1. Tile floors in wet areas, including showers.
2. Tile floors composed of rib-backed tiles.

K. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.

1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.

L. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

3.4 INSTALLATION OF TILE BACKING PANELS

A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

3.5 ADJUSTING AND CLEANING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.6 PROTECTION

A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.7 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:

1. TCNA F111: Method ANSI A108.1C. Cement mortar bed (thickset) installed over cleavage membrane.

    a. Ceramic Tile Type: CT-4.
    b. Bond Coat for Cured-Bed Method: Dry-set mortar.
    c. Grout: High-performance sanded cement grout.
    d. Joint Width: 1/4 inch.

B. Interior Wall Installations, Masonry or Concrete:

1. TCNA W202I: Thinset mortar.

    a. Ceramic Tile Type: CT-1, CT-2, and CT-3.
    b. Thinset Mortar: Dry-set mortar.
    c. Grout: High-performance unsanded cement grout.
    d. Joint Width: 1/8 inch.

C. Interior Wall Installations, Metal Studs:

1. TCNA W244C: Thinset mortar on cementitious backer board.

    a. Ceramic Tile Type: CT-1, CT-2, and CT-3.
    b. Thinset Mortar: Dry-set mortar.
    c. Grout: High-performance unsanded cement grout.
    d. Joint Width: 1/8 inch.

D. Shower Wall Installations:

1. TCNA B412: Thinset mortar over waterproof membrane cementitious backer board.

    a. Ceramic Tile Type: CT-1, CT-2, and CT-3.
    b. Thinset Mortar: Modified dry-set mortar.
    c. Grout: High-performance unsanded cement grout.
    d. Waterproof Membrane: As recommended by setting material manufacturer.
    e. Joint Width: 1/8 inch.
    f. Movement Joints: Types located on Drawings.

END OF SECTION 093100

SECTION 095123 – ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions of Division 1, State of Connecticut, Department of Transportation, Standard Specifications for Roads, Bridges, Facilities and Incidental Construction, Form 819 - 2024 and supplemental specifications thereto, shall be a part of this specification.

1.2 SUMMARY

A. Section Includes:

1. Fully concealed, direct-hung, suspension systems.

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete at ceilings.

1.3 DEFINITIONS

A. CAC: Ceiling Attenuation Class.

B. LR: Light Reflectance coefficient.

C. NRC: Noise Reduction Coefficient.

1.4 ACTION SUBMITTALS

A. Submit the following in accordance with Form 819 Article 1.20-1.05.02 and NOTICE TO CONTRACTOR – SUBMITTALS.

B. Product Data: For each type of product indicated.

C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Tile: Set of full-size Samples of each type, color, pattern, and texture.
2. Concealed Suspension System Members: 12-inch-long Sample of each type.
3. Exposed Moldings and Trim: Set of 12-inch-long Samples of each type and color.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain products from a single manufacturer in accordance with Form 819 Article 1.20-1.06.01.

B. Acoustical Testing Agency Qualifications: An independent testing laboratory, or an NVLAP-accredited laboratory, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.

C. Source Limitations:

1. Acoustical Ceiling Tile: Obtain each type through one source from a single manufacturer.
2. Suspension System: Obtain each type through one source from a single manufacturer.

D. Source Limitations: Obtain each type of acoustical ceiling tile and supporting suspension system through one source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Refer to Form 819 Article 1.06.03 and Form 819 Article 1.20-1.06.03 for additional information.

B. Deliver acoustical tiles, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

C. Before installing acoustical tiles, permit them to reach room temperature and a stabilized moisture content.

D. Handle acoustical tiles carefully to avoid chipping edges or damaging units in any way.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical tile ceiling installation.

1.8 COORDINATION

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

1.9 EXTRA MATERIALS

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

1. Acoustical Ceiling Units: Full-size units equal to 2.0 percent of quantity installed.
2. Suspension System Components: Quantity of each concealed grid and exposed component equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 ACOUSTICAL TILES, GENERAL

A. Acoustical Tile Standard: Provide manufacturer's standard tiles of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.

B. Acoustical Tile Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical tiles are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Designer from each manufacturer's full

range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

C. Coating-Based Antimicrobial Treatment: Provide acoustical tiles with face and back surfaces coated with antimicrobial treatment consisting of manufacturer's standard formulation with fungicide added to inhibit growth of mold and mildew and showing no mold or mildew growth when tested according to ASTM D 3273.

D. Tile-Based Antimicrobial Treatment: Provide acoustical tiles treated with manufacturer's standard antimicrobial solution that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria.

2.3 MINERAL-BASE ACOUSTICAL TILES FOR ACOUSTICAL TILE CEILING **ACP-1**:

A. Available Products: System design based upon USG Interiors, Inc., Style “Frost” acoustical ceiling panels.

B. Color: White.

C. Edge Detail: Shadowline bevel.

D. Thickness: 3/4 inch.

E. Size: 24 by 24 inches.

F. NRC: .70

G. Provide pre-cut tiles ready to accept recessed light fixture trims.

2.4 MINERAL-BASE ACOUSTICAL TILES FOR ACOUSTICAL TILE CEILING **ACP-2**:

A. Available Products: System design based upon USG Interiors, Inc. X-Technology Ceilings, Style “Mars” acoustical ceiling panels.

B. Color: White.

C. Thickness: ¾ inch.

D. Size: 24 x 24 inches.

E. Edge Detail: Shadowline tapered.

F. Provide pre-cut tiles ready to accept recessed light fixture trims.

G. NRC: .70

2.5 MINERAL-BASE ACOUSTICAL TILES FOR ACOUSTICAL TILE CEILING **ACP-3:**

A. Available Products: System design based upon USG Interiors, Inc. Ceilings, Style "Halcyon" acoustical ceiling panels.

B. Color: White.

C. Thickness: ¾ inch.

D. Size: 24 x 24 inches.

E. NRC: 1.0

F. Edge Detail: "Fineline" reveal style FL.

G. Provide pre-cut tiles ready to accept recessed light fixture trims.

2.6 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.

1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.

a. Type: Cast-in-place anchors.
b. Type: Postinstalled adhesive anchors.
c. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.

E. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

2.7 PRIMARY METAL SUSPENSION SYSTEM - TILE CEILING **ATC-1,** and **2**:

A. Available Products: Suspension System for Acoustical Tile Ceiling ATC-1 and 2: Where this ceiling designation is indicated, provide acoustical tile ceiling suspension system complying with the following:

1. Products: System based on the following -USG Interiors, Inc. Donn Suspension Systems, Style “Donn Identitee DXI”

2. Color: White.

3. Class: Intermediate Duty.

4. Width: 9/16 inch.

2.8 PRIMARY METAL SUSPENSION SYSTEM - TILE CEILING **ATC- 3**:

A. Available Products: Suspension System for Acoustical Tile Ceiling ATC-3: Where this ceiling designation is indicated, provide acoustical tile ceiling suspension system complying with the following:

1. Products: System based on the following -USG Interiors, Inc. Donn Suspension Systems, Style “Fineline DXF”

2. Color: White.

3. Class: Intermediate Duty.

4. Width: 1/8”inch.

2.9 METAL EDGE MOLDINGS AND TRIM

A. Available Manufacturers:

1. Armstrong World Industries, Inc.
2. Chicago Metallic Corporation.
3. Fry Reglet Corporation.

4. Gordon, Inc.
5. MM Systems, Inc.
6. USG Interiors, Inc.

B. Roll-Formed Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical tile edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.

1. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2. For deep leg edge suspension system provide manufacturer’s standard system coordinated with main suspension system.

C. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with the following requirements:

1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 (ASTM B 221M) for alloy and temper 6063-T5.
2. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.
3. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.

a. Organic Coating: Thermosetting, enamel primer/topcoat system with a minimum dry film thickness of 0.8 to 1.2 mils (0.02 to 0.03 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing and substrates to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical tile ceilings.

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

3.2 PREPARATION

A. Testing Substrates: Before installing adhesively applied tiles on wet-placed substrates such as cast-in-place concrete or plaster, test and verify that moisture level is below tile manufacturer's recommended limits.

B. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION, SUSPENDED ACOUSTICAL TILE CEILINGS

A. General: Install acoustical tile ceilings to comply with ASTM C 636and seismic requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
4. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
5. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
6. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.

7. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
8. Do not attach hangers to steel deck tabs.
9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical units.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Arrange directionally patterned acoustical tiles as follows:

1. As indicated on reflected ceiling plans.
2. Install tiles with pattern running in one direction parallel to long axis of space.
3. Install tiles with pattern running in one direction parallel to short axis of space.
4. Install tiles in a basket-weave pattern.

G. Install acoustical tiles in coordination with suspension system and exposed moldings and trim. Place splines or suspension system flanges into kerfed edges so tile-to-tile joints are closed by double lap of material.

1. Fit adjoining tile to form flush, tight joints. Scribe and cut tile for accurate fit at borders and around penetrations through tile.
2. Hold tile field in compression by inserting leaf-type, spring-steel spacers between tile and moldings, spaced 12 inches o.c.
3. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 CLEANING

A. Clean exposed surfaces of acoustical tile ceilings, including trim and edge moldings. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace tiles and other ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095123

SECTION 096519 – RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions of Division 1, State of Connecticut, Department of Transportation, Standard Specifications for Roads, Bridges, and Incidental Construction, Form 819 - 2024 and supplemental specifications thereto, shall be a part of this specification.

1.2 SUMMARY

A. Section Includes:
   1. Vinyl composition floor tile.
      a. Luxury Vinyl floor tile.

1.3 ACTION SUBMITTALS

A. Submit the following in accordance with Form 819 Article 1.20-1.05.02 and NOTICE TO CONTRACTOR – SUBMITTALS.

B. Product Data: For each type of product.

C. Shop Drawings: For each type of resilient floor tile.

   1. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
   2. Show details of special patterns.

D. Samples: Full-size units of each color, texture, and pattern of floor tile required.

   1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.

E. Samples for Initial Selection: For each type of floor tile indicated.

F. Samples for Verification: Full-size units of each color and pattern of floor tile required.

   1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.

G. Welded-Seam Samples: For seamless-installation technique indicated and for each floor covering product, color, and pattern required; with seam running lengthwise and in

center of 6-by-9-inch Sample applied to a rigid backing and prepared by Installer for this Project.

H. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Submit the following in accordance with Form 819 Article 1.20-1.05.02 and NOTICE TO CONTRACTOR – SUBMITTALS.

B. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

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

1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.7 QUALITY ASSURANCE

A. Source Limitations: Obtain products from a single manufacturer in accordance with Form 819 Article 1.20-1.06.01.

B. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Refer to Form 819 Article 1.06.03 and Form 819 Article 1.20-1.06.03 for additional information.

B. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.9 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg. For more than 95 deg F, in spaces to receive floor tile during the following periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F more than 95 deg F.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 VINYL COMPOSITION FLOOR TILE

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

1. Tarkett North America.
2. Roppe Corp.
3. Flexco Corp.

B. Flooring Tile Standard: ASTM F1066, Class 1, solid color.

C. Basis of Design Product: Vinyl composition tile (**LVT-1**) by Tarkett North America.
1. Color: Create Emphasis, Purpose 11513
2. Size: 18 inches by 18inches.
3. Shade Variation: V1 Slight Variation.

D. Basis of Design Product: Vinyl composition tile (**LVT-2**) by Tarkett North America.
   1. Color: Palladian, Palazzo 4662.
   2. Size: 13.8 inches by 12 inches.
   3. Shade Variation: V1 Slight Variation.

E. Basis of Design Product: Vinyl composition tile (**LVT-3**) by Tarkett North America.
   1. Color: Create Emphasis, Refresh 11514
   2. Size: 18 inches by 18inches.
   3. Shade Variation: V1 Slight Variation.

F. Basis of Design Product: Vinyl composition tile (**LVT-4**) by Tarkett North America.
   1. Color: Creative Expression, Loyal 11523
   2. Size: 18 inches by 18inches.
   3. Shade Variation: V3 High Variation.

G. Basis of Design Product: Vinyl composition tile (**LVT-5**) by Tarkett North America.
   1. Color: Events & Abstract, Chantil 11194
   2. Size: 18 inches by 18inches.
   3. Shade Variation: V1 Slight Variation.

H. Basis of Design Product: Vinyl composition tile (**LVT-6**) by Tarkett North America.
   1. Color: Events & Abstract, Capri 11190
   2. Size: 18 inches by 18inches.
   3. Shade Variation: V1 Slight Variation.

I. Basis of Design Product: Vinyl composition tile (**LVT-7**) by Tarkett North America.
   1. Color: Events & Abstract, Pietro 11188
   2. Size: 18 inches by 18inches.
   3. Shade Variation: V1 Slight Variation.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

C. Seamless-Installation Accessories:

   1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.

      a. Colors: As selected by Architect from manufacturer's full range to contrast with floor tile.

2. Chemical-Bonding Compound: Manufacturer's product for chemically bonding seams.

D. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

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

3.2 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft, and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

C. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.

D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

E. Do not install floor tiles until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

F. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles with grain running in one direction.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

I. Seamless Installation:

1. Heat-Welded Seams: Comply with ASTM F1516. Rout joints and heat weld with welding bead to fuse sections permanently into a seamless flooring installation.

Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.

2. Chemically Bonded Seams: Bond seams with chemical-bonding compound to fuse sections permanently into a seamless flooring installation. Prepare seams and apply compound to produce tightly fitted seams without gaps, overlays, or excess bonding compound on flooring surfaces.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.

1. Apply three coat(s).

E. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 098433 – SOUND-ABSORBING WALL UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions of Division 1, State of Connecticut, Department of Transportation, Standard Specifications for Roads, Bridges, Facilities and Incidental Construction, Form 819 - 2024 and supplemental specifications thereto, shall be a part of this specification.

1.2 SUMMARY

A. Section includes shop-fabricated, acoustical panel units tested for acoustical performance, including the following:

1. Sound-absorbing wall panels.

1.3 DEFINITIONS

A. NRC: Noise Reduction Coefficient.

B. SAA: Sound Absorption Average.

1.4 ACTION SUBMITTALS

A. Submit the following in accordance with Form 819 Article 1.20-1.05.02 and NOTICE TO CONTRACTOR – SUBMITTALS.

B. Product Data: For each type of product.

1. Include fabric facing, panel edge, core material, and mounting indicated.

C. Shop Drawings: For unit assembly and installation.

1. Include plans, elevations, sections, and mounting devices and details.
2. Include details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate panel edge profile and core materials.
3. Include details at cutouts and penetrations for other work.
4. Include direction of fabric weave and pattern matching.

D. Samples for Initial Selection: For each type of fabric facing.

1. Include Samples of hardware and accessories involving color or finish selection.

E. Samples for Verification: For the following products:

1. Fabric: Full-width by approximately 36-inch- (900-mm-) long Sample, but not smaller than required to show complete pattern repeat, from dye lot to be used for the Work, and with specified treatments applied. Mark top and face of fabric.
2. Panel Edge: 12-inch- (300-mm-) long Sample(s) showing each edge profile, corner, and finish.
3. Core Material: 12-inch- (300-mm-) square Sample at corner.
4. Mounting Devices: Full-size Samples.
5. Assembled Panels: Approximately 36 by 36 inches (900 by 900 mm), including joints and mounting methods.

1.5 INFORMATIONAL SUBMITTALS

A. Submit the following in accordance with Form 819 Article 1.20-1.05.02 and NOTICE TO CONTRACTOR – SUBMITTALS.

B. Coordination Drawings: Elevations 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. Electrical outlets, switches, and thermostats.
2. Items penetrating or covered by units including the following:
   a. Conduits.
   b. Alarms.
   c. Equipment.
   d. Electrical Panels.
   e. Access panels.

C. Product Certificates: For each type of unit.

D. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of unit to include in maintenance manuals. Include fabric manufacturers' written cleaning and stain-removal instructions.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Refer to Form 819 Article 1.06.03 and Form 819 Article 1.20-1.06.03 for additional information.

B. Comply with fabric and unit manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.

C. Deliver materials and units in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Air-Quality Limitations: Protect units from exposure to airborne odors, such as tobacco smoke, and install units under conditions free from odor contamination of ambient air.

C. Field Measurements: Verify unit locations and actual dimensions of openings and penetrations by field measurements before fabrication, and indicate them on Shop Drawings.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace units and components that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to the following:

a. Acoustical performance.
b. Fabric sagging, distorting, or releasing from panel edge.
c. Warping of core.

2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain wall units specified in this Section from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: Units shall comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, as

determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Surface-Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

    a. Flame-Spread Index: 25 or less.
    b. Smoke-Developed Index: 450 or less.

2. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265 Method B Protocol or NFPA 286.

2.3 SOUND-ABSORBING WALL UNITS

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

1. Acoustical Panel Systems (APS, Inc.)
2. MBI Products Company, Inc.
3. Architectural Design Resources (ADR)

B. Basis of Design product: Sound-Absorbing wall panel with copolymer finish by Conwed.

C. Manufacturer's standard panel construction consisting of facing material laminated to front face, edges, and back edge border of core.

1. Panel Shape: As indicated on Drawings.
2. Mounting: Edge mounted with splines secured to substrate.

    a. Finish Color at Exposed Edges: As selected by Architect from manufacturer's “Urban Forest” range.

3. Mounting: Z-clips to Z-bar.
4. Core: Manufacturer's standard.

    a. Core-Face Layer: Manufacturer's standard impact-resistant, acoustically transparent, copolymer sheet.

5. Edge Construction: Manufacturer's standard chemically hardened core with no frame.
6. Edge Profile: Square.
7. Corner Detail in Elevation: Square with continuous edge profile indicated.
8. Reveals between Panels: Flush.

9. Facing Material: Manufacturer’s standard
10. Acoustical Performance: Sound absorption NRC of not less than 0.75 according to ASTM C 423 for Type A mounting according to ASTM E 795.
11. Nominal Core Thickness: 2 inches (51 mm).
12. Panel Width: As indicated on Drawings.
13. Panel Height: As indicated on Drawings.

2.4 MATERIALS

A. Core Materials: Manufacturer's standard.
   1. Impact-Resistant, Acoustically Transparent, Copolymer Sheet for Face Layer: 1/16- to 1/8-inch- (1.6- to 3.2-mm-) thick layer of perforated, noncombustible, copolymer sheet laminated to face of core.

B. Facing Material as selected by Architect from manufacturer's full range.
   1. Washable surface
   2. Applied Treatments: Stain resistance and flame retardant.

C. Mounting Devices: Concealed on back of unit, recommended by manufacturer to support weight of unit

2.5 FABRICATION

A. Standard Construction: Use manufacturer's standard construction unless otherwise indicated; with facing material applied to face, edges, and back border of dimensionally stable core; and with rigid edges to reinforce panel perimeter against warpage and damage.

B. Edge Hardening: For cores, chemically harden core edges and areas of core where mounting devices are attached.

C. Core-Face Layer: Evenly stretched over core face and edges and securely attached to core; free from puckers, ripples, wrinkles, or sags.

D. Facing Material: Apply fabric facing fully covering visible surfaces of unit; with material stretched straight, on the grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other visible distortions or foreign matter.

   1. Square Corners: Tailor corners. Heat-seal vinyl fabric seams at corners.
   2. Radius and Other Nonsquare Corners: Attach facing material so there are no seams or gathering of material.
   3. Fabrics with Directional or Repeating Patterns or Directional Weave: Mark fabric top and attach fabric in same direction so pattern or weave matches in adjacent units.

E. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch (1.6 mm) for the following:

1. Thickness.
2. Edge straightness.
3. Overall length and width.
4. Squareness from corner to corner.
5. Chords, radii, and diameters.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fabric, fabricated units, substrates, areas, and conditions for compliance with requirements, installation tolerances, and other conditions affecting unit performance.

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

3.2 INSTALLATION

A. Install units in locations indicated. Unless otherwise indicated, install units with vertical surfaces and edges plumb, top edges level and in alignment with other units, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.

B. Comply with manufacturer's written instructions for installation of units using type of mounting devices indicated. Mount units securely to supporting substrate.

3.3 INSTALLATION TOLERANCES

A. NRC Variation from Plumb and Level: Plus or minus 1/16 inch (1.6 mm) in 48 inches (1200 mm), noncumulative.

B. Variation of Joint Width: Not more than 1/16-inch (1.6-mm) variation from hairline in 48 inches (1200 mm), noncumulative.

3.4 CLEANING

A. Clip loose threads; remove pills and extraneous materials.

B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION 098433

SECTION 105113 – METAL LOCKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions of Division 1, State of Connecticut, Department of Transportation, Standard Specifications for Roads, Bridges, Facilities and Incidental Construction, Form 819 - 2024 and supplemental specifications thereto, shall be a part of this specification.

1.2 SUMMARY

A. Section Includes:
   1. Welded athletic lockers.
   2. Locker benches.

1.3 ACTION SUBMITTALS

A. Submit the following in accordance with Form 819 Article 1.20-1.05.02 and NOTICE TO CONTRACTOR – SUBMITTALS.

B. Product Data: For each type of metal locker.

   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker and bench.

C. Shop Drawings: For metal lockers.

   1. Include plans, elevations, sections, details, and attachments to other work.
   2. Show locker trim and accessories.
   3. Include locker identification system and numbering sequence.

D. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available.

E. Samples for Verification: For the following products, in manufacturer's standard size:

   1. Lockers and equipment.
   2. Locker benches.

F. Product Schedule: For lockers. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Submit the following in accordance with Form 819 Article 1.20-1.05.02 and NOTICE TO CONTRACTOR – SUBMITTALS.

B. Qualification Data: For Installer.

C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Refer to Form 819 Article 1.06.03 and Form 819 Article 1.20-1.06.03 for additional information.

B. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.8 COORDINATION

A. Coordinate sizes and locations of concrete bases for metal lockers.

B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures.

b. Faulty operation of latches and other door hardware.

2. Damage from deliberate destruction and vandalism is excluded.
3. Warranty Period for Welded Metal Lockers: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain products from a single manufacturer in accordance with Form 819 Article 1.20-1.06.01.

1. Obtain locks from single lock manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Accessibility Requirements: For lockers and locker benches indicated to be accessible, comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.

2.3 WELDED ATHLETIC LOCKERS

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

1. ASI Storage Solutions
2. Lyon Workspace Products, LLC.
3. Olympus Lockers & Storage Products, Inc.

B. Style: Double tier.

C. Locker Size: 18 inches wide by 18 inches deep by 36 inches high per compartment.

D. Doors: One piece; fabricated from 0.075-inch nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.

1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches wide; welded to inner face of doors.
2. Door Style: Vented panel as follows:

a. Louvered Vents: No fewer than six 6-inch louver openings at top and bottom for double-tier lockers.

E. Body: Assembled by welding body components together. Fabricate from unperforated steel sheet with thicknesses as follows:

1. Tops, Bottoms, and Sides: 0.060-inch nominal thickness.
2. Backs: 0.048-inch nominal thickness.
3. Shelves: 0.060-inch nominal thickness, with double bend at front and single bend at sides and back.

F. Frames: Channel formed; fabricated from 0.060-inch nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.

1. Cross Frames for Double-Tier Lockers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.

G. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.
1. Hinges: Manufacturer's standard, steel, continuous or knuckle type.

H. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.

1. Single-Point Latching: Finger-lift latch control designed for use with padlocks; positive automatic latching and prelocking.
   a. Latch Hook: Equip each door with one latch hook, fabricated from 0.120-inch (3.04-mm) nominal-thickness steel sheet; welded midway up full-height door strike; with resilient silencer.

I. Projecting Turn-Handle and Latch: Steel handle welded to manufacturer's standard, three-point, cremone-type latching mechanism consisting of steel rods or bars that engage locker frame at top and bottom of door, and center latch that engages strike jamb; with steel padlock loop.

J. Door Handle and Latch for Box Lockers: Stainless steel strike plate with integral pull; with steel padlock loop that projects through metal locker door.

K. Locks: Combination padlocks.

L. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch (9 mm) high.

M. Hooks: Manufacturer's standard ball-pointed type, aluminum, or steel; zinc plated.

N. Free-Standing Lockers:
1. 6-inch legs.
2. Front and end closed bases.

O. Base: Closed style, fit in 6-inch high spaces between legs, for 6-inch leg lockers.

P. Continuous Sloping Tops: Fabricated from 0.048-inch nominal-thickness steel sheet, with a pitch of approximately 20 degrees.

Q. Recess Trim: Fabricated from 0.048-inch nominal-thickness steel sheet.

R. Filler Panels: Fabricated from 0.048-inch nominal-thickness steel sheet.

S. Boxed End Panels: Fabricated from 0.060-inch nominal-thickness steel sheet.

T. Finished End Panels: Fabricated from 0.024-inch nominal-thickness steel sheet to cover unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of non-recessed metal lockers; finished to match lockers.

U. Materials:

1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.

V. Finish: Baked enamel or powder coat.

1. Color: As selected by Architect from manufacturer's full range.

2.4 LOCKS

A. Combination Padlocks: Key-controlled, three-number dialing combination locks; capable of five combination changes.

2.5 LOCKER BENCHES

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

1. ASI Storage Solutions
2. Lyon Workspace Products, LLC.
3. Olympus Lockers & Storage Products, Inc.

B. Provide bench units with overall assembly height of 17-1/2 inches.

C. Bench Tops: Manufacturer's standard one-piece units, with rounded corners and edges.

1. Size: Minimum 12 inches wide by 1-1/4 inches thick.
2. Hardwood with two coats of clear sealer on all surfaces.

a. Color: As selected by Architect from manufacturer's full range.

D. Fixed-Bench Pedestals: Manufacturer's standard supports, with predrilled fastener holes for attaching bench top and anchoring to floor, complete with fasteners and anchors, and as follows:

1. Tubular Steel:

a. 1-1/2-inch-diameter steel tubing threaded on both ends, with standard pipe flange at top and bell-shaped cast-iron base; with baked-enamel or powder-coat finish; anchored with exposed fasteners.
b. 1-1/4-inch-diameter steel tubing, with 0.1265-inch-thick steel flanges welded at top and base; with baked-enamel finish; anchored with exposed fasteners.
c. Color: As selected by Architect from manufacturer's full range.

E. Materials:

1. Stainless Steel Plate, Sheet, and Strip: ASTM A240/A240M or ASTM A666, Type 304.
2. Hardwood: Industrial grade maple.
3. Extruded Aluminum: ASTM B221, alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated.
4. Steel Tube: ASTM A500/A500M, cold rolled.

2.6 FABRICATION

A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.

1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.

B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.

C. Equipment: Provide each locker with an identification plate and the following equipment:

1. Single-Tier Units: Shelf, one double-prong ceiling hook, and two single-prong wall hooks.
2. Open-Front Athletic Lockers: Shelf and Coat Rods

D. Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker

groups. Factory weld main locker groups into one-piece structures. Grind exposed welds flush.

E. Accessible Lockers: Fabricate as follows:

1. Locate bottom shelf no lower than 15 inches (381 mm) above the floor.
2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches (1219 mm) above the floor.

F. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.

G. Individual Sloping Tops: Fabricated in width to fit one locker frame in lieu of flat locker tops; with integral back; finished to match lockers. Provide wedge-shaped divider panels between lockers.

H. Recess Trim: Fabricated with minimum 2-1/2-inch (64-mm) face width and in lengths as long as practical; finished to match lockers.

I. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.

J. Boxed End Panels: Fabricated with 1-inch- (25-mm-) wide edge dimension and designed for concealing fasteners and holes at exposed ends of non-recessed metal lockers; finished to match lockers.

K. Finished End Panels: Designed for concealing unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of non-recessed metal lockers; finished to match lockers.

L. Center Dividers: Full-depth, vertical partitions between bottom and shelf; finished to match lockers.

2.7 ACCESSORIES

A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.

B. Anchors: Material, type, and size required for secure anchorage to each substrate.

1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls for corrosion resistance.
2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

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

3.2 INSTALLATION

A. General: Install lockers level, plumb, and true; shim as required, using concealed shims.

1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches (910 mm) o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
2. Anchor single rows of metal lockers to walls near top and bottom of lockers and to floor.

B. Welded Lockers: Connect groups together with standard fasteners, with no exposed fasteners on face frames.

C. Equipment:

1. Attach hooks with at least two fasteners.
2. Identification Plates:

a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
b. Attach plates to upper shelf of each open-front metal locker, centered, with a least two aluminum rivets.

D. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.

1. Attach recess trim to recessed metal lockers with concealed clips.
2. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.
3. Attach sloping-top units to metal lockers, with closures at exposed ends.
4. Attach finished end panels using fasteners only at perimeter to conceal exposed ends of non-recessed metal lockers.

3.3 ADJUSTING

A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding.

3.4 PROTECTION

A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

B. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 105113

SECTION 283100 – FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish and install a protected premises fire alarm and detection system with emergency voice/alarm system, including all equipment and accessories as specified herein and as required by the Code, as indicated on and in accordance with the requirements of the Contract Documents.

B. The contractor shall be responsible for sub-contracting a licensed fire alarm vendor/installer for delegated design services to modify and expand the existing fire alarm system per local AHJ requirements.

C. Section includes:

1. Power Supply.
2. Fire Alarm Control Panel.
3. Remote Annunciators.
4. Data Gathering Panels,
5. Visual Alarm Equipment.
6. Automatic Area Detectors.
7. Automatic Duct Smoke Detectors.
8. Heat Detectors.
9. Waterflow and Tamper Switches.
10. Addressable Manual Fire Alarm Stations.
11. Strobes.
12. One-Way Audio Alarm Devices.
13. Intelligent Modules.
14. Miscellaneous Equipment.

1.2 RELATED DOCUMENTS

A. Refer to Divisions 01, 14, 21, 22, 23, 25, 27 and 28 for the scope of work furnished and installed under those Divisions on which work in this Division may be dependent.

B. The following specification sections apply to all Work herein:

1. Section 26 05 00 - Common Work Results for Electrical.
2. Section 26 05 19 - Low Voltage Electrical Power Conductors and Cables.
3. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
4. Section 26 05 29 - Hangers and Supports for Electrical Systems.
5. Section 26 05 33 - Raceway and Boxes for Electrical Systems.
6. Section 26 05 44 - Sleeves and Sleeve Seals for Electrical Raceways and Cabling.
7. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.
8. Section 26 05 53 - Identification for Electrical Systems.
9. Section 26 08 00 - Commissioning of Electrical Systems.
10. Section 26 08 01 - Testing of Electrical Systems.

1.3 REFERENCES

A. The complete fire alarm and detection system and all components shall be designed, manufactured, tested, and installed in accordance with the latest applicable codes and reference standards including the following:

1. Codes:
   - A. CTBC - Connecticut State Building Code.
   - B. NFPA 13 - Sprinkler Systems.
   - C. NFPA 20 - Fire Pump Supervision.
   - D. NFPA 70 - National Electrical Code with CTBC Amendments.
   - E. NFPA 72 - National Fire Alarm Code.
   - F. NFPA 90A - Air Conditioning Systems.
   - G. NFPA 101 - Life Safety Code with CTBC Amendments.
   - H. CTFC - Connecticut State Fire Code
   - I. Americans with Disabilities Act of 1990.
2. Reference Standards:
   - A. UL Standard 38 - Manual Signaling Boxes for Fire Alarm Systems.
   - B. UL Standard 217 - Smoke Detectors - Single/Multiple Station.
   - C. UL Standard 228 - Door Holders - Closers.
   - D. UL Standard 268 - Standard for Smoke Detectors for Fire Alarm Signaling Systems.
   - E. UL Standard 268A - Duct Smoke Detectors.
   - F. UL Standard 464 - Audible Signaling Appliances.
   - G. UL Standard 521 - Heat Detectors.
   - H. UL Standard 864 - Control Panels.
   - I. UL Standard 1424 - Standard for Cables for Power-Limited Fire-Alarm Circuits.
   - J. UL Standard 1480 - Speakers.
   - K. UL Standard 1481 - Power Supplies.
   - L. UL Standard 1638 - Visual Signaling Appliances.
   - M. UL Standard 1971 - Signal Devices for Hearing Impaired.
   - N. ANSI 117.1 - Accessible and Usable Buildings and Facilities

B. The fire alarm system and its components shall be UL listed. The equipment and installation shall comply with all local codes and authorities having jurisdiction, including, but not limited to, Connecticut State Building Code, National Electrical Code and the Connecticut State Fire Code. Where the local standards vary from the UL and NFPA standards previously referenced, the local standards take precedence. All Devices and components shall be approved by FM Global unless explicitly permitted otherwise.

1.4 QUALITY ASSURANCE

A. All equipment and material to be furnished and installed on this Project shall be the product of a single manufacturer and suitable for its intended use on this Project.

B. Before commencing work, submit data showing that the manufacturer has successfully installed fire alarm systems of the same scope, type and design as specified. Include the names and locations of at least three (3) installations where such systems have performed satisfactorily for the preceding eighteen (18) months.

C. Provide the services of a representative or technician from the manufacturer of the system. The representative or technician is to be certified and experienced in the installation and operation of

the type of system provided. The representative shall be licensed in the State, if required by law. This representative shall supervise installation, software programming, software documentation, adjustments, preliminary testing, and final testing, and provide final certification of the system. This representative shall provide operational instruction to the Owner's personnel. Instruction shall include system operation, maintenance, programming and arm/disarm procedures.

D. The equipment manufacturer shall have been engaged in the production of this type of equipment for at least ten (10) years and have a fully equipped service organization capable of responding to the project site within four (4) hours from the initial contact for warranty or regular service work. Emergency and/or off-hours calls shall be responded to within four (4) hours of initial contact seven (7) days a week.

1.5 SUBMITTALS

A. Provide the following submittal data according to the Conditions of the Construction Contract and Division 1 Specifications and describe the proposed system and its equipment. The complete submittal shall include, but not be limited to, all of the following material:

1. Power Calculations:
   A. Battery capacity calculations.
   B. Supervisory power requirements for all equipment.
   C. Alarm power requirements for all equipment.
   D. Power supply rating justification showing power requirements for each of the system power supplies.
   E. Voltage drop calculations for wiring runs demonstrating a worst-case condition.
   F. Panel ampere loading, for each system control panel, power supply and/or DGP, during both normal and alarm modes with time calculations to substantiate compliance with battery back-up power requirements.
2. Complete manufacturer's catalog data including supervisory power usage, alarm power usage, physical dimensions, finish and mounting requirements.
3. Complete drawings covering the following shall be submitted for the proposed system. Floor plans for each floor and level shall be provided in a CAD compatible format showing all equipment and raceways, marked for size, conductor count with type and size, showing the percentage of allowable National Electric Code fill used.
4. A complete proposed system database including a description of all logic strings, control by event programming and point identification labels in a formatted printed form, as required for off-site editing, shall be submitted for evaluation by the Owner. The program shall include all required interactive control functions between the local network systems and the methods for implementing these actions.
5. Address, telephone number, and contact person(s) of the manufacturer's local service facility for normal and off-hour warranty issues.
6. A fire alarm system input-output function matrix designed in accordance with NFPA 72. Matrix shall illustrate alarm output events in association with initiating devices. Matrix shall represent a summary of the installed system alarm, supervisory and trouble functions. Include any and all departures, exceptions, variances or substitutions from these Specifications and/or drawings at the time of bid.
7. For each system control panel and/or DGP, provide written schedule of active and spare addresses provided on each addressable circuit to substantiate compliance with circuit usage/spare requirements, described elsewhere in these Specifications.
8. Provide manufacturer’s printed product data and catalog pages including, but not limited to:
   A. Area smoke detectors.

B. Heat detectors.
C. Manual pull stations.
D. Addressable interface modules.
E. Strobes.
F. Duct smoke detectors.
G. Remote test stations/LED indicators.

9. Provide shop drawings as follows:
   A. Drawing or catalog page showing actual dimensions of each FCC component.
   B. Drawing(s) or catalog page(s) showing actual dimensions of each system control panel, amplifier cabinet and/or battery cabinet.
   C. Drawing or catalog page showing actual dimensions of the remote annunciator(s).
   D. Single-line riser diagram showing all equipment, all connections and number and size of all conductors and conduits.
   E. Drawing(s) showing complete assembly of all components at the FCC within architectural enclosure.
10. Copies of certification of service technician's formal training by the system manufacturer. As a minimum, certification documents shall indicate training dates, systems qualified, name of individual certified and current status.
11. Two (2) samples of each piece of equipment or device for approval. One of each device/equipment will be retained by the Owner, the other shall be retained by the Construction Manager at the job site for reference.
12. Submit a paragraph-by-paragraph letter of compliance (of this Specification) for the fire alarm system, identifying compliance or non-compliance and reasons for non-compliance.
13. All submittal data shall be in bound form with this Contractor's name, supplier's name, and project name.
14. Only basic equipment devices have been shown on the contract drawings. Specific wiring between equipment/devices may not be shown or may be shown for design intent only. Submit for approval the complete engineered system configuration and layout showing all devices, wiring, conduit, and locations along with other required information as specified herein to provide a complete operational system as specified.
15. No matter how minor, any deviations from these Specifications shall be submitted in written form review by the Engineer. Complete drawings and itemizations of deviations shall be included.

1.6 RECORD DRAWINGS

A. In addition to the requirements for record drawings stated in Section 26 05 00, provide (or modify) the original fire alarm contract drawings to reflect the “as-built” conditions in AutoCAD format.

B. All original symbols shall be utilized for all equipment. No additional system components shall be shown, or those shown deleted.

C. Floor plans shall show the exact locations of devices installed.

D. Riser diagrams shall show the floors and circuits on the floors on which they were installed.

E. These drawings shall be on the original title blocks, etc., with “as-built” and the date submitted in the issue information column.

F. All changes from the original contract drawings shall be bubbled with the next successive revision triangle.

G. A letter shall be drafted and accompany the drawings, on company letterhead and bearing the signature of an authorized employee of the company, attesting to the accuracy of the locations of equipment shown on the “as-builts”.

H. A letter shall be drafted and accompany the drawings, on company letterhead and bearing the signature of an authorized employee of the company, attesting that they have tested the sequence of operation of EACH device in accordance with the approved sequence of operations per the requirements of the AHJ.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with the requirements of the Division 01 and Section 260500.

1.8 RELATED WORK

A. Coordinate work of this Division with all related Divisions. Work and/or equipment provided in other Divisions and related to the fire alarm system shall include, but not be limited to:

1. Duct smoke detectors to be installed in coordination with Division 23 of the Specifications. The devices shall be furnished, wired and connected to the fire alarm system by this Contractor.
2. Sprinkler water flow alarm and valve tamper switches to be provided and installed by the Fire Protection Sprinkler Contractor under Division 21 of the Specifications. They shall be wired and connected to the fire alarm system through addressable interface modules furnished by this Contractor.
3. Elevator communications circuit wiring (trail cables) and installation of alarm notification devices to be provided by the Elevator Contractor under Division 14 of the Contract Documents. Devices and interface shall be provided at each Elevator Machine Room by this Division.
4. Elevator recall control circuits shall be coordinated with the elevator control equipment. They shall be wired and connected to the fire alarm system by this Division in locations approved by the Elevator Contractor. Provide all initiating devices, including alarm verification type Elevator Lobby and Elevator Machine Room smoke detectors.
5. Elevator, stair, and mechanical shaft smoke hatch/vents shall have a supervised fire alarm control circuit provided at each hatch/vent. They shall be programmed, wired, and connected to the fire alarm system by this Division. Provide an area smoke detector adjacent to each vent/hatch and provide any additional power circuits necessary to activate hatches and all required initiating devices from the source provided for the life safety (fire alarm) system. See architectural drawings for locations of all hatch/vent locations.
6. Security system for door release and hold-opens provided under another Section. Communications link between security system and fire alarm system as well as required fire alarm system programming by this Contractor. Coordinate protocol, physical connection type and location with Security Contractor.
7. Fire protection subsystems (Ansul, preaction, etc.) to be provided under another Division. Provide all required fused cutouts and communications interconnections with the base building fire alarm system.
8. Coordinate with all other trade Contractors for the mounting of and/or interfacing with any and all other fire alarm system related devices.

1.9 WARRANTY

A. Comply with the requirements of Division 01 and Section 260500.

B. Provide a one (1) year warranty period for the entire fire detection, alarm and communication system.

C. Training and Servicing Requirements

1. Train not more than eight (8) building operators of the system, with personal on-the-job instruction provided by a competent engineer for a minimum of 80 hours. The instruction shall be scheduled at a time as selected by the Owner. This is the minimum requirement. Where additional hours are specified in other paragraphs of this Specification, including alternates, those hours shall be additive to this minimum.
2. The operators shall be trained in the operation and preventive maintenance of the entire system, including the central console, printer, and other central panel equipment, including the procedures for replacing paper, maintenance items, etc. The operators shall be trained to recognize malfunctions of the control center by observations of printed copy and visual and audible signals. The instructions for accomplishing this and instructions for the corresponding action to be taken shall be included in the operator's manual.
3. In addition to the electronic media requirement, provide five (5) complete hard-copy sets of each of the following: Written operating and maintenance instructions, Specification data sheets and maintenance schedules.
4. Warrant the continuous future availability of service for this system. The servicing shall be provided by a factory trained service representative.
5. All components, parts and assemblies shall be guaranteed against defects in workmanship and materials for a period of one (1) year after acceptance.
6. Submit a letter of approval of the installation from the local Code Authority before requesting final acceptance of the system.
7. For the purpose of definition, the following shall apply:
    A. Beneficial Use: This shall mean that the Owner's operators are able to use the facility and receive reliable information therefrom in their normal work schedules for all inputs and outputs in this system network in which this Contractor has completed work.

1.10 MAINTENANCE AND SERVICE CONTRACT

A. Provide one (1) year of system maintenance and service, and one (1) year warranty period for the fire detection, alarm and communication system.

B. Provide technical instructions on trouble-shooting, maintenance and all NFPA-required testing during the one (1) year service contract. This instruction and testing shall take place during the scheduled preventive maintenance periods.

C. For the purpose of definition, the following shall apply:

1. Acceptance: The effective date of the start of the 12-month service and testing contract shall constitute formal acceptance of the facility.
2. Guarantee: The terms of the service contract shall fulfill the guarantee requirements. The expiration of the first 12-month paid-up service contract shall constitute termination of the guarantee period unless excepted by amendments to the service contract.

1.11 TOOLS AND SPARE PARTS

A. All special tools and spare parts required for operation and maintenance of equipment shall be furnished and delivered to the Owner or his representatives, and a receipt obtained prior to or at the time of the instructions to operating personnel.

B. A list of the special tools and spare parts to be supplied shall be detailed in the technical proposal.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Being listed herein as an acceptable manufacturer does not permit the manufacturer to provide standard manufactured equipment which does not comply with the performance and/or physical characteristic requirements of the Contract Documents.

B. All substitutions must be identified in the Base Bid as a voluntary DEDUCT alternate, and must be accompanied by a letter of equivalency certifying the product's equivalency in all performance and physical characteristics to the products listed herein. The proposed substitutions shall be inclusive of all cost and physical implications throughout the project. Under no circumstances should the substitution result in added cost to the project. Should the substitution be approved neither the project specifications nor the Contract Documents will be revised to reflect the substitution.

C. Fire alarm and detection system shall be manufactured by the following manufacturer, no alternates shall be considered unless they are listed and approved to be compatible with the existing equipment::

1. Firelite Alarms by Honeywell

2.2 GENERAL

A. This Contractor shall furnish, install, test, and place in operating condition a complete microprocessor-based, electrically supervised, intelligent, addressable, low voltage and modular, protected premises, fire alarm and detection system with digital communication techniques as specified herein and indicated on the drawings. The system shall include, but not be limited to, all control equipment including modifications and expansions to the existing fire alarm control panel, remote panels and data gathering panels, power supplies, initiating and signaling devices, hardware, software, conduit, wire, fittings, and all other accessories required to meet Code and provide a complete and operable system whether or not specifically itemized here. If the existing FACP is determined to be incapable of expansion/modifications, the contractor shall provide new to cover the scope of the package.

B. The operation of any station shall identify its location at the FACP.

C. Generic terms such as "subsystem", "the system", "a system", "the fire alarm system", etc., shall be deemed to apply to the complete system, unless specifically noted elsewhere.

D. The system shall operate as a non-coded, continuous sounding system which will activate all visual and audio alarm devices until silenced.

E. The system shall be an integrated system of the addressable multiplexed type, completely supervised, such that a break in any wire (loop) will not prevent any component and/or device from operating. The system shall include multiplexing cabinets (data gathering panels) installed in appropriate approved locations in the building. The system shall be of the type such that each device connected to the system will be provided with a unique address and separately identified at the Fire Alarm Control Panel (FACP).

F. Provisions shall be made within the FACP and each data gathering panel for a software comparison for each software update which will highlight each change between versions of the software (for comparison at time of installation and for the life of the system). This feature is provided to limit accidental changes between software versions which might affect the function and/or operation of the system.

G. Provision shall be made to permit on-line programming modifications to add, delete or modify points to any existing programmed category in the field, by the Owner or a representative thereof, subsequent to inputting an established authorization code. Provide comparison check of each version of software.

H. The Fire Alarm Control Panel and the data gathering panels shall communicate via a peer-to-peer protocol. These system devices shall be connected as network "nodes". The network connections in each of these system devices or nodes shall be made using a network interface module (NIM). Status changes in any network node shall be sent to all other nodes for processing and local operations as required.

I. Provide all associated provisions to allow for two (2) additional alarm initiating device loops and four (4) additional alarm shutdown relay loops per floor; include provisions in FACP, LSIP, remote multiplexing panels, system wiring and programming.

J. The system shall consist of, but not be limited to, the following:

1. Expanded/Modified Fire Alarm Control Panel (FACP) with integral flashing "fire" visible signal, and central station connection.
2. Data gathering panels (DGP's) (or multiplexing panels/cabinets) where required.
3. Remote annunciator panel(s) with alphanumeric display.
4. System LCD display terminal(s) with keypad(s).
5. Addressable manual dual action pull stations.
6. Addressable analog photoelectric area smoke sensors.
7. Addressable analog photoelectric duct smoke sensors.
8. Addressable area heat sensors.
9. Addressable interface modules.
10. Audible and visual notification devices.
11. Interface with elevator controls for Fireman's recall.
12. Interface with security systems for notification and life safety override.
13. Interface with HVAC and BMS.
14. Interface monitoring and/or control of fixed fire suppression system.
15. Municipal fire reporting tie-in equipment.

K. Non-addressable alarm initiating, supervisory and status monitored devices shall be integrated into the fire alarm system, as applicable, via addressable interface module(s):

1. Sprinkler water flow alarm (alarm initiating).
2. Sprinkler standpipe water flow (alarm initiating).
3. Sprinkler valve tamper switch (supervisory).
4. Dry pipe sprinkler system (alarm initiating).
5. Dry pipe sprinkler system low air - high air pressure alarm (supervisory - two [2] monitoring points).
6. Fire pump status contacts (supervisory) (minimum of three [3] monitoring points).
7. Emergency generator status contacts (supervisory) (minimum of three [3] monitoring points).

8. Fire pump ATS position (normal, emergency), each fire pump or sprinkler pump.

L. Audible/visual signaling devices and communicating devices to be controlled by the FACP and/or DGP's.

1. Horns.
2. Strobe lights.
3. Combination Horn/Strobes.

M. Devices to be controlled by the FACP, DGP's programmable relays, duct smoke detector programmable relays, remote system programmable relays and/or intelligent addressable interface module relays:

1. Connections to the appropriate receiving agency for manual station alarm, sprinkler alarm, smoke alarm, interfaced suppression system alarm, supervisory and system trouble conditions.
2. Magnetic door holders release control.
3. Elevator controls for elevator recall.
4. Elevator shaft, stair and/or mechanical shaft smoke hatch/vent release control.
5. Mechanical system fan shutdown control.

2.3 WIRING CONFIGURATION

A. Wiring shall be continuously electrically supervised against component failures and shall detect opens, shorts and grounds which shall report as a trouble alarm.

B. All network cabling between data gathering panels and between data gathering panels and the FACP shall be NFPA 72 Style 7 (Class A), with two (2) diversely routed conduits with loop isolator analog signaling circuitry required to communicate with and receive alarms from the points on the loop.

C. All device wiring, Signaling Line Circuits (SLC's), Initiating Device Circuits (IDC's) and Notification Appliance Circuits (NAC's) shall be NFPA 72 Class B. Addressable loops shall be configured with loop isolators on the floor served and wired in a manner that prevents a catastrophic wiring event on a floor from affecting the performance of other portions of the floor and all other floors. A minimum of two (2) loops per floor for each floor shall be provided for each circuit type (e.g., initiating, communication, visual, etc.).

D. Each SLC, IDC and NAC shall have a capacity as required for all devices (zones) which shall include all functions relating to fire alarm system stated and implied in this Specification, as shown on the drawings (including equipment noted as "future"), plus 25% space capacity for future modifications.

E. A minimum of two (2) circuits each for audible devices and visual devices shall be provided on each floor. Each circuit shall not consist of more than 60% of the devices on the floor, and routing of each circuit shall maintain 20 feet of separation from the other circuit. Devices shall be circuited so that devices in any area, space or room alternate between two or more circuits.

F. Loops shall not serve more than one (1) floor or more than one (1) fire zone within a floor

2.4 POWER SUPPLY

A. System power supplies shall be provided, including necessary transformer rectifiers, regulators, filters and surge protection to render the system impervious to any variation in input power quality, including surges, transients, undervoltage, line noise, harmonics, etc., whether originating from the building primary power or generator power required for system operation.

B. Capacity shall be provided to power the system in a worst-case condition with all devices in alarm and all local indicating appliances active without exceeding the listed ratings plus 25% spare capacity.

C. All system devices shall display normal and alarm conditions consistently whether operating from normal power or reserve (standby) power.

D. Systems not capable of displaying an alarm indication at each detector when in a standby power mode shall include an addressable remote LED indicator to perform this required function.

E. Power for all devices, including the secondary power battery chargers, shall be obtained from dedicated emergency power circuits, with lock-on provisions for the overcurrent protective device serving the branch circuit. Each circuit used for fire alarm purposes shall be permanently labeled for function. All power for the system shall be derived from the dedicated service.

F. Size all wiring based on expected maximum load so as not to exceed the maximum voltage drop required within the NEC for feeders and branch circuits.

G. Secondary Power Supply: Provide sealed gelled electrolyte batteries as the secondary power supply for all fire alarm functions. The battery supply shall be calculated to operate loads in a supervisory mode for twenty-four (24) hours, with no primary power applied, and after that time, operate in alarm mode for five (5) minutes. Batteries shall be sized at 125% of the calculated size to compensate for deterioration and aging during the battery life cycle. Battery calculations shall be submitted to justify the battery size.

H. Provide battery charging circuitry for each standby battery bank in the system. The charger shall be automatic in design, adjusting the charge rate to the condition of the batteries. All system battery charge rates and terminal voltages shall be read using the fire alarm control panel LCD display in the service mode, indicating directly in volts and amps. Meters reading only in percentage are not acceptable.

2.5 FIRE ALARM CONTROL PANEL

A. Existing FACP(s) shall be reused, and shall be modified, expanded, reconfigured and reprogrammed as required to provide coverage of installations as part of this package, while retaining existing functionality for portions of the system not impacted by this package. If the FACP(s) are found to be incapable of being modified/expanded, the contractor shall provide additional equipment as required to achieve a fully functioning system. The contractor and contractor's FA vendor/installer shall be responsible for surveying the existing equipment to determine the requirements for system modifications/expansions. At a minimum, new FACP's shall be provisioned with adequate equipment/components and capacity to provide coverage for the entire MOE Facility in the future. The FACP shall be capable of accepting fiber network cards/connections to integrate other FACP's/Nodes at remote locations within the vicinity, as well as IP/Cellular Digital Alarm Communications Transmitter.

B. Existing FACP models are as follows:

1. MOE Facility: Firelite ES-200X

C. The FACP shall supervise and control the fire alarm system as follows:

1. Alarming, acknowledgment and recording of the specified alarm indications.
2. The system shall continuously monitor all remote inputs for presence of an alarm. Reporting of a new alarm or a return to normal shall be within a three (3) second interval. This time interval starts at the time the alarm or return to normal is initiated at the remote point and ends upon completion of the alarm printout.
3. The existence of an alarm on any point shall not delay the reporting of additional alarms at other points. All alarms shall be retained by buffered registers so that none shall be lost due to any cause.
4. Continuously monitor all contact devices in the fire alarm system, normal power source, power failure, fire pump operation and emergency generator operation for the presence of an alarm.
5. Automatic and immediate logging of all alarm conditions on the system printer.

D. The cabinetry shall be coordinated with the Architect and shall be made of 16 gauge steel with welded construction of configuration selected by the Architect. The cabinets shall be designed for front access only to all equipment and shall contain required louvered panels in sufficient size and quantity to allow for natural ventilation without the use of fans. The panel shall also be provided with the appropriate openings in the bottom to accept the necessary power and communications cable.

E. Properly design, layout, and construct the FACP subject to the approval of the Owner and the local Authority Having Jurisdiction. The FACP shall be integrated into the Fire Command Center. Refer to details on Architect's drawings. Coordinate the overall dimensions and appearance with all other architectural finishes. The equipment shall be arranged properly to present an efficient and organized appearance, with layout and finishes approved before final fabrication. Drawings indicating plan view, front elevation and sections through major components, identifying all of the components listed hereinbelow, shall be submitted.

F. Municipal fire reporting tie-in equipment which will initiate a fire alarm signal to JCI for central station supervision.

1. Central tie-in shall differentiate the following signals:
   A. Manual
   B. Automatic
   C. Water flow
   D. Common trouble shall report to central station (including all subsystems trouble).
   E. Supervisory.
   F. Carbon Monoxide.

G. Alarm annunciator display and keypad to display each device, location, type of alarm, trouble and malfunction status. Indications shall be provided in a graphic format for individual devices, including the operating conditions or status of:

1. Area, as well as duct-type smoke detectors.
2. Heat detectors.
3. Sprinkler valve tamper and water flow detecting devices.
4. Manual fire alarm stations.
5. Subsystem common alarms.

6. System trouble and malfunction status.
7. Fire pumps and special service fire pump monitoring including for each pump:
   A. Pump running.
   B. Pump power.
   C. Alternate pump power (generator).
   D. Phase reversal.
   E. Trouble.
8. Emergency power system indications, including the following:
   A. Generator run.
   B. Generator malfunction.
   C. Normal/Emergency position of each transfer switch.
9. System and amplifier trouble and malfunction indications.
10. System power supply indications. (Normal, Emergency, Power On).

H. In addition to visual indications previously specified, an audible signal shall be provided for all alarms or change of status to the system. A switch shall be provided on the console to acknowledge the alarm and silence the audible signal. Subsequent alarms to the console shall reenergize the audible signal until they are acknowledged.

I. Systems test switch which will initiate trouble indicator to the central station while in test mode, but will not transmit alarms.

2.6 REMOTE ANNUNCIATORS

A. Annunciator(s) at the regularly assigned locations shall contain the following equipment:

1. An alarm annunciator display and keypad to display all alarm and trouble zones at the facility.
2. Standby power system indications (LED's), including the following:
   A. Generator run.
   B. Generator malfunction.
   C. Normal/Emergency position of each transfer switch.

   Coordinate layout and finish of each system with the Architect. Building frontage/entrance remote annunciators shall be listed for wet/exterior installations as required.

2.7 DATA GATHERING PANELS

A. Data Gathering Panels (Remote Control Panels, Multiplexing or Transponder Panels) shall consist of the following:

1. A microprocessor which, in response to interrogatory or command communications from the Fire Alarm Control Panel, shall report status or carry out commands. The system DGP’s shall be solid-state and modular in design.
2. DGP’s shall be housed in surface- or flush-mounted steel cabinets with lockable, hinged, steel doors with red finish. Each cabinet shall be provided with a cabinet door tamper switch wired to a status monitoring circuit to report all door openings.
3. DGP’s shall be configured as required.
4. Each cabinet located in conditioned spaces shall be designed for front access to all equipment and shall contain required louvered vent panels and appropriate openings in side or bottom to accept necessary wiring. All cabinets located in unconditioned spaces and/or spaces exposed to outdoor conditions shall be provided with a suitable environmental enclosure with heat powered via fire alarm system power distribution.

2.8 AUTOMATIC AREA DETECTORS

A. Photoelectric area-type smoke detectors shall be provided in quantities that meet local codes, NFPA 72 and manufacturer's recommendations, and shall be located in all required areas, including, but not limited to:

1. Electrical Equipment Rooms.
2. Elevator Machine Rooms.
3. Mechanical Equipment Rooms.
4. Communications Equipment Rooms.
5. Electric closets.
6. Communications closets.
7. Elevator Lobbies.
8. Top of elevator shafts.
9. Top of stair enclosures.
10. Outside the entrance to each exit stair.
11. At each smoke vent.
12. On each side of each HVAC transfer opening with a smoke or fire/smoke damper.

B. Detector layouts in Mechanical Rooms, Electrical Rooms and all areas without ceilings are indicated on the drawings for an approximate quantity only. Provide a shop drawing for each area, coordinated with all trades, indicating inaccessible locations (due to large conduit banks or ductwork) as well as all beams or structural pockets 8 inches deep or larger. Provide all required detectors in each area as required by Code based upon the architectural/structural conditions.

C. Area smoke detectors shall be fully addressable, using analog and/or intelligent technology, operating on the photoelectronic principle, set to respond to a predetermined smoke density. A nominal 1.5% light obscuration per foot is considered maximum detected with a solid state light emitting diode and a high-speed light sensing photo-diode within a light sensing chamber. Components shall be long-life, solid state, with a design life in excess of 40 years. This includes the power on/alarm LED, which is pulsed under normal conditions and constant in alarm. The detector sensitivity shall be individually adjustable with remote sensitivity adjustment from FACP. The unit shall give advance indication to the main processor when maintenance will be needed. The detector shall plug into a base having an alarm-indicating LED. The unit shall give advance indication to the main processor when maintenance will be needed. Detectors shall be equipped with auxiliary contacts for remote indication.

D. Detectors shall be listed by UL for sensitivity testing by means of the portable programmer/tester or by readout from the control panel. Device address and sensitivity assignments shall be predetermined electronically. Devices requiring dipswitch settings, rotary switch settings, staples or jumper settings are not acceptable.

2.9 AUTOMATIC DUCT SMOKE DETECTORS

A. Photoelectric duct-type smoke detectors shall be provided in quantities that meet local codes, NFPA 72, and manufacturer's recommendations, and shall be located in all required areas, including but not limited to

1. At every return air duct or plenum tap into a common return air vertical shaft or riser on each floor.
2. In the return air duct serving each supply air fan or ventilation fan, and each piece of air handling equipment exceeding 2,000 cfm.

3. At each smoke and fire/smoke damper device, located within 5 feet of the associated damper.

B. Coordinate with Divisions 23 and 25 for locations.

C. Duct-mounted smoke detectors shall be fully addressable, using analog and/or intelligent technology, operating on the photoelectronic principle, set to respond to a predetermined smoke density. A nominal 1.5% light obscuration per foot is considered maximum detected with a solid state light emitting diode and a high-speed light sensing photo-diode within a light sensing chamber. Components shall be long-life, solid state, with a design life in excess of 40 years. This includes the power on/alarm LED, which is pulsed under normal conditions and constant in alarm. The detector sensitivity shall be individually adjustable with remote sensitivity adjustment from FACP. The unit shall give advance indication to the main processor when maintenance will be needed. Detectors shall be equipped with auxiliary contacts for remote indication.

D. Duct-type detectors shall be self-compensating for the effects of air velocity (from 300-4000 fpm), temperature, humidity, and atmospheric pressure. The detectors shall be provided with full length sampling tubes in locations that are consistent with the devices' UL listing, as coordinated with Division 23 and Division 25 of the Specifications. These devices shall be fully addressable using analog and/or intelligent technology. The units shall give advance indication to the main processor when maintenance will be needed. Include in shop drawing submission the methods and expected levels for testing the device sensitivity and required velocity, with verification of the stated values included in the system site approval and testing procedure.

E. Detectors shall be listed by UL for sensitivity testing by means of the portable programmer/tester or by readout from the control panel. Device address and sensitivity assignments shall be predetermined electronically. Devices requiring dipswitch settings, rotary switch settings, staples or jumper settings are not acceptable.

F. Except for automatic duct smoke detectors mounted in MER's at 6 ft. 6 in. or lower, provide, for each automatic duct smoke detector, a remote test station with key switch and LED. These test stations shall be located in the nearest electrical closet, or MER at 6 ft. 6 in. or lower.

2.10 HEAT DETECTORS

A. Heat detectors, combination rate-of-rise and fixed temperature, shall be provided in quantities that meet local codes, NFPA 72, and manufacturer's recommendations, and shall be located, at a minimum, in the following areas:

1. Mechanical Equipment Rooms, in lieu of smoke detectors where conditions are such that a smoke detector may be prone to false alarms.
2. Emergency Generator Rooms/Enclosures.
3. Areas exposed to outdoor conditions and/or unconditioned spaces (e.g., parking levels, etc.), in lieu of smoke detectors (i.e., ambient temperatures could exceed the temperature ratings of a smoke detector).

B. The area-type heat detector shall be fully addressable, using analog and/or intelligent technology, combination rate-of-rise and fixed temperature type. In addition, this unit shall be equipped with integral communication capability and with a solid-state light emitting diode alarm indicating lamp. The thermal sensors setting this device shall be capable of 8.5°C for rate-of-rise setting of 57°C for fixed temperature setting. The heat detector unit shall be equipped with auxiliary contacts for remote indication.

C. Detector layouts in Mechanical Rooms, Electrical Rooms and all areas without ceilings are indicated on the drawings for an approximate quantity only. Provide a shop drawing for each area, coordinated with all trades, indicating inaccessible locations (due to large conduit banks or ductwork) as well as all beams or structural pockets 8 inches deep or larger. Provide all required detectors in each area as required by Code based upon the architectural/structural conditions.

D. Detectors shall be listed by UL for sensitivity testing by means of the portable programmer/tester or by readout from the control panel. Device address and sensitivity assignments shall be predetermined electronically. Devices requiring dipswitch settings, rotary switch settings, staples or jumper settings are not acceptable.

2.11 WATERFLOW AND TAMPER SWITCHES:

A. Waterflow and tamper switches in the sprinkler systems and the tamper switches on valves for the sprinkler systems will be provided under the Fire Protection Division. Coordinate with Fire Protection Division as to the proper type and number of contacts required on the sprinkler waterflow and tamper switch devices. These devices shall be connected to individually zoned, addressable modules.

2.12 ADDRESSABLE MANUAL FIRE ALARM STATIONS

A. Manual pull stations shall be located in the following areas (mounting height shall be 42 to 48 inches AFF):

1. Within 5 feet of each entrance to each exit passageway and exit stair.
2. Adjacent to the exit door, leading to the outdoors, within each exit.
3. Provide additional manual pull stations if the travel distance between pull stations exceeds 200 feet.

B. The addressable manual station shall be dual action non-coded type manual station of metal construction with normally open, single-pole, single-throw (SPST) general alarm contacts. The addressable manual station shall contain an addressable printed circuit board with circuitry to respond to poling signals from the FACP and shall report alarm or trouble status changes. When operated, the alarm lever shall remain in its "down" position to indicate its operation, with alarm contacts closed until the station is reset.

C. The station shall be reset by opening the front, resetting the lever and closing the station front. The station shall be tested by opening the station front and then returning same to normal. It shall be necessary to open the station to replace the break rod. A spare break rod shall be furnished with each station and delivered to the Owner.

D. The station shall be furnished for semi-flush mounting or flush mounting with matching backbox where shown on the drawings. The manual station shall be.

2.13 STROBES

A. Strobe lights shall be utilized for the visual warning system and shall be located in the following areas (mounting height shall be 80 inches AFF measured to the center point or 6 inches below the finished ceiling, whichever is the lower point):

1. Mounted on wall or columns and spaced to permit the visual signal to be seen within all general and public areas.
2. Common corridors.

3. Elevator Lobbies.
4. Restrooms.
5. Conference Rooms.
6. Equipment Rooms.
7. Near equipment mounted outdoors.

B. Strobes shall be constructed of an electronic high intensity flashing light and sealed and protected by a lexan lens. Lettering shall be red with a clear lens mounted with a gloss finished red plate. The word "FIRE" shall appear on the strobe or faceplate. The strobe shall flash at a rate of one flash per second maximum, and shall be powered by a supervised 24 VDC source. The assembly shall mount on a standard outlet box.

C. Provide weatherproof visual devices at outdoor locations.

D. Fire strobe lights shall be rated 15/30/75/110 candela.

E. Combination audible/visual units shall be an integral unit, combining the individual features of the audible device and visual device.

F. Where multiple devices are visible from any location, circuitry shall be incorporated for the synchronization of the flash rate and flash initiation.

2.14 ONE-WAY AUDIO ALARM DEVICES

A. Horns shall be utilized for the audible alarm devices and shall be ,provided in quantities that meet local codes, NFPA 72, and manufacturer's recommendations, and shall be located in all required areas, including, but not limited to:

1. Mounted on wall or columns and spaced to permit the audio signal to be heard within all areas.
2. Common corridors.
3. Elevator Lobbies.
4. Restrooms.
5. Conference Rooms (with more than eight [8] seats).
6. Equipment Rooms.
7. Near equipment mounted outdoors.
8. Stairways (one [1] every third floor, speaker only).

B. Provide electronic horn alarm indicating devices that shall be polarized horn type operating from power supply in the local DGP panels. In-Out screw terminals shall be provided for wiring. The horn shall have a red or white (as selected by the Architect) plastic housing. Horn shall be selectable for high or low dBA output. Selection of low or high output shall be reversible. Horns shall be selectable for steady output and shall meet the temporal 3-sound output standards for temporal output. Selection of steady or temporal output shall be reversible. A synchronized temporal pattern sound output level of 97 dBA average shall be provided.

C. Audible alarm signals shall produce a sound level at least 15 dBA above the average ambient sound level or 5 dBA above the maximum sound level, whichever is greater. The sound level shall be measured at 5 feet above the floor at any occupied area.

D. Provide completely weatherproof, self-contained audible devices where exposed to weather.

E. Combination audible/visual units shall be an integral unit, combining the individual features of the audible device and visual device.

2.15 BMS INTERFACE

A. The BMS interface shall be a supervised connection to the BMS control system to transmit specific alarms for remote monitoring. Provide new bacnet interface/gateway at MOE FACP as required.

2.16 INTELLIGENT MODULES

A. General: The personality of multifunction modules shall be programmable at site to suit conditions and may be changed at any time using a personality code downloaded from the Analog Loop Controller or it shall be possible to address each Analog Intelligent module with the use of rotary switches. The modules shall have a minimum of two (2) diagnostic LED's mounted behind a finished cover plate. A green LED shall flash to conform communication with the loop controller. A red LED shall flash to display alarm status. The module shall be capable of storing up to 24 diagnostic codes which can be retrieved for troubleshooting assistance. Input and output circuit wiring shall be supervised for open and ground faults. The module shall be suitable for operation in the following environment:

1. Temperature: 32°F to 120°F (0°C to 49°C).
2. Humidity: 0-93% RH, non-condensing.

B. Single Input Module: The intelligent Single Input Module shall provide one (1) supervised Class A input circuit capable of a minimum of 4 personalities, each with a distinct operation. The module shall be suitable for mounting in a 2-1/2 in. (64 mm) deep 1-gang box and 1-1/2 in. (38 mm) deep 4 in. square box with 1-gang cover. This single input module shall support the following circuit types:

1. Normally-Open Alarm Latching (Manual Station, Heat Detectors, etc.).
2. Normally-Open Alarm Delayed Latching (Waterflow Switches).
3. Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.).
4. Normally-Open Active Latching (Supervisory, Tamper Switches).

C. Dual Input Module: The intelligent Dual Input Module shall provide two (2) supervised Class A input circuits each capable of a minimum of four (4) personalities, each with a distinct operation. The module shall be suitable for mounting on North American 2-1/2 in. (64 mm) deep 1-gang boxes and 1-1/2 in. (38 mm) deep 4 in. square boxes with 1-gang covers. This dual input module shall support the following circuit types:

1. Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.).
2. Normally-Open Alarm Delayed Latching (Waterflow Switches).
3. Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.).
4. Normally-Open Active Latching (Supervisory, Tamper Switches).

D. Monitor Module: The intelligent Monitor Module shall be factory set to support one (1) supervised Class A Normally-Open Active Non-Latching Monitor circuit. The monitor module shall be suitable for mounting in a 2-1/2 in. (64 mm) deep 1-gang box and 1-1/2 in. (38 mm) deep 4 in. square box with 1-gang cover.

E. Waterflow/Tamper Module: The intelligent Waterflow/Tamper Module shall be factory set to support two (2) supervised Class A input circuits. Channel A shall support a Normally-Open

Alarm Delayed Latching Waterflow Switch circuit. Channel A shall support a Normally-Open Active Latching Tamper Switch. The waterflow/tamper module shall be suitable for mounting in a 2-1/2 in. (64 mm) deep 1-gang box and 1-1/2 in. (38 mm) deep 4 in. square box with 1-gang cover.

F. Control Relay Module: The intelligent Control Relay Module shall provide one Form "C" dry relay contact rated at 2 amps at 24 VDC to control external appliances or equipment shutdown. The control relay shall be rated for pilot duty and releasing systems. The position of the relay contact shall be confirmed by the system firmware. The control relay module shall be suitable for mounting in a 2-1/2 in. (64 mm) deep 1-gang box and 1-1/2 in. (38 mm) deep 4 in. square box with 1-gang cover.

2.17 MISCELLANEOUS EQUIPMENT

A. The automatic door holders and fire shutters will be provided under other Sections. Coordinate with other Trades as to the proper voltage level, power requirements, frequency (AC or DC) and contacts required for proper operation. It shall be the responsibility of this Section to provide all electrical service to these devices, from the life safety system power supply.

2.18 SEQUENCE OF OPERATION

A. Activation of the following devices shall cause the associated sequence of events to take place.

B. Manual Pull Station:

1. Activate alarm on all audible and visual notification devices on the floor of incidence, the floor below, and the floor above.
2. Activate an audible and visual "alarm" signal at the FACP and all remote annunciators.
3. Sound an audible inquiry tone only (no visual indication) throughout the balance of the building which is not in alarm.
4. Shutdown all mechanical equipment as required by code and as indicated on contract drawings/riser diagrams.
5. Transmit alarm signal to all interconnected systems.
6. Annunciate device on FACP, and all remote annunciators and record on English language printer.
7. A "manual" alarm signal shall be sent via central station to the Fire Department.

C. Area Smoke Detector, Duct Smoke Detector or Heat Detector:

1. Activate alarm on all audible and visual notification devices on the floor of incidence, the floor below and the floor above.
2. Activate an audible and visual "alarm" signal at the FACP and all remote annunciators.
3. Sound an audible inquiry tone only (no visual indication) throughout the balance of the building which is not in alarm.
4. Annunciate device on FACP, and all remote annunciators and record on English language printer.
5. An "automatic" alarm signal shall be sent via central station to the Fire Department.
6. Shutdown all fans serving the affected space.
7.
8. Annunciate condition to security system.

D. Elevator Smoke Detector (Dual Verification Type) Located in Elevator Lobby, Elevator Machine Room or Elevator Shaft: As per currently

programmed/configured and as required by code. No modifications to vertical transportation installations are currently included in the package.

E. Sprinkler Water Flow Alarm:

1. Activate alarm on all audible and visual notification devices on the floor of incidence, the floor below, and the floor above.
2. Activate an audible and visual "alarm" signal at the FACP and all remote annunciators.
3. Sound an audible inquiry tone only (no visual indication) throughout the balance of the building which is not in alarm.
4. Annunciate device on FACP, and all remote annunciators and record on English language printer.
5. A "waterflow" alarm signal shall be sent via central station to the Fire Department.
6. Shutdown all fans serving the affected space.
7. Annunciate condition to security system.
8. Recall all elevators serving alarm floor to the Ground Floor.

F. Tamper Switch or Other Supervisory Component:

1. Activate an audible and visual "supervisory" signal at the FACP and all remote annunciators.
2. Annunciate device on FACP, and all remote annunciators and record on English language printer.
3. A "supervisory" signal shall be sent via central station to the Fire Department.

G. Trouble Condition (e.g., Wiring Failure):

1. Activate an audible and visual "trouble" signal at the FACP and all remote annunciators.
2. Annunciate device on FACP, and all remote annunciators and record on English language printer.
3. A "trouble" signal shall be sent via central station to the Fire Department.

H. Subsequent alarms automatically initiated on the initially alarmed floors shall not automatically reactivate the audible alarm signal unless the initial alarm actuating circuit has been cleared and reset.

PART 3 EXECUTION

3.1 INSTALLATION

A. General

1. All devices that are recessed or semi-recessed into two-hour fire-rated partitions shall:
   A. Penetrate into the partition a maximum of 2-1/2 inches.
   B. Allow a maximum penetration of 25 square inches per 10 square feet.

B. Central Station Tie-in: Coordinate options with the Owner/Facilities Operator in sufficient time to obtain all required approvals to meet the project schedule. Provide all equipment, power connections, communications wiring, conduit, etc., as required.

C. Software and Firmware: Each DGP and the FACP shall run the same version of firmware and software at all times. If for any reason the version of firmware or software is required to be changed in any DGP or at the FACP, all software for the system shall be revised.

D. Wiring

1. All wiring shall be in raceways where required by Code. Wiring and raceways shall be installed in compliance with National Electrical Code, NFPA 72, and Fire Department regulations. Codes shall be implicitly followed, in particular with regard to material type and quality, circuitry extensions from and connections to outlet and junction boxes, panelboards and similar appurtenances. All wiring sizes shall conform to recommendations of the equipment manufacturer, and as indicated on the engineered shop drawings.
2. Electrical wiring and components shall conform to the following standards:
   A. Installation of conduit, wire, sleeves, outlet boxes, insulating bushings, system cabinets, terminal boxes, pull boxes, junction boxes, inserts, anchors, system devices and similar elements, shall be in accordance with the appropriate requirements of these Specifications and in accordance with the applicable Sections of the National Electrical Code and Connecticut State Building Code for signaling systems, and all authorities having jurisdiction.
   B. Components shall be installed in accordance with their listing and in accordance with Underwriters Laboratories, Inc. (UL) or Factory Mutual (FM). All fire alarm system wiring and system operation shall be installed in accordance with requirements of the Fire Department.
   C. Multiconductor cable used for signaling communication shall be No. 16 AWG minimum. Audio pairs shall be No. 14 AWG minimum. Multiconductor cable shall be provided with a minimum of 10% spare pairs. Insulation of conductors shall be of a type that will not support flame.
   a. Wire and cable for power, sprinkler and motor control shall be copper and shall conform to the standards of the Underwriters Laboratories, Inc. Conductor sizes shall be as required by Code and shall not be less than No. 12 AWG for power work and No. 14 AWG for sprinkler and motor control unless otherwise indicated or specified.

   D. Riser wiring shall not share conduit or raceway with horizontal wiring.
   E. All cabling shall comply with UL-1424. Additionally, cabling shall conform to the following:
      1). A minimum temperature rating of 150°C.
      2). A minimum average insulation thickness of 15 mils.
      3). A minimum average jacket thickness of 25 mils.
      4). The color of the cable shall be red.
      5). The cable shall be a type FPLP (plenum type).
      6). The cable shall be visibly marked externally that it meets the above requirements and is listed by UL.
      7). The cable shall have the following markings:
         a). Company name.
         b). "Type FPLP"
         c). Size (AWG)
         d). Temperature rating.
         e). The UL register mark.
3. Power supply for this system shall be sized to accommodate all functions related to the life safety system stated or implied in these Specifications, and as shown on the drawings and for future occupancy points as outlined elsewhere in this Section. The power supply shall be in accordance with and shall be obtained from main service switchboard with a

secondary power supply from the emergency light and power system via an automatic transfer switch sized as required.

4. Horizontal wiring shall be wiring with standard insulation and run in rigid conduit or may be Teflon or equivalent insulated where run without conduit or raceway in the hung ceiling return air plenums where approved by local authorities. Where wiring is subject to mechanical damage, such as exposed in Mechanical Equipment Rooms, Teflon or equivalent shall be run in a raceway or standard insulated wire shall be run in rigid conduit.
5. Wiring for all municipal fire reporting tie-ins (to central station) shall be run in conduit.

3.2 MANUFACTURER CERTIFICATION

A. At the completion of installation, but prior to field testing, a representative of the system manufacturer (not the installing Contractor, nor the local authorized retailer, etc.) shall review the entire installation and provide a report certifying that all equipment, as installed, is compliant with the manufacturer's requirements and recommendations.

B. The following areas shall be addressed in the report as a minimum:

1. Review of the project specifications to determine that the installed system is in compliance and note any areas of non-compliance, including the reasons for non-compliance.
2. Review "as-built" drawings to determine that the installation complies with all requirements and recommendations of the manufacturer.
3. Review operating system (OS) program to determine that the OS is the proper revision (REV) for the project and that all components are operating on the same OS.
4. Perform functionality tests to determine that the system is working properly.
5. Inspect wiring terminations and types (shielded vs. unshielded, etc.) against manufacturer recommendations and code requirements.
6. Inspect all equipment (software, hardware and firmware, etc.) revision (REV) levels to ensure that all equipment is operating on the required (and same) REV level.
7. Review all adjustable settings (e.g., sensitivity settings, etc.) to ensure all are set correctly for the system configuration.

C. Field testing shall not start until completion of this task.

3.3 FACTORY TESTING

A. All standard factory tests shall be performed in accordance with the latest version of NEMA and UL Standards.

3.4 FIELD TESTING

A. Test and Reports:

1. A licensed trained technical representative of the manufacturer shall supervise the final control panel connections and testing of the system. Upon completion of the acceptance tests, the Owner and/or his representatives shall be instructed in the proper operation of the system.
2. Provide fire-watch as required for all outages of the FAS in coordination with the owner.
3. The installing Contractor shall functionally test each and every device in the entire system for proper operation and response. In addition, each circuit in the system shall be fully tested for wiring supervision. Any items found not properly installed or non-functioning shall be replaced or repaired and re-tested.

4. The installing Contractor shall provide a complete written report on the functional test of the entire system. A copy of the test report shall be provided with maintenance manuals. The test report shall be signed and dated by the licensed fire alarm technician responsible for supervising the final system test and checkout.
5. A complete demonstration of the operation of the entire system shall be conducted by this Contractor, the Division 14 Contractor, the Division 21 Contractor, the Division 22 Contractor, the Division 23 Contractor, the Division 25 Contractor, and the system manufacturer for the Fire Department Inspectors.
6. Any required re-tests shall be made by this Contractor, the Manufacturer, and the Division 25 Contractor at no expense to the Owner. The Contractor shall pre-test the system for Contract Document and City Building and Fire Department requirements and shall so certify to the Engineer, and shall provide at least two (2) weeks written notice to the Architect and Owner of the Fire Department scheduled date for witness testing.
7. The Division 14 and Division 23 Contractors shall participate in the testing program.
8. Refer to the Division 14 Specifications for additional testing requirements.
9. Requirements for temporary occupancy shall be verified with the Building Department.

B. System Testing:

1. Prior to starting the site testing, a certification of each DGP, FACP and all wiring shall be submitted by the system manufacturer or a certified representative stating that all work is in compliance with the standards and recommendations of the manufacturer.
2. A complete operational test of the fire alarm system shall be performed.
3. In addition to a complete system integration test, any subsystems, or partial system completions, that must be tested for early activation of the life safety systems shall also be included. The Construction Manager/General Contractor shall define the schedule of all areas which must be completed in advance of the complete system.
4. In addition to all tests of the fire alarm system that are required by the Owner, Architect and Engineer, the installing Contractor shall be responsible to demonstrate the operation of the system to Fire Department.
5. Testing shall include the manual and automatic activation verification of all fire alarm initiating (input alarms and trouble indications) and output functions as listed in the system operation matrix.
6. Each smoke or heat detector shall be individually field tested prior to installing the device at its designated location to ensure reliability after shipment and storage conditions. A dated log indicating correct address, type of device, sensitivity and initials of the technician performing test - using test equipment specifically designed for that purpose - shall be prepared and kept for final acceptance documentation. After testing, the detection devices and base shall be labeled with the system address, date and initials of installing technician. Labeling shall not be visible after installation is complete.
7. 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.
    A. A systematic record shall be maintained of all readings using schedules or charts of tests and measurements. Areas shall be provided on the logging form for readings, dates and witnesses.
    B. The Acceptance Inspector shall be notified before the start of any required tests. All items found at variance with the drawings or this Specification during testing or inspection by the Acceptance Inspector shall be corrected.
    C. Test reports shall be delivered to the Acceptance Inspector as completed.

8. All test equipment, instruments, tools and labor required to conduct the system tests shall be made available by this Contractor. The following equipment shall be a minimum for conducting the tests:
   A. Multimeter for reading voltage, current and resistance.
   B. Intelligent device programmer-tester.
   C. Laptop computer with programming software for any required program revisions.
   D. Two-way radios, flashlights, smoke generation devices and supplies.
   E. Spare printer paper.
   F. An approved device for measuring air flow through air duct smoke detector sampling assemblies.
   G. Decibel meter.
   H. Testing documentation.
9. In addition to the testing specified to be performed by the installing Contractor, the installation shall be subject to test by the Acceptance Inspector.
10. A written "Acceptance Test Procedure" (ATP) for testing the fire alarm system components and installation will be prepared by the Contractor 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.
11. A final "as-built" function matrix shall be prepared by the installing Contractor referencing each alarm input to every output function affected as a result of an alarm, trouble or supervisory condition on that input. In the case of outputs programmed using more complex logic functions involving "any", "or", "not", "count", "time", and "timer" statements, the complete output equation shall be referenced in the matrix.
12. A complete listing of all device labels for alphanumeric annunciator displays and logging printers shall be prepared by the installing Contractor prior to the ATP.
13. The items tested shall include, but not be limited to, the following:
   A. System wiring shall be tested to demonstrate correct system response and correct subsequent system operation in the event of:
      1). Activation of all initiating devices.
      2). Open, shorted and grounded intelligent analog signaling circuit.
      3). Open, shorted and grounded network signaling circuit.
      4). Open, shorted and grounded conventional zone circuits.
      5). Open, shorted and grounded speaker, telephone circuits.
      6). Intelligent device removal.
      7). Primary power or battery disconnected.
      8). Incorrect device at address.
      9). Printer trouble, off line or out of paper.
      10). Loss of data communications between DGP's.
      11). Loss of data communications between system annunciators.
   B. System evacuation alarm notification appliances shall be demonstrated as follows:
      1). All alarm notification appliances actuate as programmed.
      2). Audibility and visibility at required levels.
   C. System indications shall be demonstrated as follows:
      1). Correct message display for each alarm input at the control panel, each remote alphanumeric LCD display.
      2). Correct annunciator light for each alarm input, at each annunciator and color graphic terminal.
      3). Correct printer logging for all system activity.
   D. System on-site and/or off-site reporting functions shall be demonstrated as follows:

1). Correct alarm custom message display, address, device type, date and time transmitted for each alarm input.
2). Correct trouble custom message display, address, device type, date and time transmitted for each alarm input.
3). Trouble signals received for disconnect.

E. Secondary power capabilities shall be demonstrated as follows:
1). 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.
2). System primary power shall be restored for forty-eight (48) hours and system charging current shall be normal trickle charge for a fully charged battery bank.
3). System battery voltages and charging currents shall be checked at the fire alarm control panel using the test codes and displayed on the LCD display.

14. In the event of system failure to perform as specified and programmed during the ATP procedure, at the discretion of the acceptance inspector, the test shall be terminated.
A. This Contractor shall retest the system, correcting all deficiencies and providing test documentation to the acceptance inspector.
B. In the event that software changes are required during the ATP, a utility program shall be furnished by the system manufacturer to compare the edited program with the original. This utility shall yield a printed list of the changes and all system functions, inputs and outputs affected by the changes. The items listed by this program shall be the minimum acceptable to be retested before calling for resumption of the ATP. The printed list and the printer log of the retesting shall be submitted before scheduling of the ATP.
C. The Acceptance Inspector may elect to require the complete ATP to be performed again if, in his opinion, modifications to the system hardware or software warrant complete retesting.

END OF SECTION 283100